

IWUA 79th Annual Convention

January 21, 2016

Measuring Mores Creek Summit

Dec 30, 2015

150% of Median



Natural Resources Conservation Service

Idaho Water Supply Outlook Report January 1, 2016

To better understand what is driving our weather in Idaho, check out the article below which explains this year's dominant weather pattern with quotes from our USDA Meteorologist.

January 4, 2016 News Headlines: ENSO summary from PBS NewsHour Science page

"Think El Niño is weird now? Just wait for this summer"

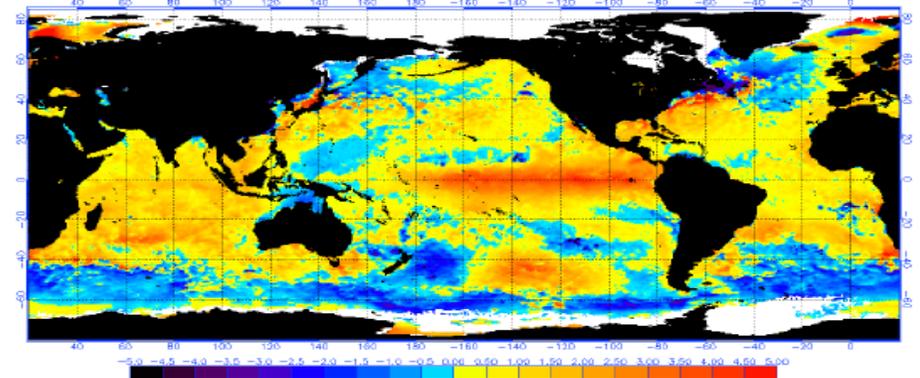
See link for full article:

<http://www.pbs.org/newshour/updates/think-el-nino-is-weird-now-just-wait-for-this-summer/>

The El Niño Southern Oscillation (ENSO) is a patch of warmer-than-normal water in the eastern and central Pacific Ocean that develops around the equator. Picture it as a spoon stirring a cup of coffee, said Brad Rippey, a meteorologist with the U.S. Department of Agriculture.

The heat acts like the spoon bowl, pushing huge currents around the Pacific. But then some of this warmth seeps upward from the moving water, like an invisible spoon handle, and begins stirring the air. "Eventually everything is moving in tandem," Rippey said, and that's when things get weird for the planet's weather.

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 1/4/2016
(white regions indicate sea-ice)



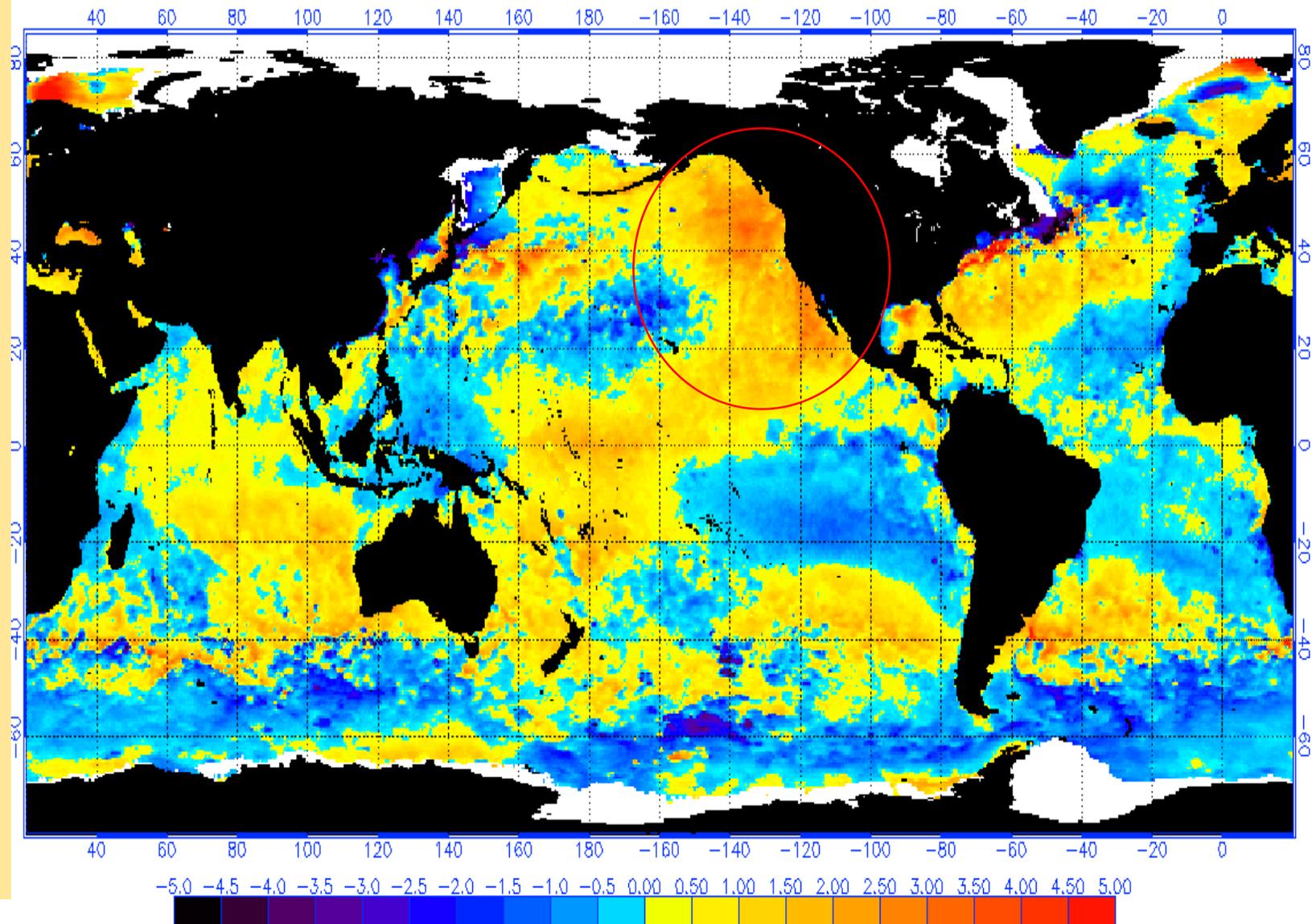
Ron Abramovich
Water Supply Specialist
Snow Survey
Boise, Idaho

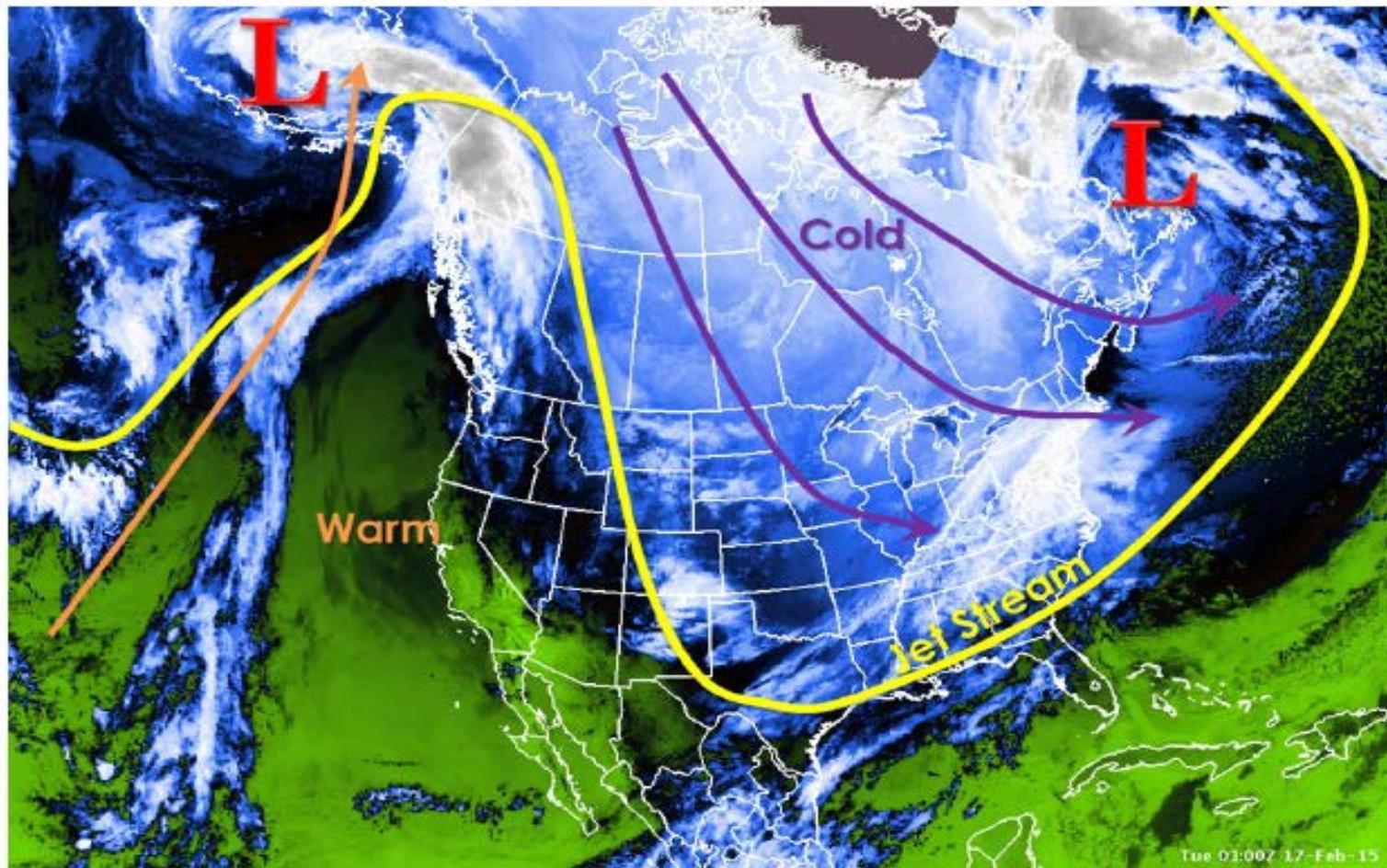


- Warmest waters off North America's west coast in 60-70 years
- Pacific Decadal Oscillation Index switched to + in Jan 2014; still on the positive side Jan 2016
- Temperatures were ~6 F above normal, similar to Seattle's 2015 winter temperatures
- NOAA mentioned warm waters had extended to depths of 60-100 meters

Sea Surface Temperatures March 16, 2015

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 3/16/2015
(white regions indicate sea-ice)



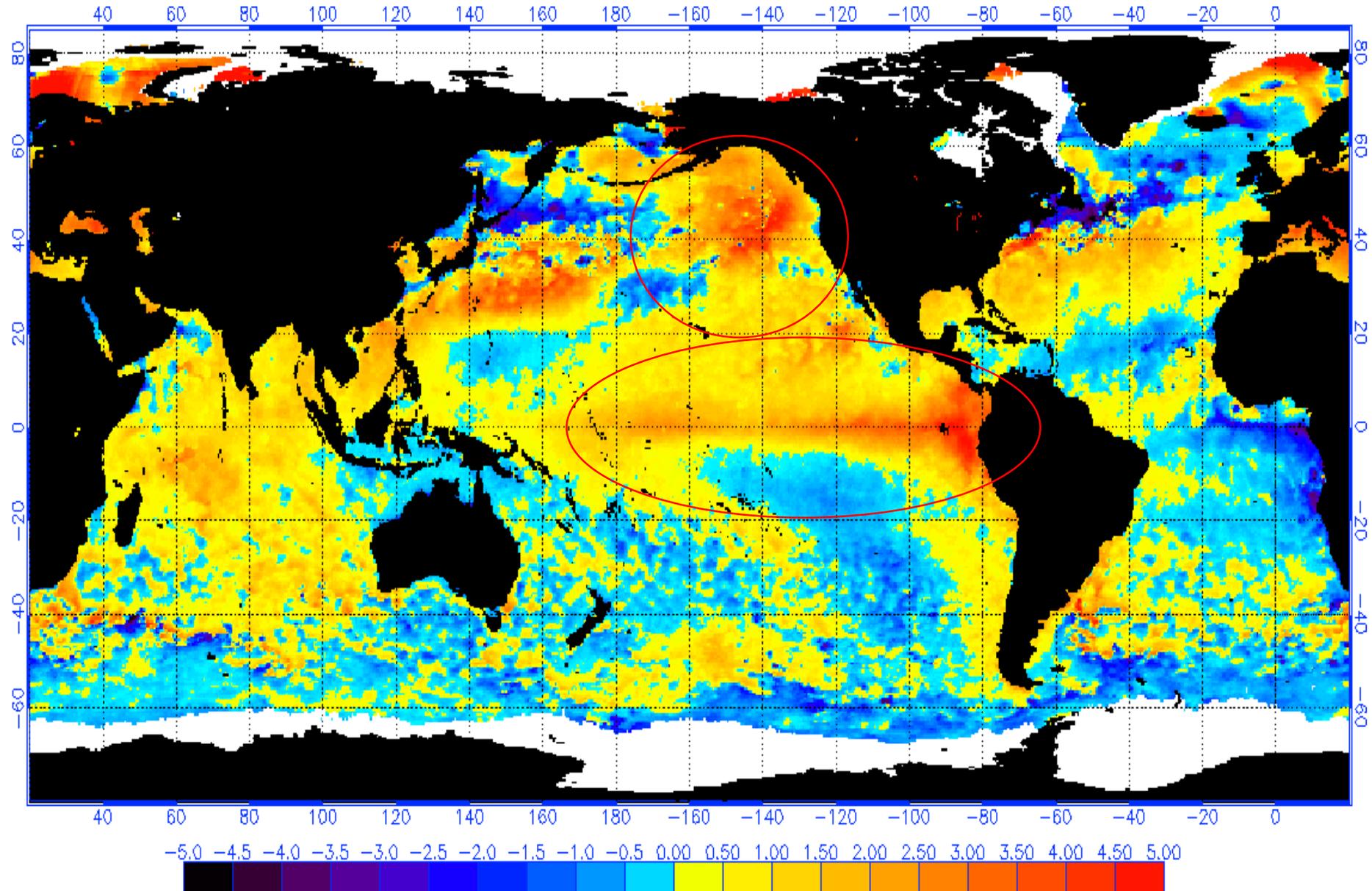


**From NWS:
Example of
winter weather
pattern for
2015 but also
for most of
2014**

The ridge has kept our area unseasonably warm and relatively dry through early March. A few Pacific weather systems were able to punch through, but precipitation totals for January through the first part of March were less than 50% of normal across most of southwest Idaho and southeast Oregon, and less than 25% of normal in a few areas.

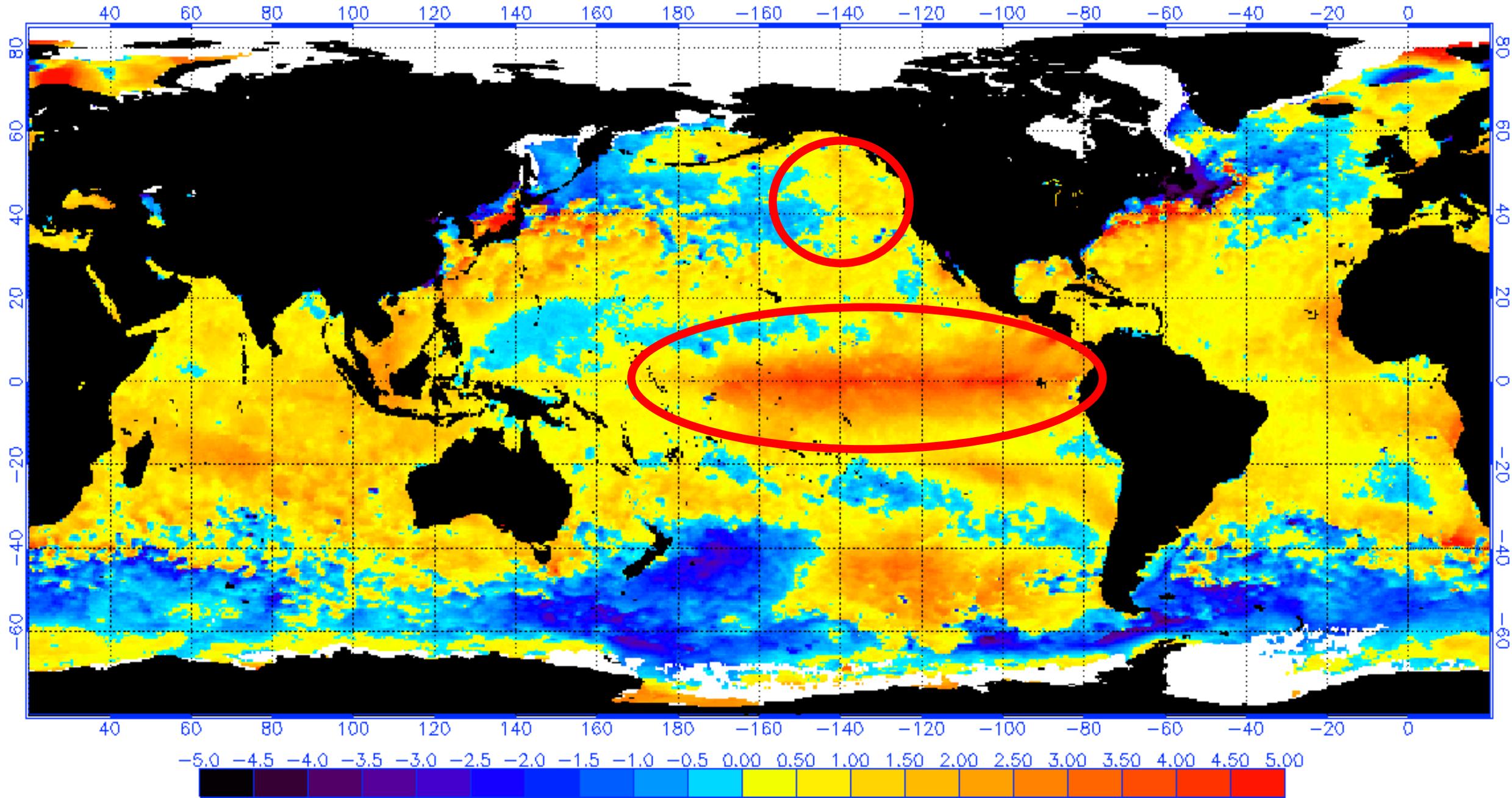
Sea Surface Temperatures June 15, 2015 – Strong El Nino Building

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 6/15/2015
(white regions indicate sea-ice)



NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 1/18/2016
(white regions indicate sea-ice)

Jan 18 2016



This pattern resembles a modified Strong El Niño pattern, and could stick around for the winter months.

From Andrew at The Weather Centre, July 2015

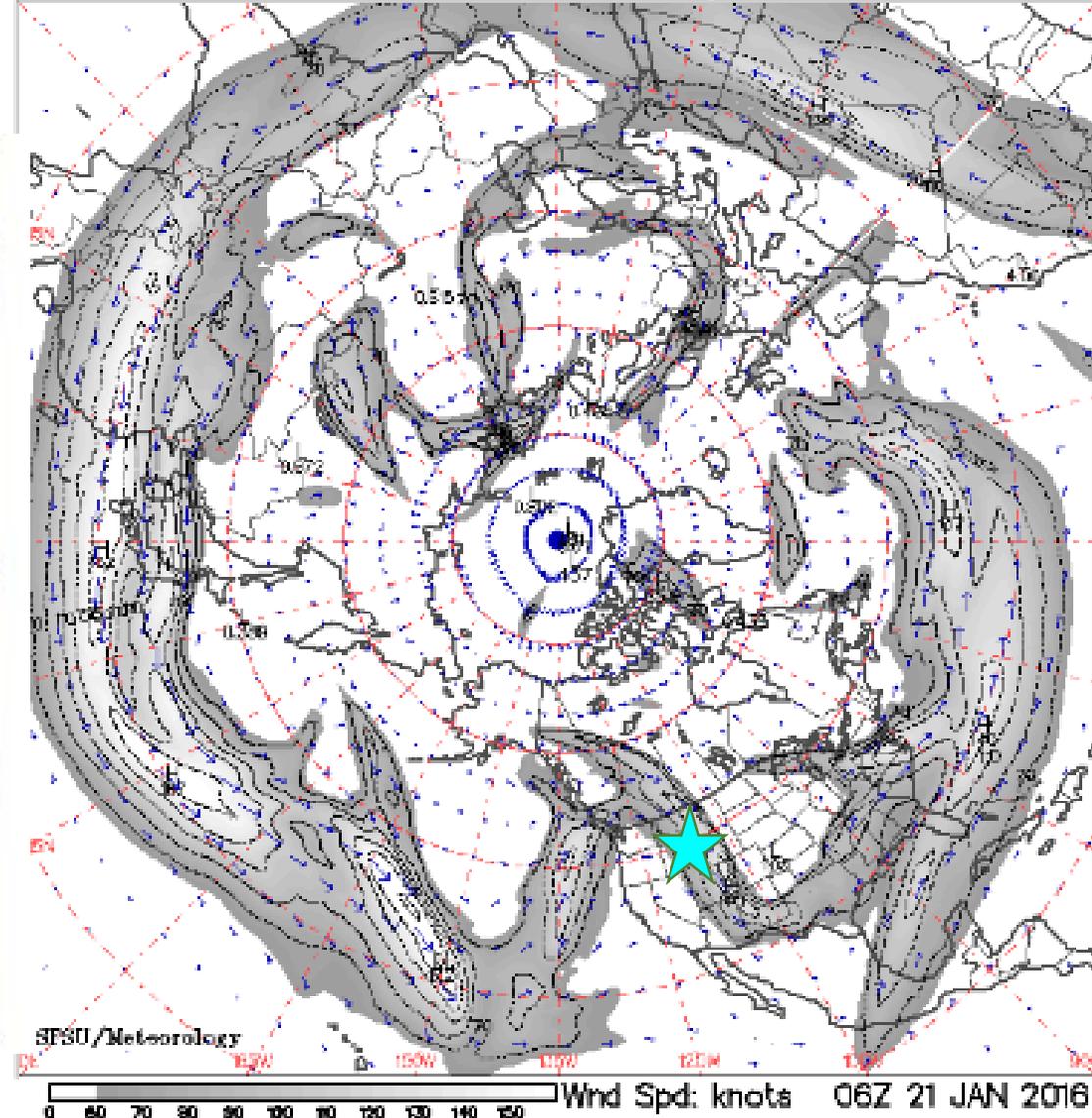
<http://theweathercentre.blogspot.com/#sthash.SoE5xzjO.dpuf>

Jet Stream Jan 21, 2016

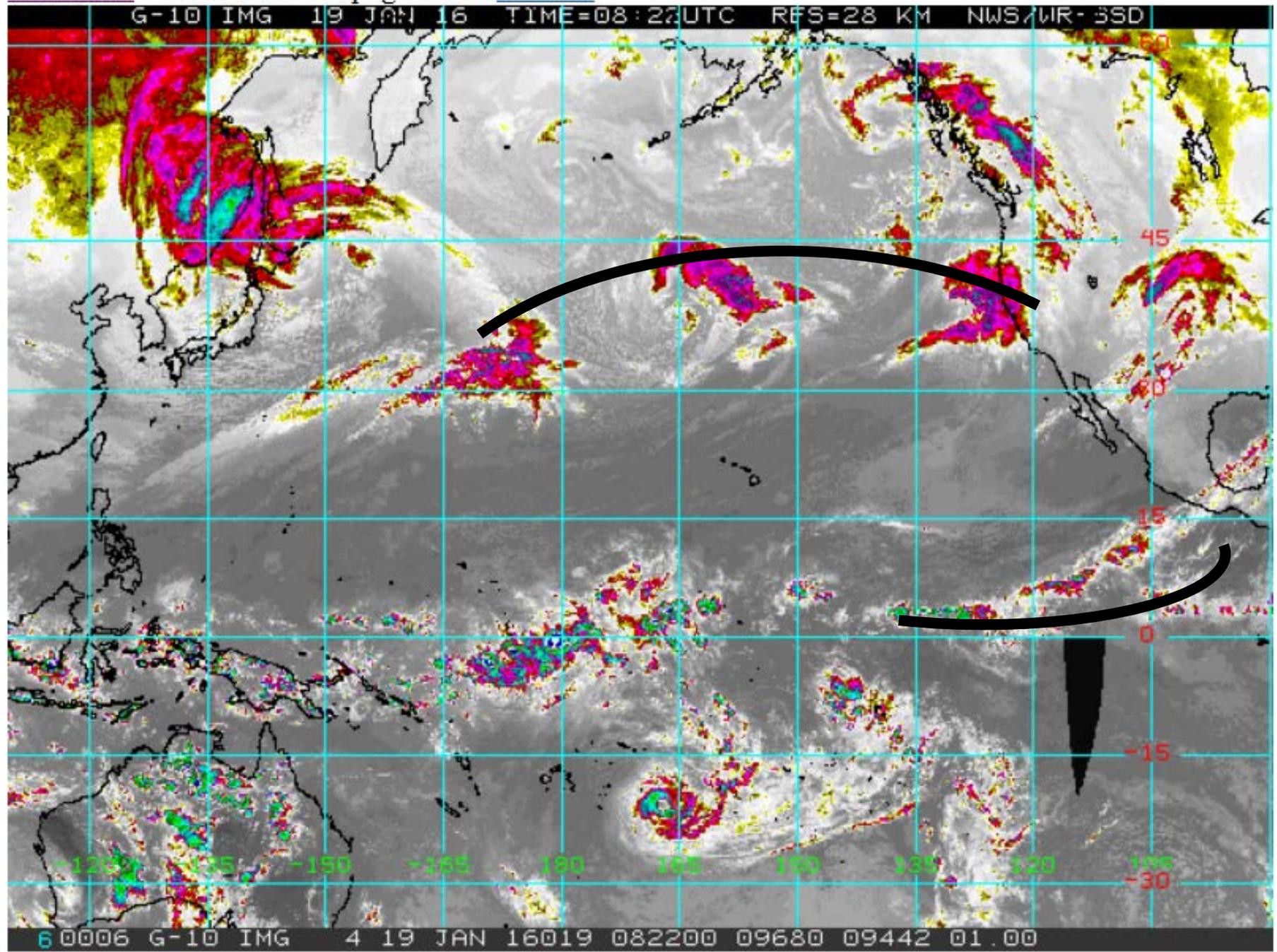


300 mb Jet Stream

GFS Analysis for 06Z 21 JAN 2016

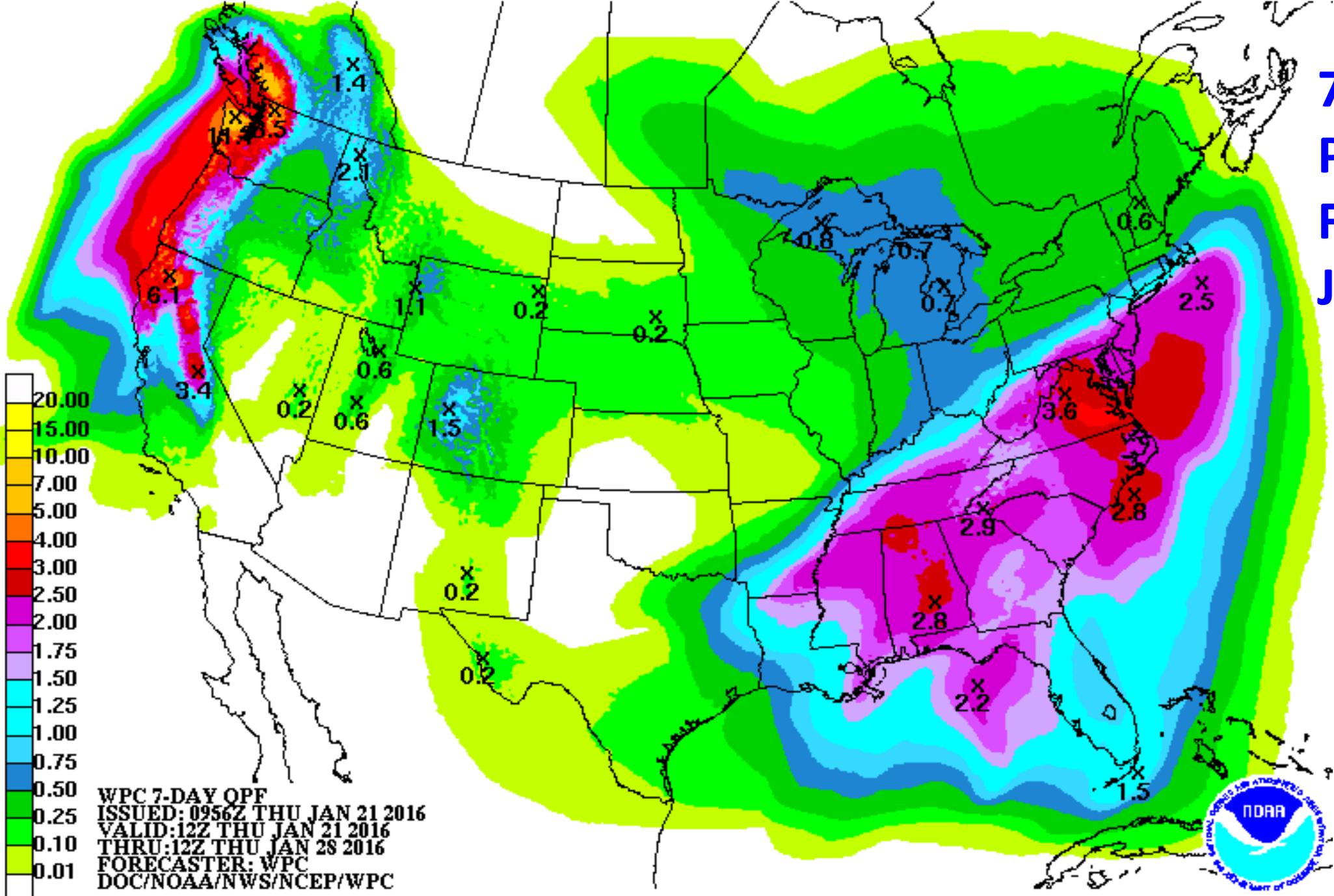


animation To refresh the page click: [Refresh](#)



**Radar Image
Jan 19, 2016**

7 Day Total Precipitation Forecast Jan 21 - 28



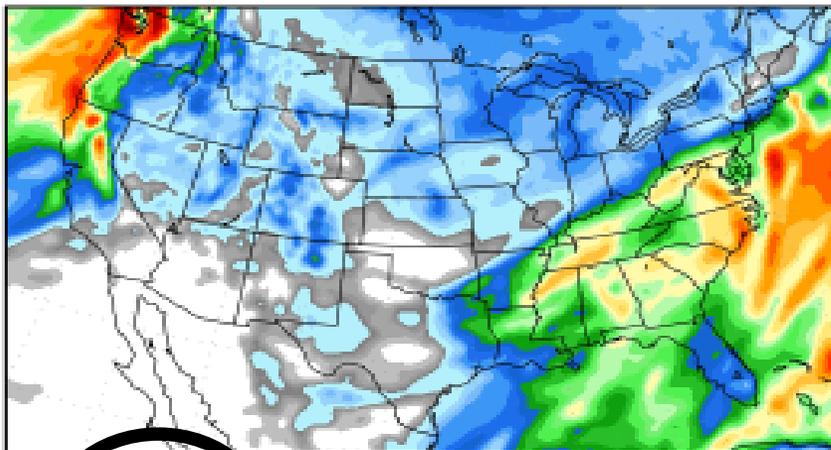
Precipitation Forecasts

Precipitation (in)
during the period:

Thu, 21 JAN 2016 at 00Z
-to-
Fri, 29 JAN 2016 at 00Z

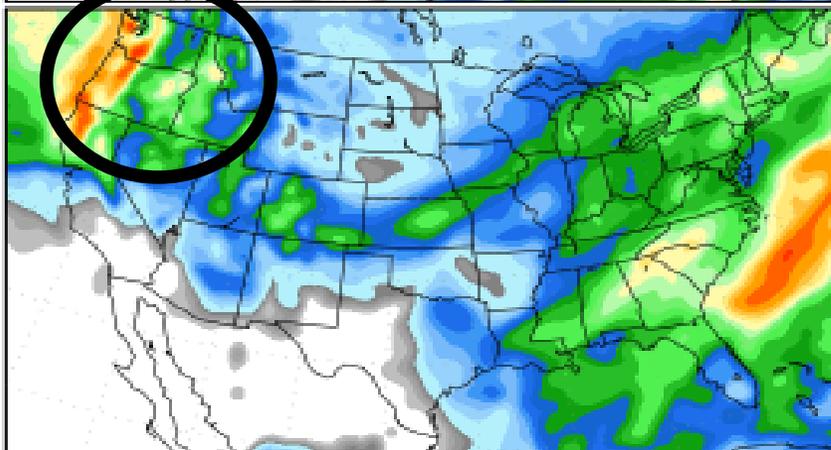


**Total Precip
Jan 21 – 29**



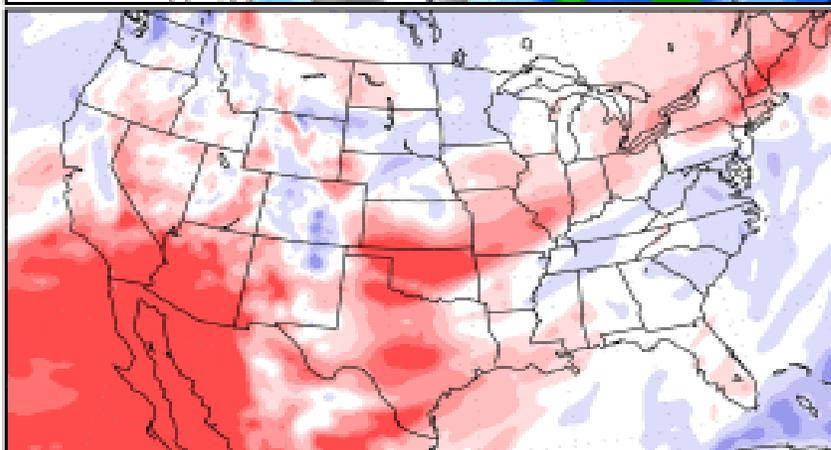
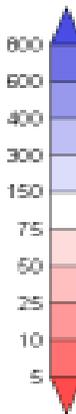
Fri, 29 JAN 2016 at 00Z
-to-
Sat, 06 FEB 2016 at 00Z

**Total Precip
Jan 29 – Feb 6**



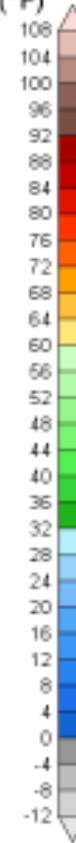
Precipitation (% of normal)
during the first period:

Thu, 21 JAN 2016 at 00Z
-to-
Fri, 29 JAN 2016 at 00Z

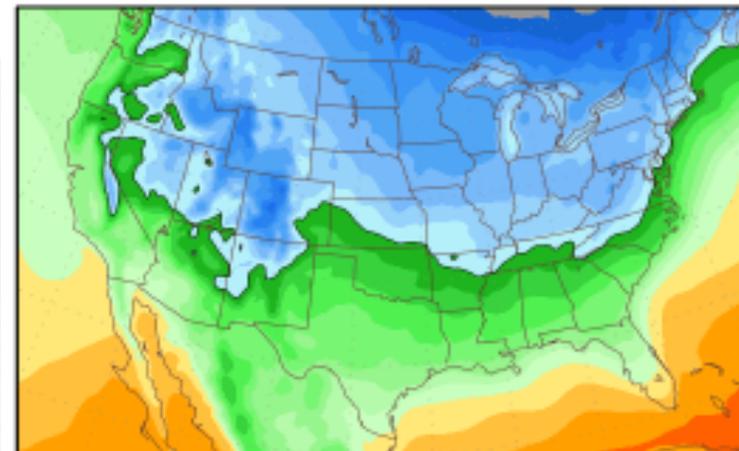


Mean Surface Temperature (°F)
during the period:

Thu, 21 JAN 2016 at 00Z
-to-
Fri, 29 JAN 2016 at 00Z

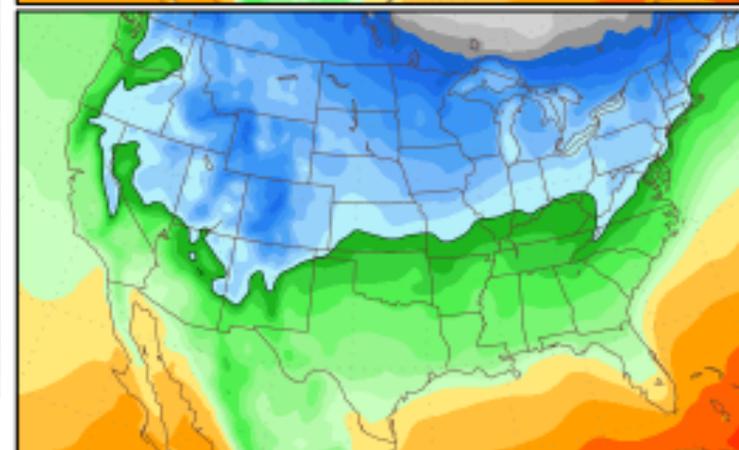


**Mean Temps
Jan 21 – 29**



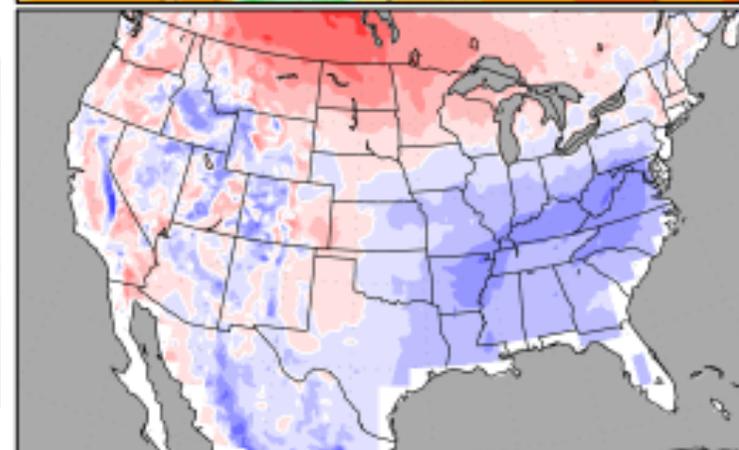
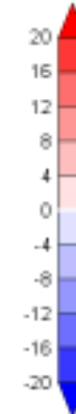
Fri, 29 JAN 2016 at 00Z
-to-
Sat, 06 FEB 2016 at 00Z

**Mean Temps
Jan 29 – Feb 6**



Temperature Anomaly
during the first period:

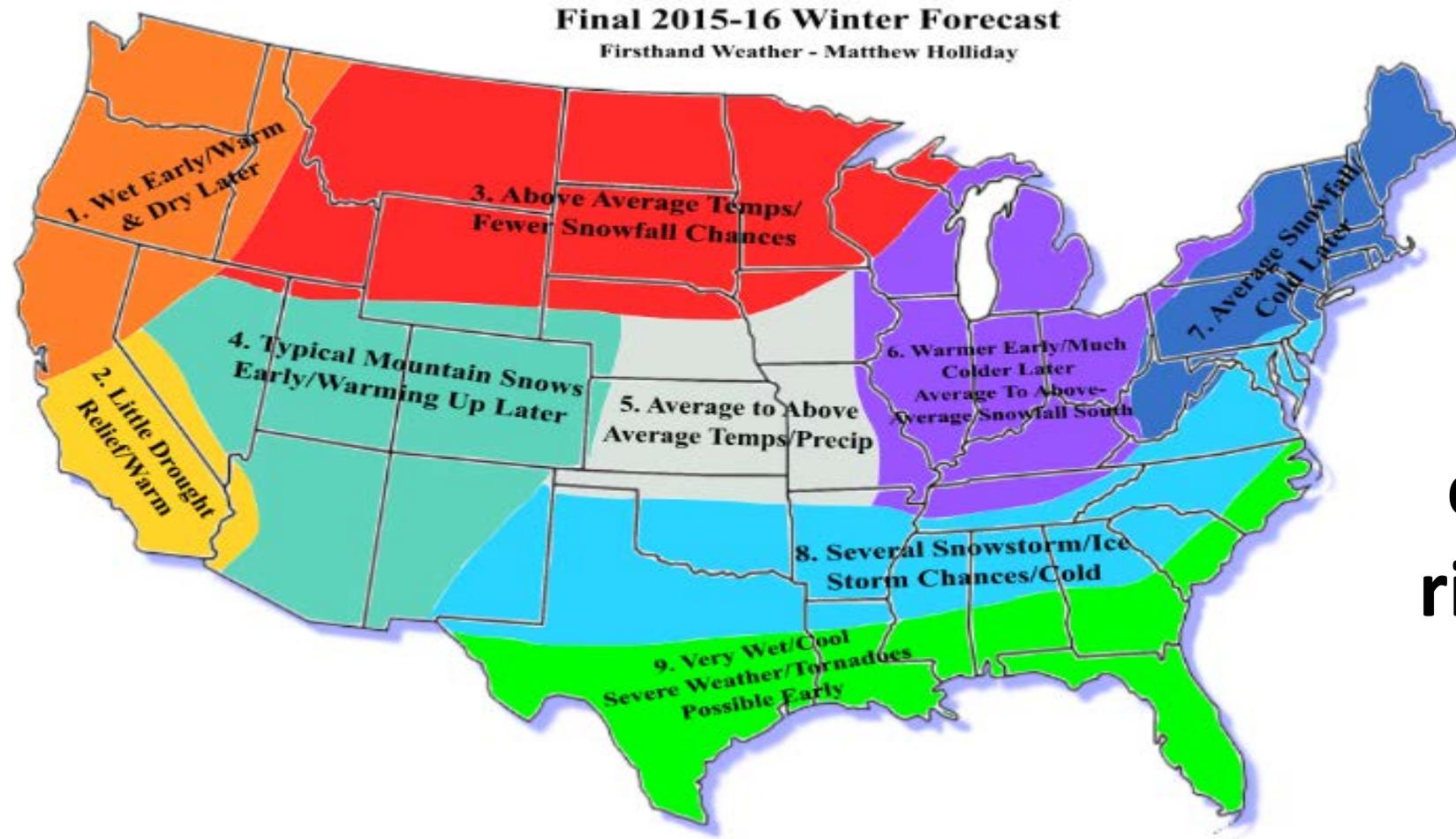
Thu, 21 JAN 2016 at 00Z
-to-
Fri, 29 JAN 2016 at 00Z



Firsthand Weather's Final 2015-16 Winter Forecast

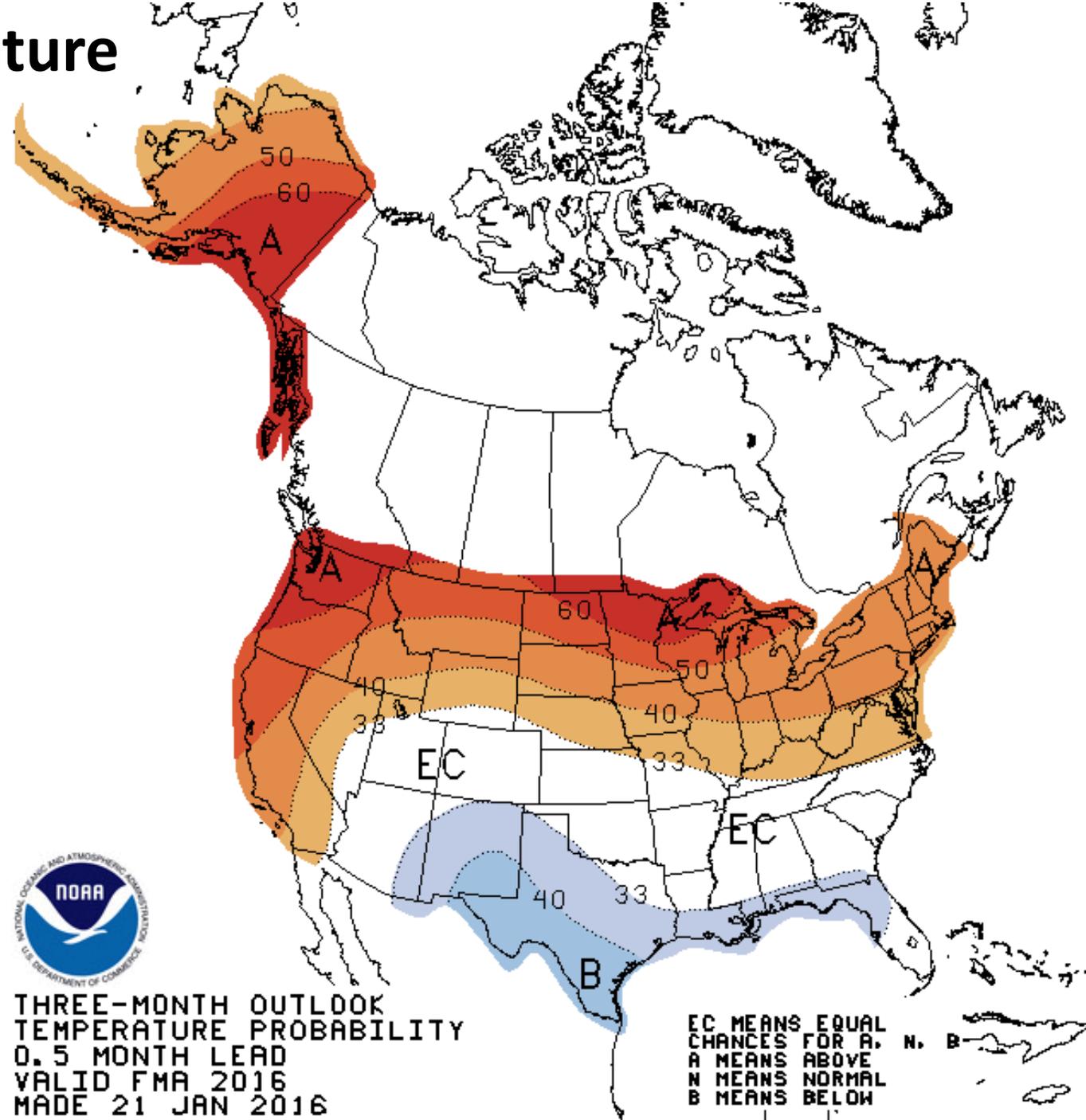
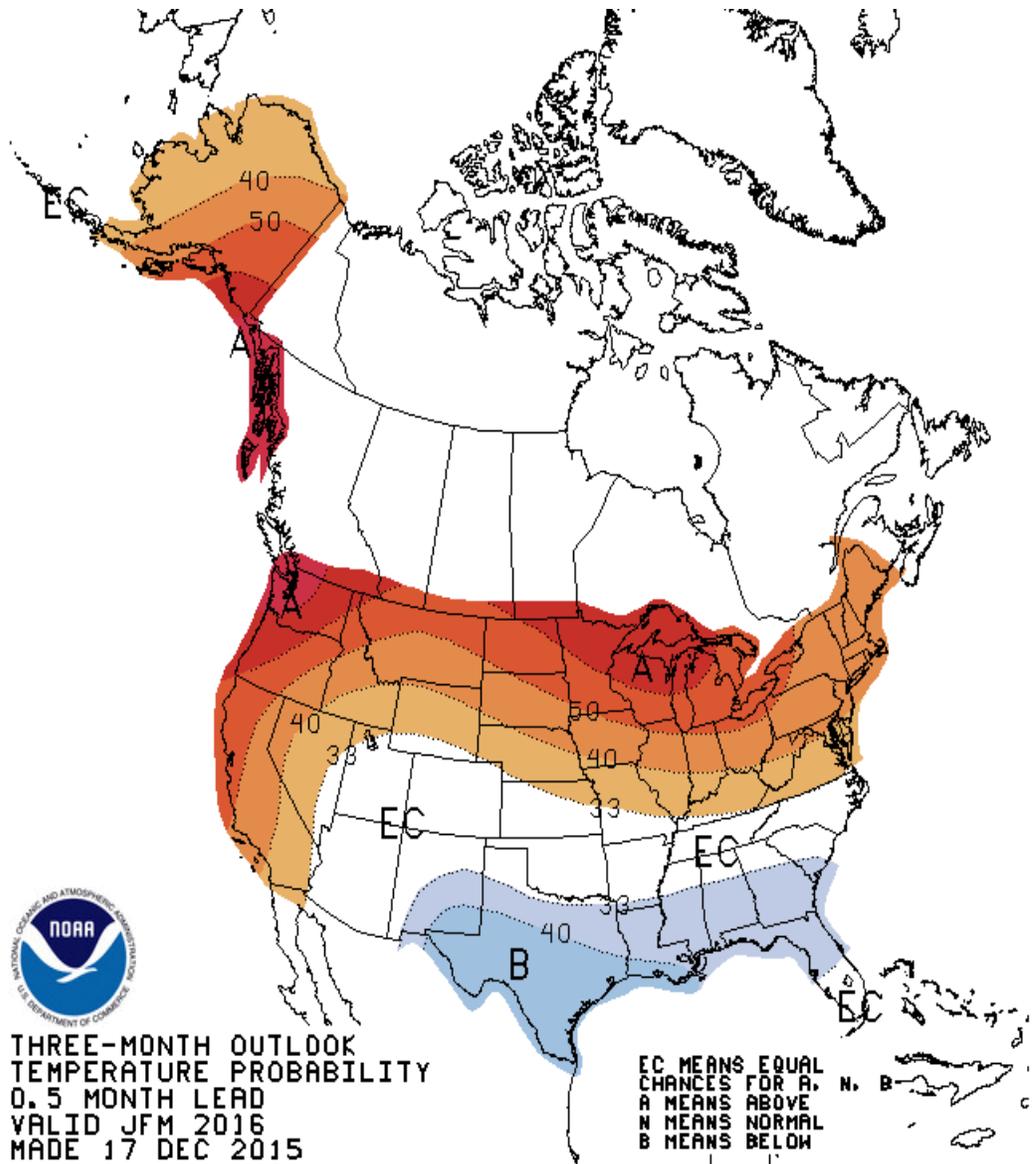
[Matthew Holliday](#) | November 8, 2015

Firsthand Weather's Final 2015-16 Winter Forecast:

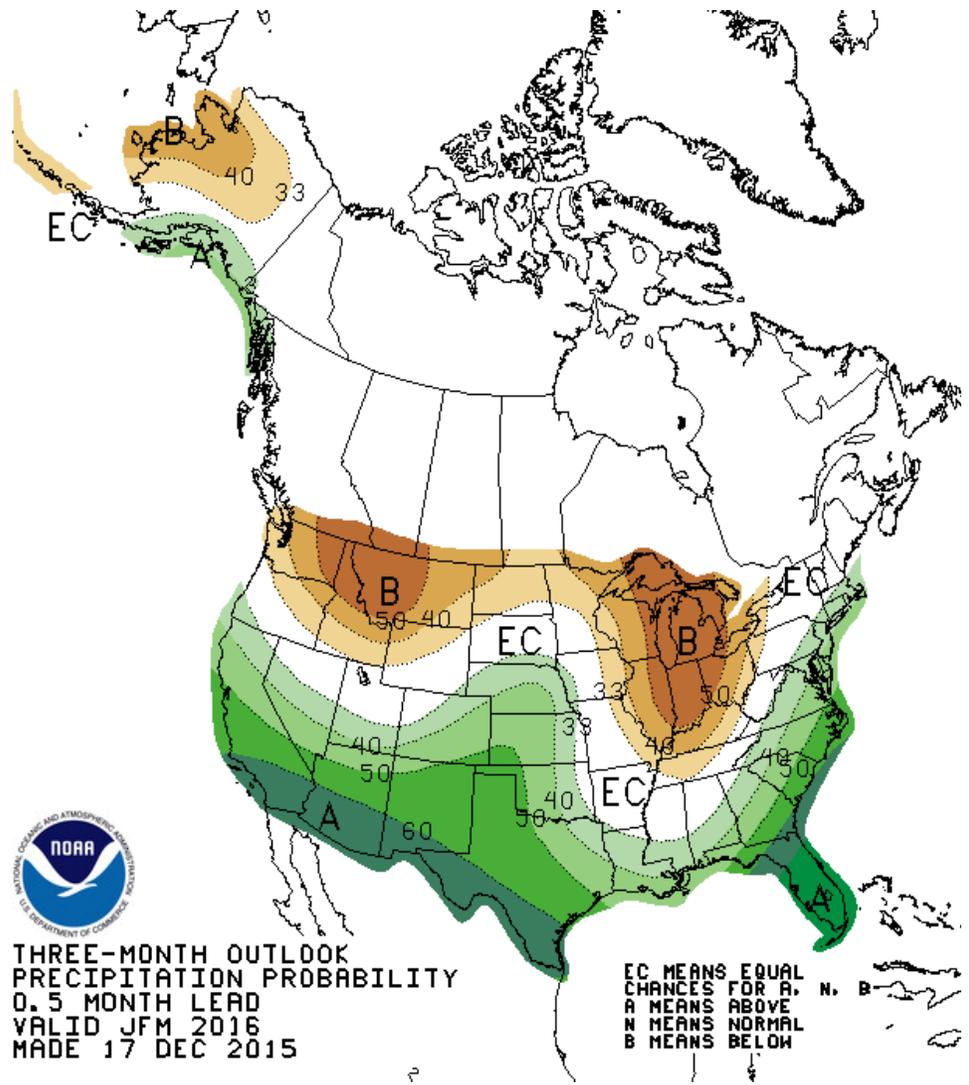


... this upcoming winter forecast is going to be more challenging to “get right” than the prior two winter forecasts.

Jan Feb & Mar 3 Month Temperature Forecasts from Dec & Jan

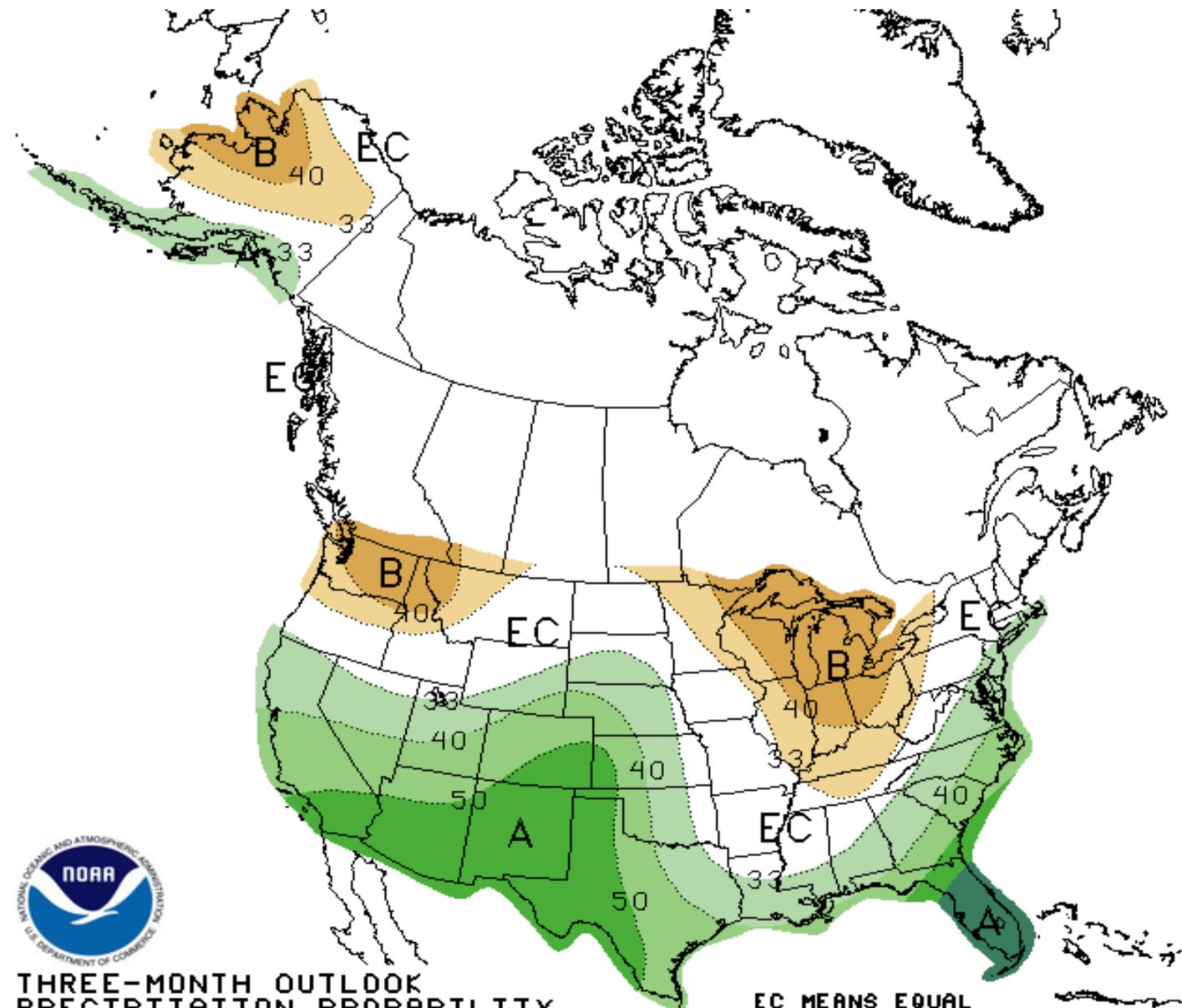


Jan Feb & Mar 3 Month Precipitation Forecasts from Dec & Jan



THREE-MONTH OUTLOOK
 PRECIPITATION PROBABILITY
 0.5 MONTH LEAD
 VALID JFM 2016
 MADE 17 DEC 2015

EC MEANS EQUAL
 CHANCES FOR A,
 A MEANS ABOVE
 N MEANS NORMAL
 B MEANS BELOW



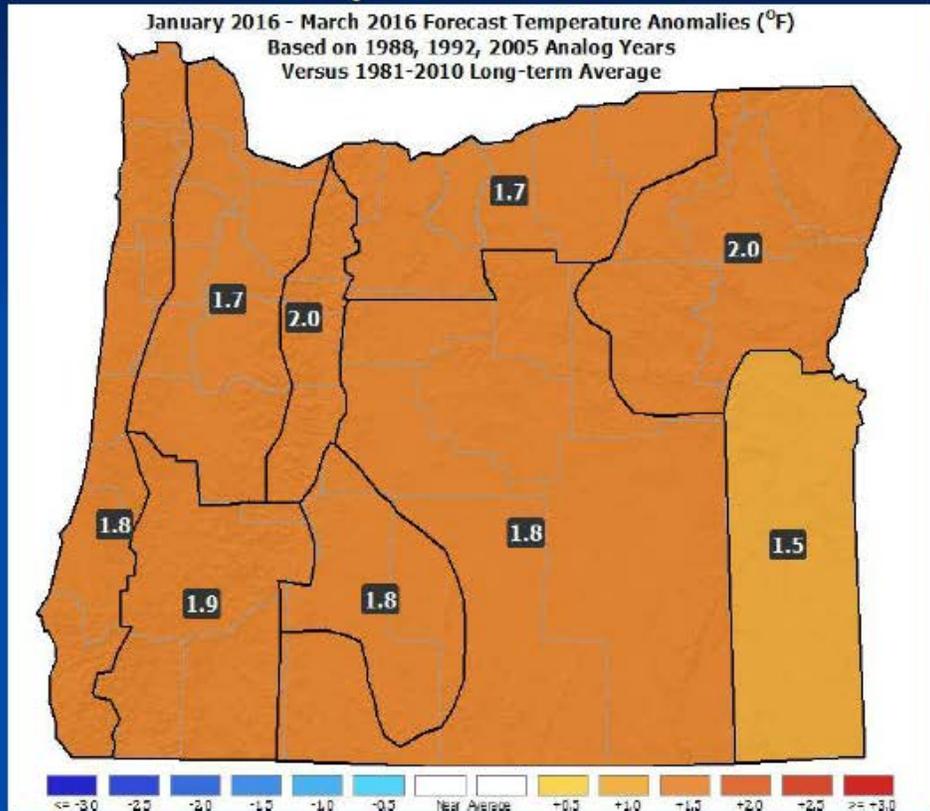
THREE-MONTH OUTLOOK
 PRECIPITATION PROBABILITY
 0.5 MONTH LEAD
 VALID FMA 2016
 MADE 21 JAN 2016

EC MEANS EQUAL
 CHANCES FOR A,
 A MEANS ABOVE
 N MEANS NORMAL
 B MEANS BELOW

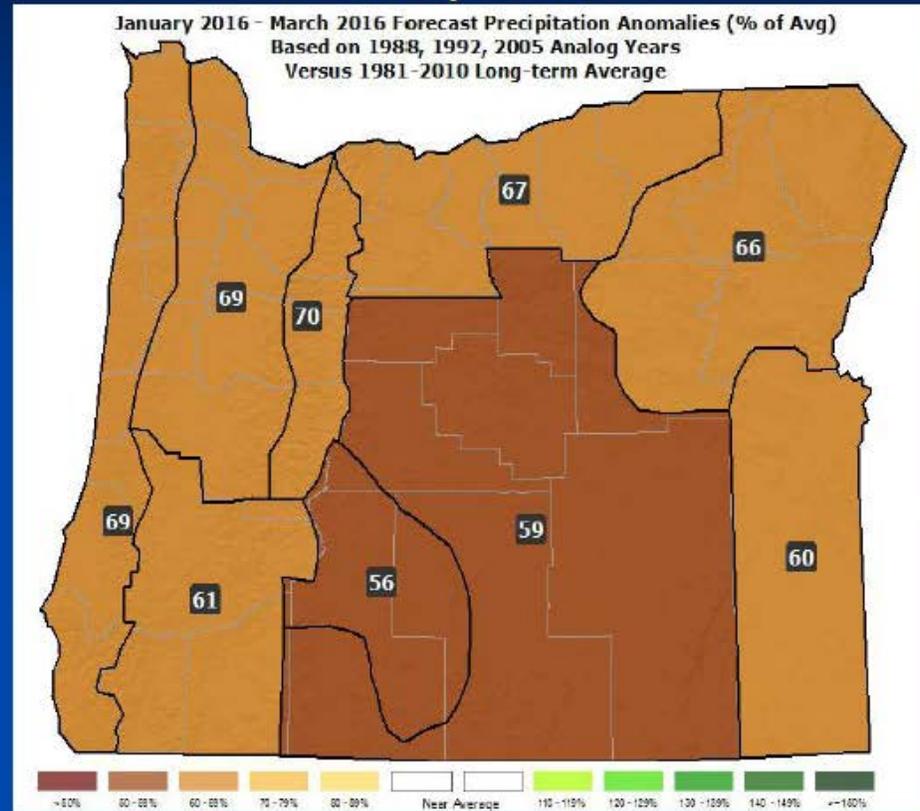
January – March 2016 Forecast

From Pete Parson

Temperatures



Precipitation



A cooperative product between the Oregon Department of Agriculture & the Oregon Department of Forestry.

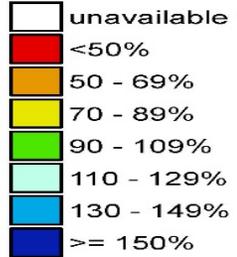
**Analog Years:
1988, 1992,
2005**

- Above average temperatures likely, on the order of $\approx 1-3$ °F, with severe and/or prolonged cold spells unlikely.
- Precipitation forecast is less certain. Approximately 60% - 80% of average rain/mountain snow is the most likely scenario.

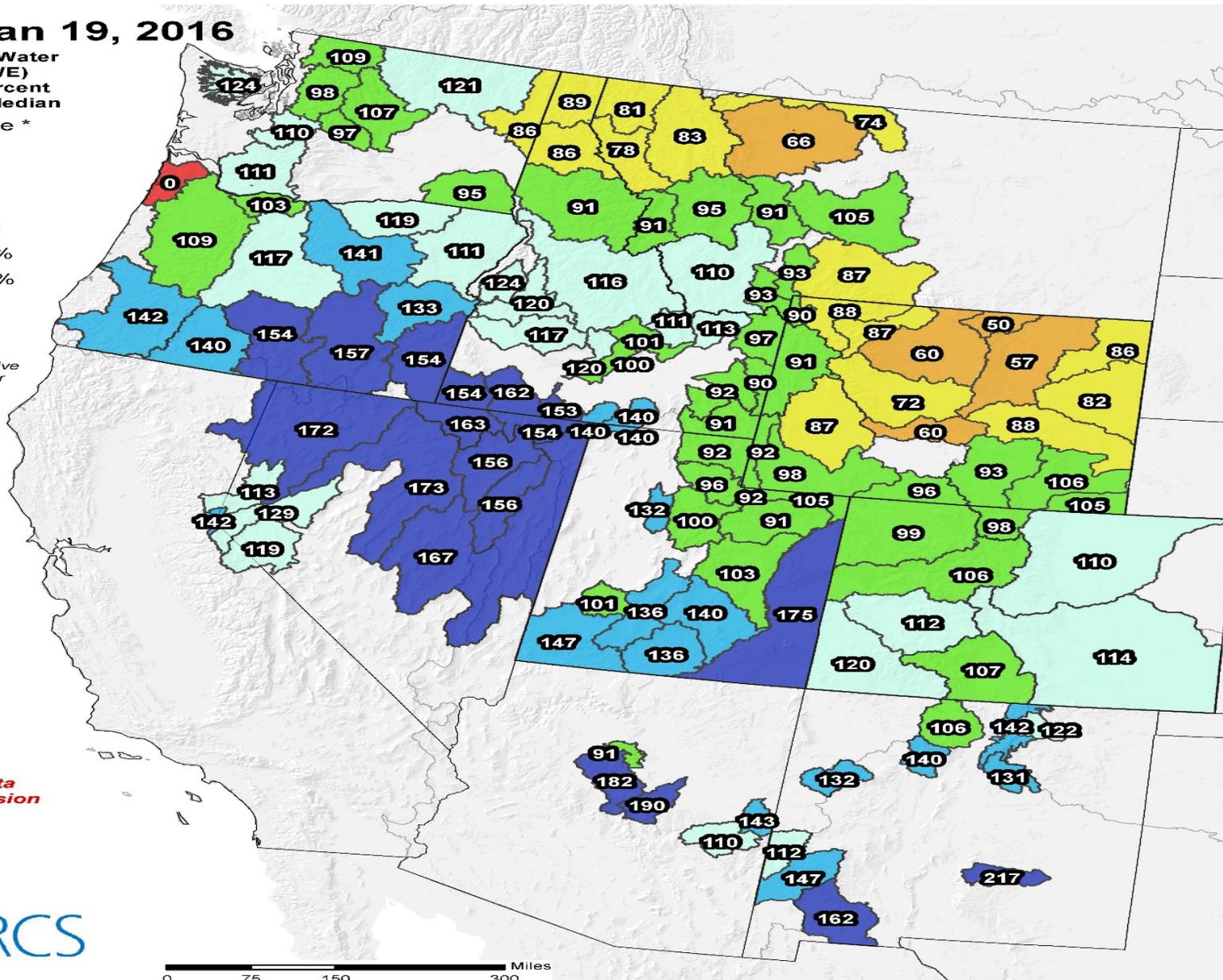
Westwide SNOTEL Current Snow Water Equivalent (SWE) % of Normal

Jan 19, 2016

Current Snow Water Equivalent (SWE) Basin-wide Percent of 1981-2010 Median



* Data unavailable at time of posting or measurement is not representative at this time of year



Provisional data subject to revision



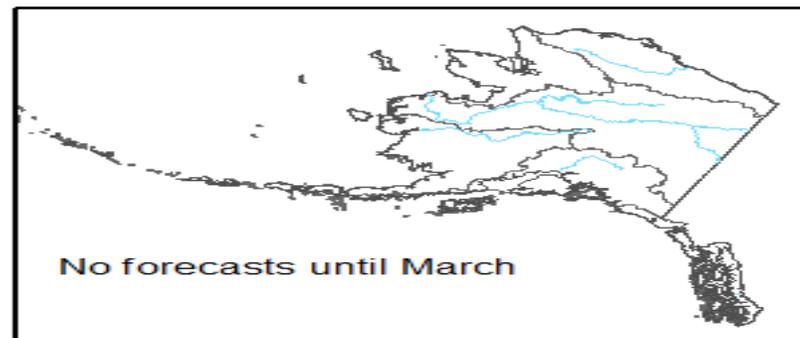
The snow water equivalent percent of normal represents the current snow water equivalent found at selected SNOTEL sites in or near the basin compared to the average value for those sites on this day. Data based on the first reading of the day (typically 00:00).

Prepared by:
USDA/NRCS National Water and Climate Center
Portland, Oregon
<http://www.wcc.nrcs.usda.gov>

Spring and Summer Streamflow Forecasts as of January 1, 2016

Percent of 1981-2010 Average

- > 180
- 150 - 180
- 130 - 149
- 110 - 129
- 90 - 109
- 70 - 89
- 50 - 69
- 25 - 49
- < 25



50% exceedance probability forecasts shown. For forecasts at other exceedance probabilities, see individual state reports.

Prepared by:
USDA Natural Resources Conservation Service
National Water and Climate Center
Portland, Oregon
<http://www.wcc.nrcs.usda.gov>
Created: 7 Jan 2016 14:21

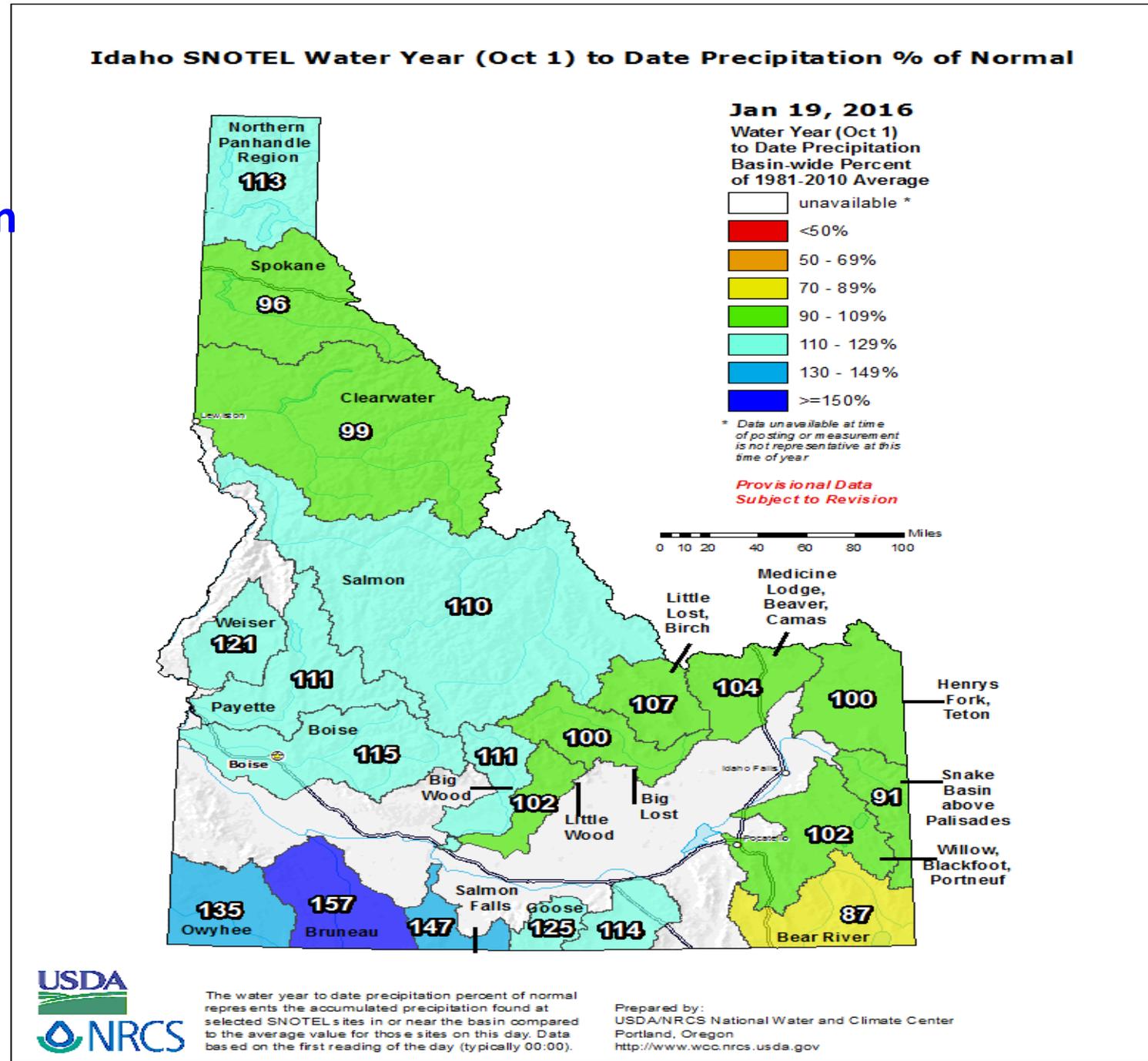
Water Year To Date Precipitation

January 1-12 had minimal precipitation
January 13 storms started moving into Idaho

For Jan 1 – 21 period,
we have received 50 – 70% of the
normal January precipitation
amounts for most of state.

But only 45-50% of January totals for:
Panhandle, Clearwater, Little Wood
& Big Lost.

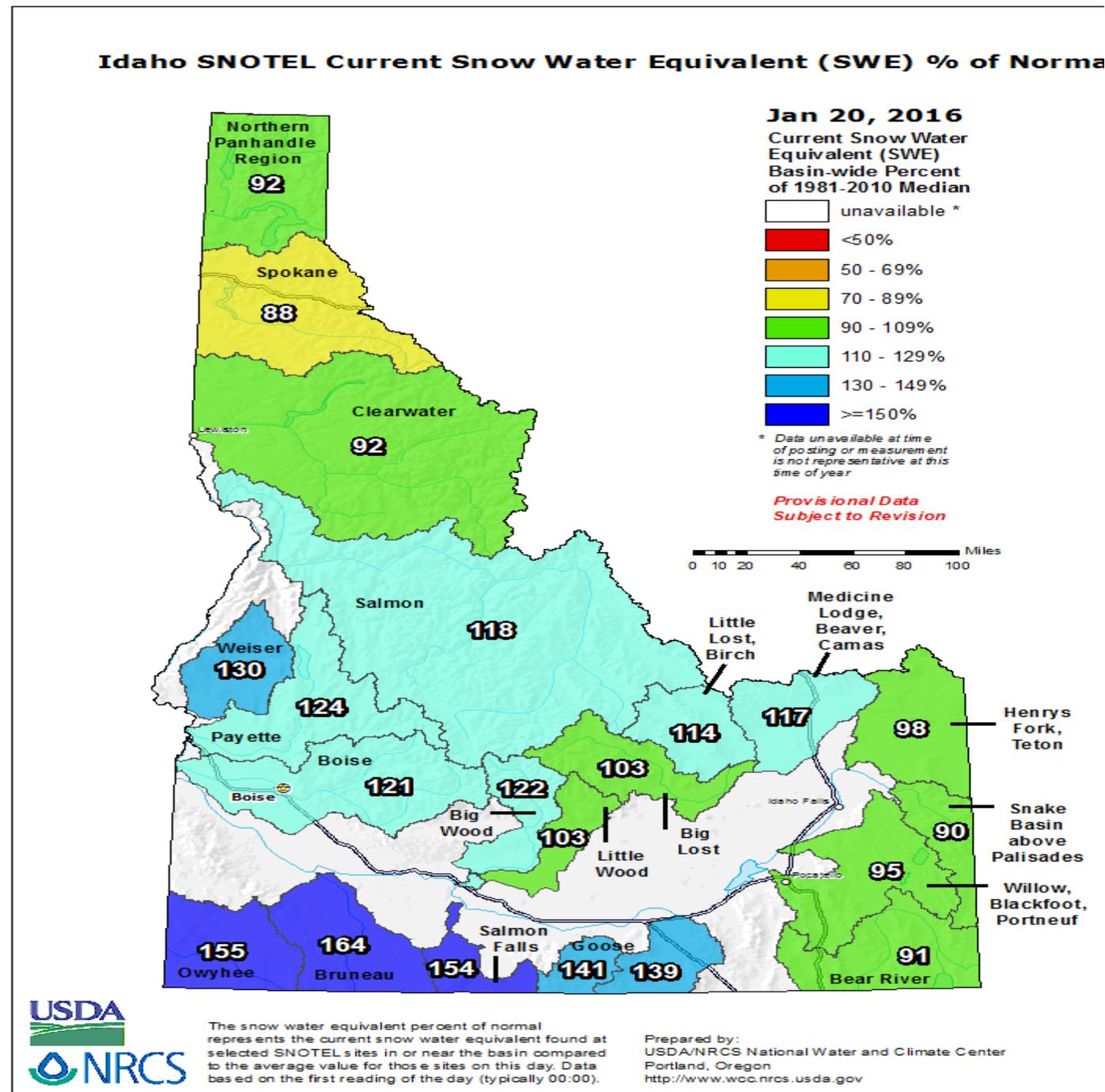
With at least one more storms this
weekend...



With minimal precipitation, the 1st half of January, snowpack %'s were dropping 1 - 2 percentage points a day.

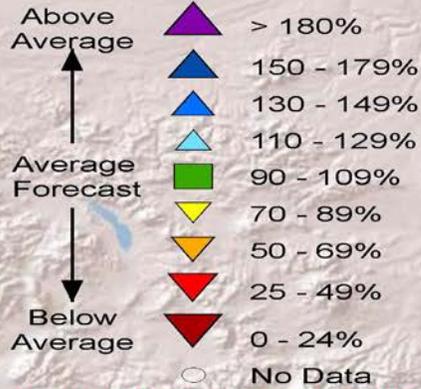
Today's snowpacks are 70 - 87% of their seasonal peaks that occur in early April for many basins: West Central Basins, Big Wood, Oakley, Salmon Falls, Bruneau & Owyhee basins.

Lowest snowpacks are 49-55% of seasonal peaks in the Bear, Upper Snake, Little Wood, Clearwater & Panhandle

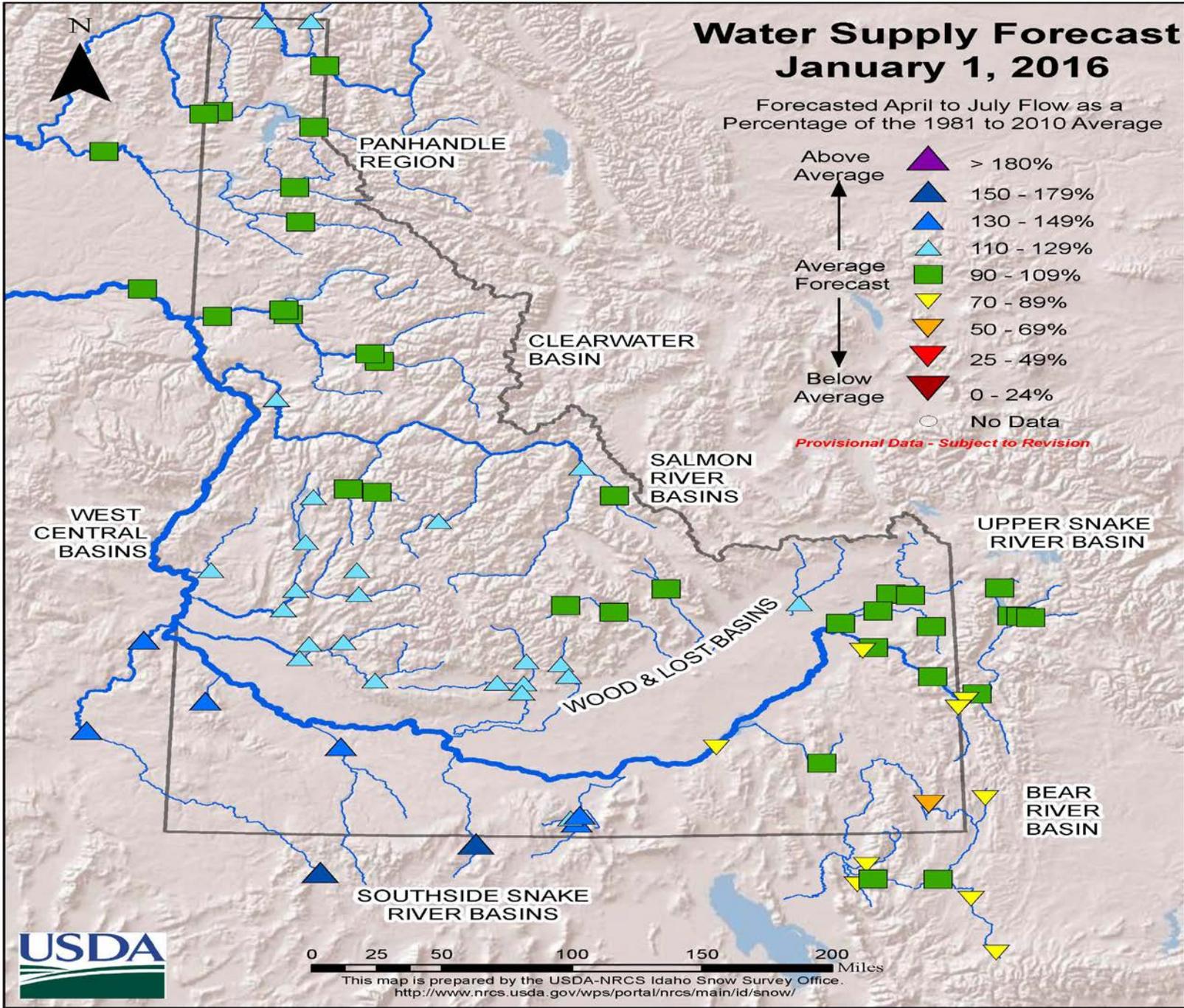


Water Supply Forecast January 1, 2016

Forecasted April to July Flow as a Percentage of the 1981 to 2010 Average



Provisional Data - Subject to Revision



0 25 50 100 150 200 Miles

This map is prepared by the USDA-NRCS Idaho Snow Survey Office.
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/id/snow/>

IDAHO SURFACE WATER SUPPLY INDEX (SWSI) January 1, 2016

The Surface Water Supply Index (SWSI) is a predictive indicator of surface water availability within a watershed for the spring and summer water use season. The index is calculated by combining pre-runoff reservoir storage (carryover) with forecasts of spring and summer streamflow. SWSI values are scaled from +4.0 (abundant supply) to -4.0 (extremely dry), with a value of zero indicating a median water supply as compared to historical occurrences. The SWSI analysis period is from 1981 to present.

SWSI values provide a more comprehensive outlook of water availability by combining streamflow forecasts and reservoir storage where appropriate. The SWSI index allows comparison of water availability between basins for drought or flood severity analysis. Threshold SWSI values have been determined for some basins to indicate the potential for agricultural irrigation water shortages.

<i>BASIN or REGION</i>	<i>SWSI Value</i>	<i>Most Recent Year With Similar SWSI Value</i>	<i>Agricultural Water Supply Shortage May Occur When SWSI is Less Than</i>
Spokane	-0.3	2013	NA
Clearwater	0.8	2006	NA
Salmon	0.6	2010	NA
Weiser	1.5	2010	NA
Payette	1.0	2008	NA
Boise	1.5	2012	-1.4
Big Wood	0.8	2012	0.7
Little Wood	1.3	2012	-1.2
Big Lost	0.8	2010	0.7
Little Lost	0.8	2006	1.3
Teton	0.3	2010	-3.9
Henrys Fork	-0.3	2012	-3.5
Snake (Heise)	-0.3	2010	-1.6
Oakley	1.3	2005	0.7
Salmon Falls	1.7	1993	-0.5
Bruneau	3.1	2006	NA
Owyhee	1.0	2005	-3.0
Bear River	-0.8	2015	-3.7

Updated Jan 11, 2016 to verify projected storage levels

Summary Table: Amount of streamflow needed in 2016 for adequate surface irrigation supplies.

Fall reservoir carryover storage are used to project spring storage levels. Then, by knowing the adequate irrigation water supply needed in your basin, spring reservoir volumes are subtracted from the adequate irrigation supply to determine the volume of streamflow to marginally meet adequate surface irrigation supplies in 2016.

Column 2 - Column 3 = Column 4 Col4/Col5 X 100=Col 5

1 Basin	2 Adequate irrigation water supply KAF	3 Projected end of Mar, Feb, or Jan reservoir storage KAF	4 2016 Streamflow volume needed for adequate water supply KAF	5 % of average streamflow needed to meet an adequate irrigation supply in 2016 KAF	6 1981-2010 Streamflow average KAF	7 Streamflow period used in analysis	8 2015 Streamflow % of average KAF	9 %
Boise	1500	625	875	64%	1360	apr-sep	750	55%
Big Wood	275	70	205	77%	265	apr-sep	80	30%
Little Wood	60	17	43	47%	92	mar-sep	31	33%
Big Lost	180	33	147	98%	150	apr-sep	88	59%
Little Lost	40	—	40	118%	34	apr-sep	24	71%
Teton	85	—	85	44%	193	apr-sep	160	83%
Snake (Halse)	4,400	1450	2950	78%	3,780	apr-sep	3200	85%
Oakley	50	17	33	106%	31	mar-sep	13	51%
Salmon Falls	110	25	85	100%	85	mar-sep	42	49%
Owyhee	450	110	340	51%	665	feb-sep	180	27%
Bear River	280	500	0	0%	205	apr-sep	89	42%

Projected change in reservoir storage from Fall 2015 to target levels in Spring 2016 when the streamflow forecast and runoff period starts.

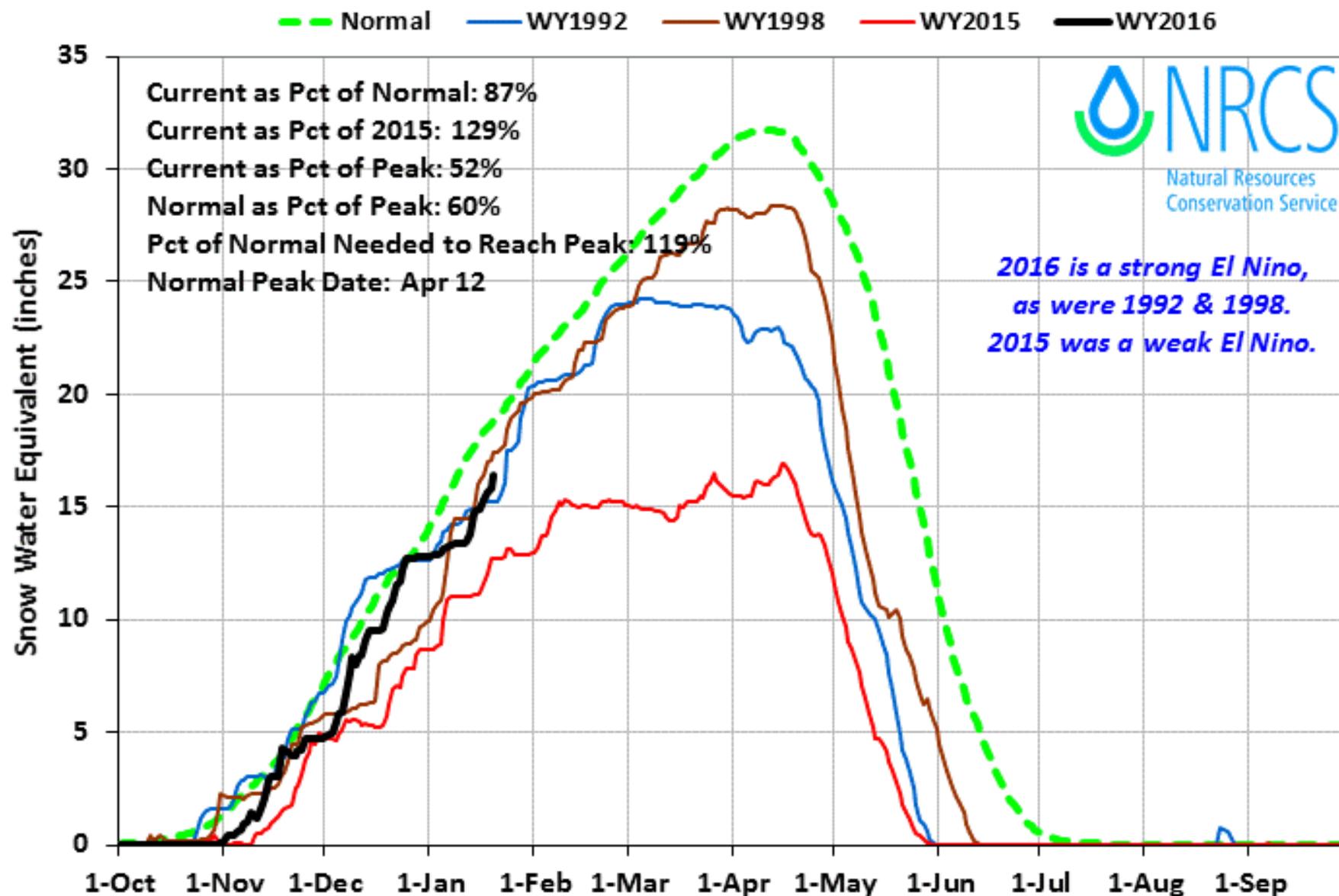
	Oct 31 Storage (KAF)	Nov 30 Storage (KAF)	Dec 31 Storage (KAF)	Jan 31 Storage (KAF)	Feb 28 Storage (KAF)	Projected Mar 31 (KAF)	Estimated Change in Storage (KAF)
Boise Reservoir System	396.2	423.8	470.9	not est	not est	625	201
Magic Reservoir	19.1	25.8	29.8	not est	not est	70	44
Little Wood Reservoir	4.2	6.5	9	not est	17	not est	10
Mackay Reservoir	9.0	17.2	23.3	not est	not est	33	16
Jackson & Pallsades	1046.8	1158.0	1260	not est	not est	1450	292
Oakley Reservoir	7.9	10.1	11.9	not est	17	not est	7
Salmon Falls Reservoir	11.2	13.4	16.2	not est	25	not est	12
Lake Owyhee	26.4	43.1	69.5	110	not est	not est	67
Bear Lake	467.7	453.3	460.4	not est	not est	500	47

Summary Table: Amount of streamflow needed in 2016 for adequate surface irrigation supplies.

Basin	% of average streamflow needed to meet an adequate irrigation supply in 2016 KAF
Boise	64%
Big Wood	77%
Little Wood	47%
Big Lost	98%
Little Lost	118%
Teton	44%
Snake (Heise)	78%
Oakley	106%
Salmon Falls	100%
Owyhee	51%
Bear River	0%

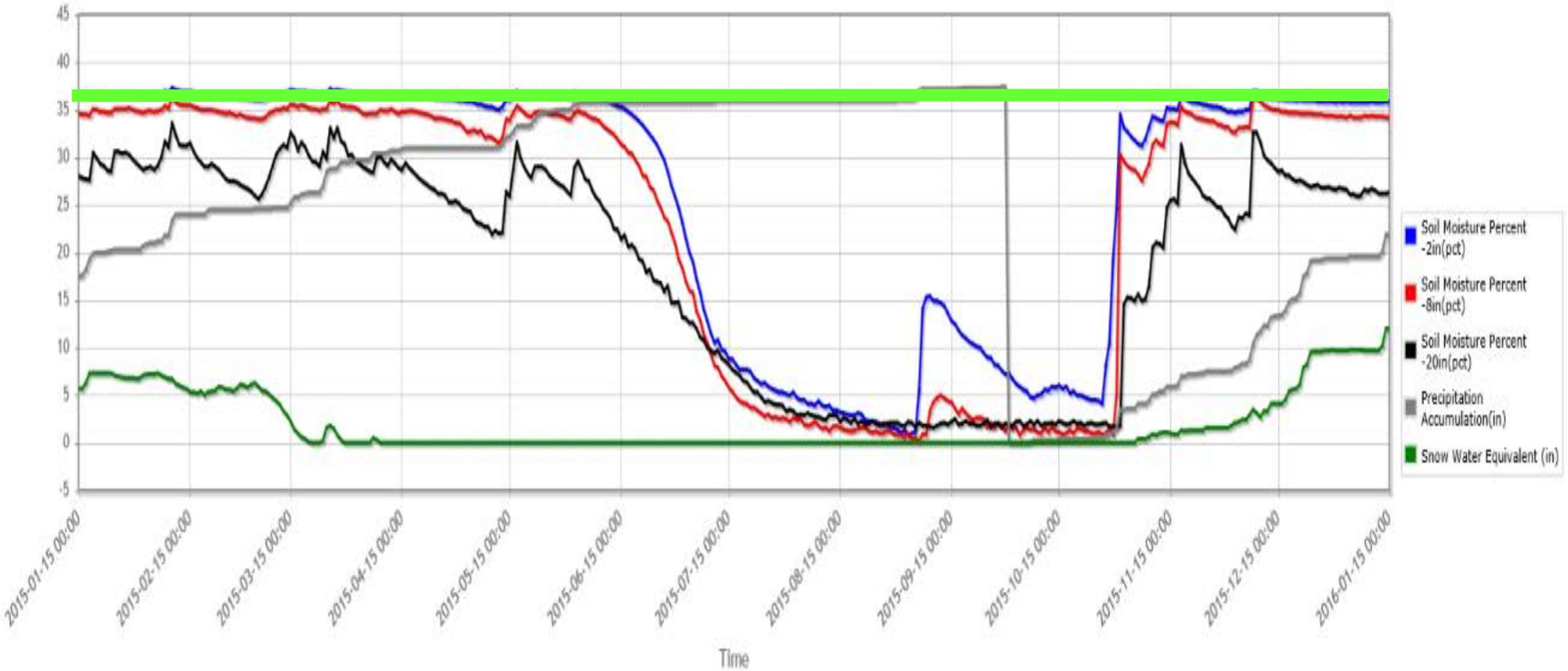
Northern Panhandle Region 2016 Snowpack Comparison Graph (8 sites)

Based on Provisional SNOTEL data as of Jan 20, 2016

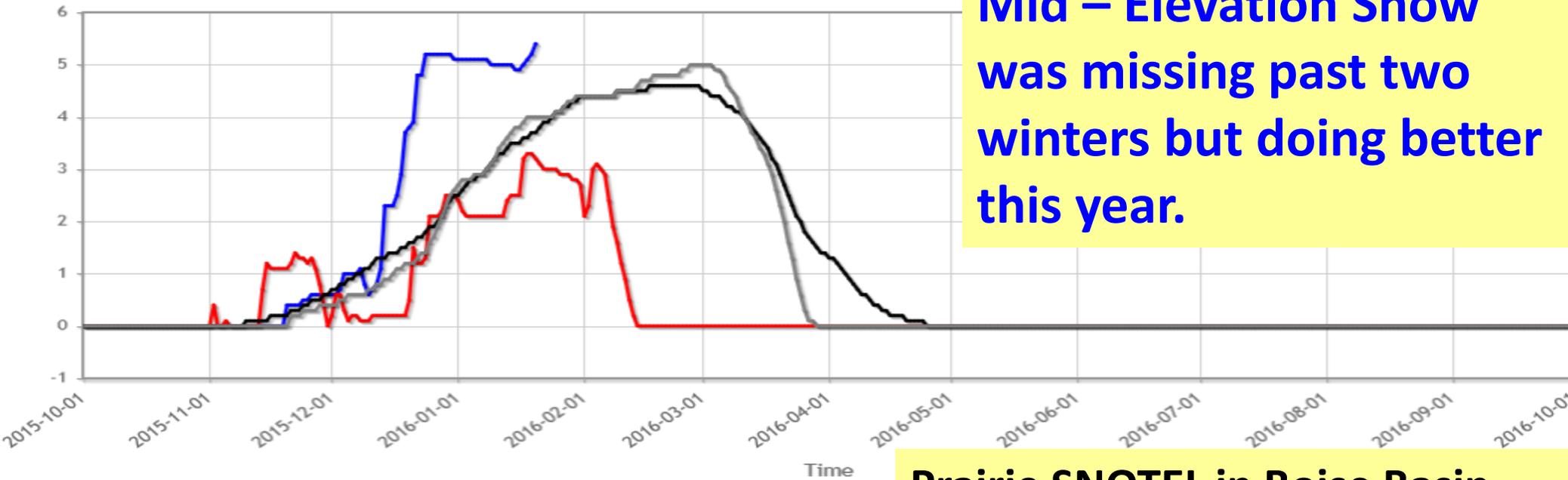


Soil Moisture is as good as last year in northern Idaho,

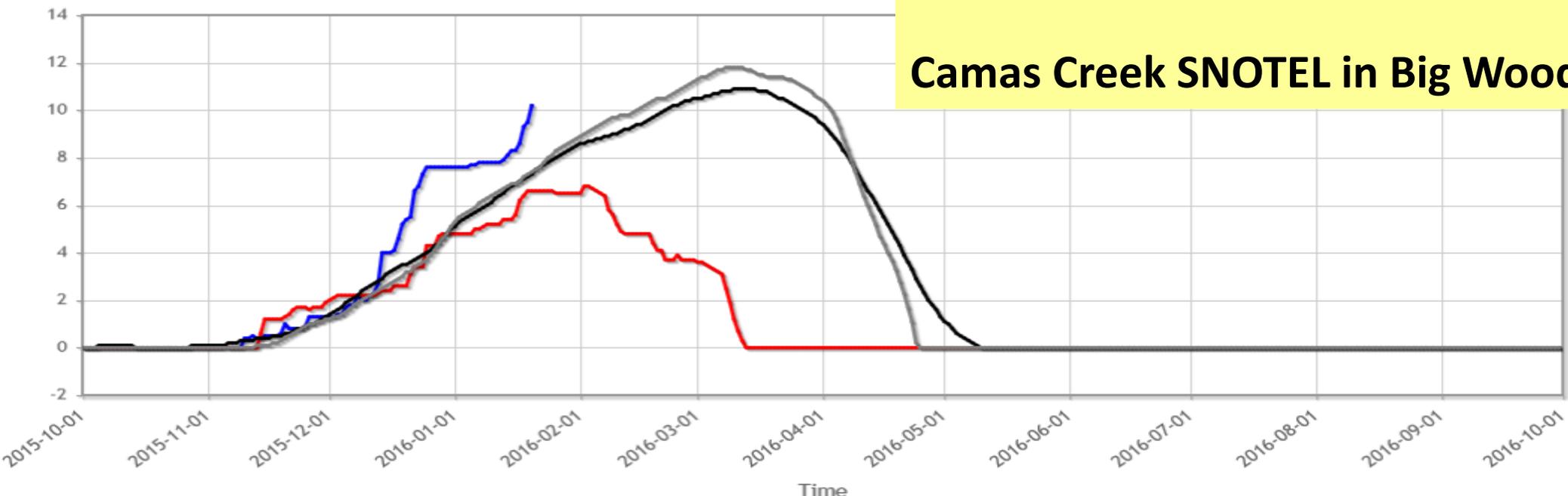
Moscow Mountain (989) Idaho SNOTEL Site - 4700 ft



Prairie (704) Idaho SNOTEL Site - 4800 ft

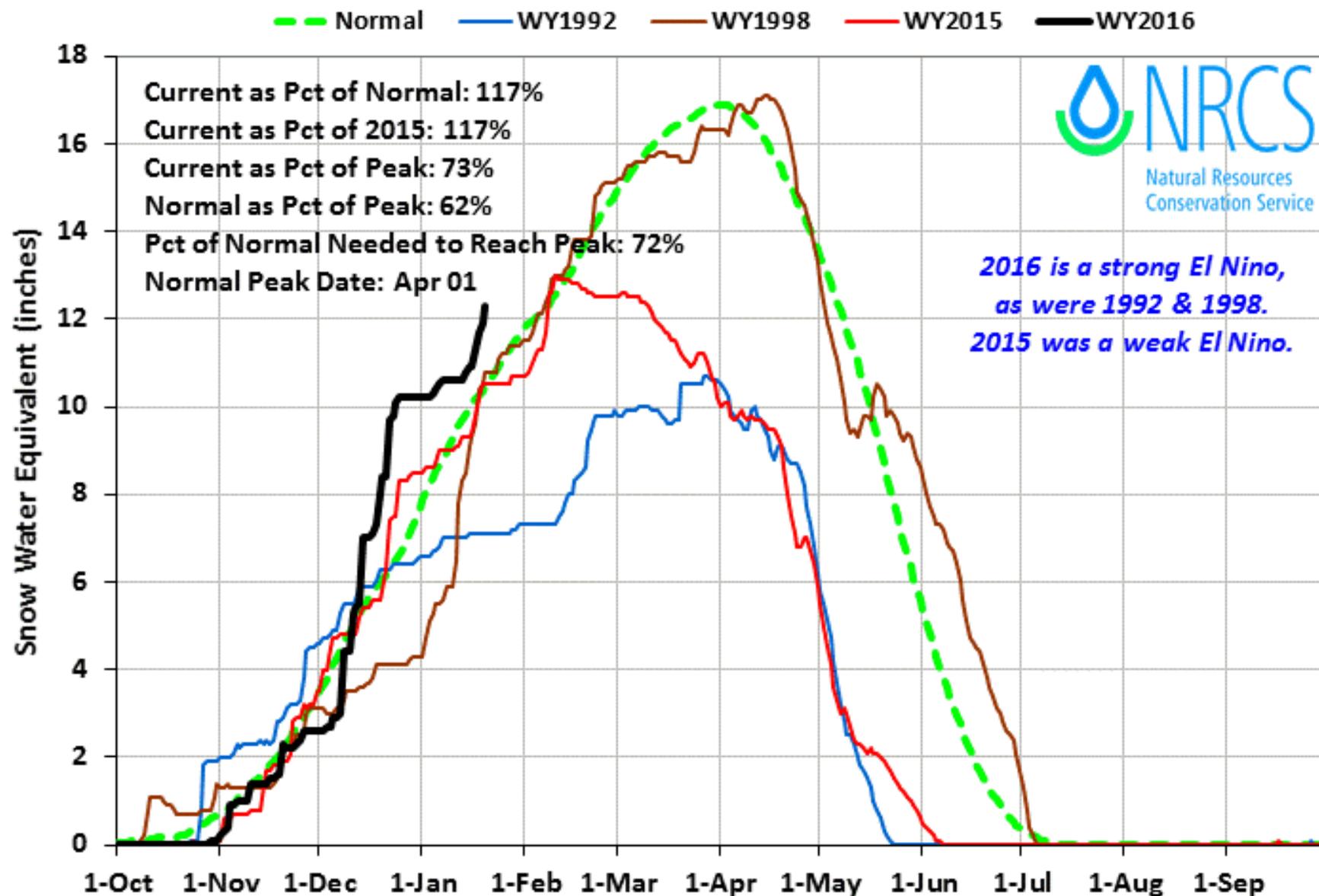


Camas Creek Divide (382) Idaho SNOTEL Site - 5710 ft



Big Wood Basin 2016 Snowpack Comparison Graph (9 sites)

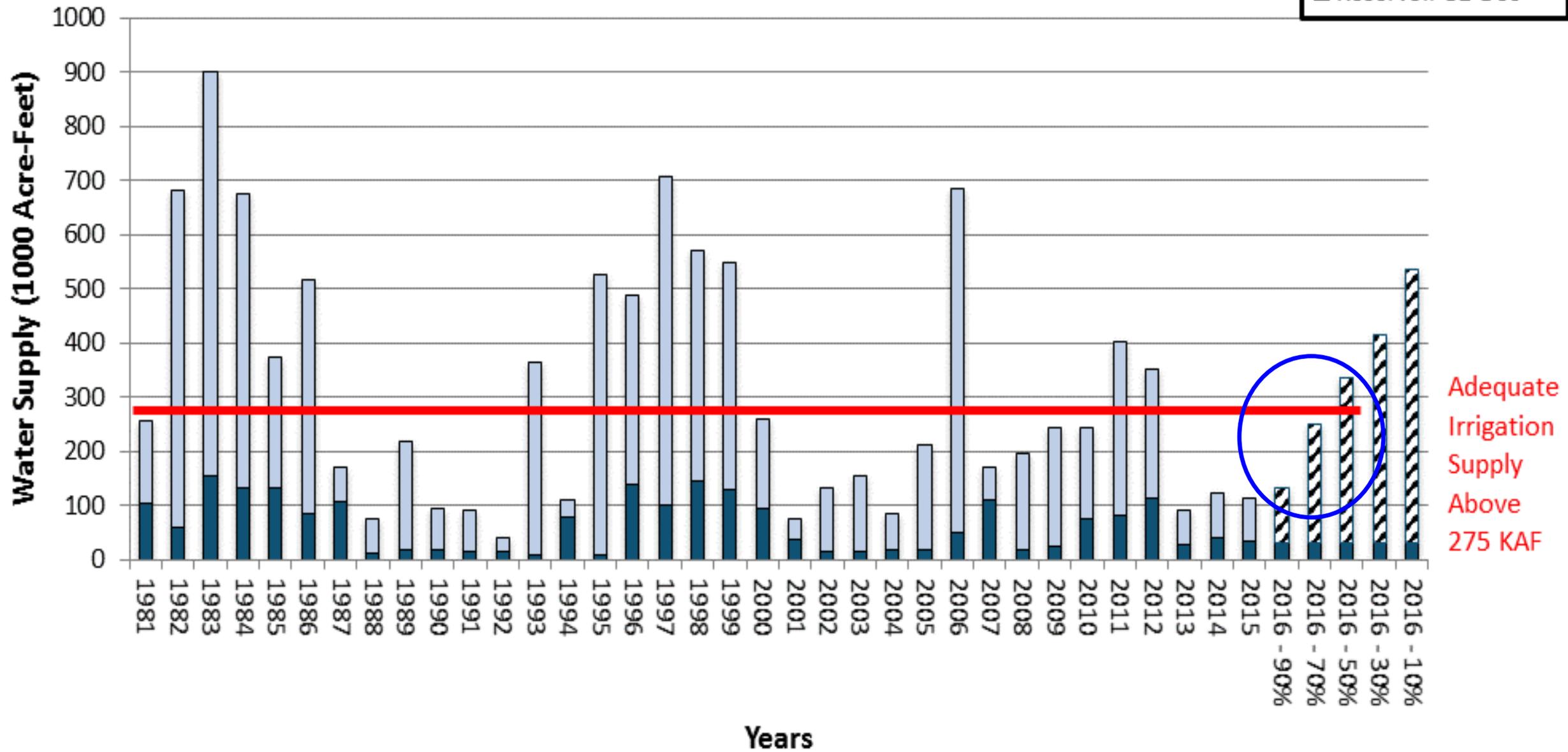
Based on Provisional SNOTEL data as of Jan 20, 2016



Jan 1 Historic and Forecasted Surface Water Supply Big Wood River Basin

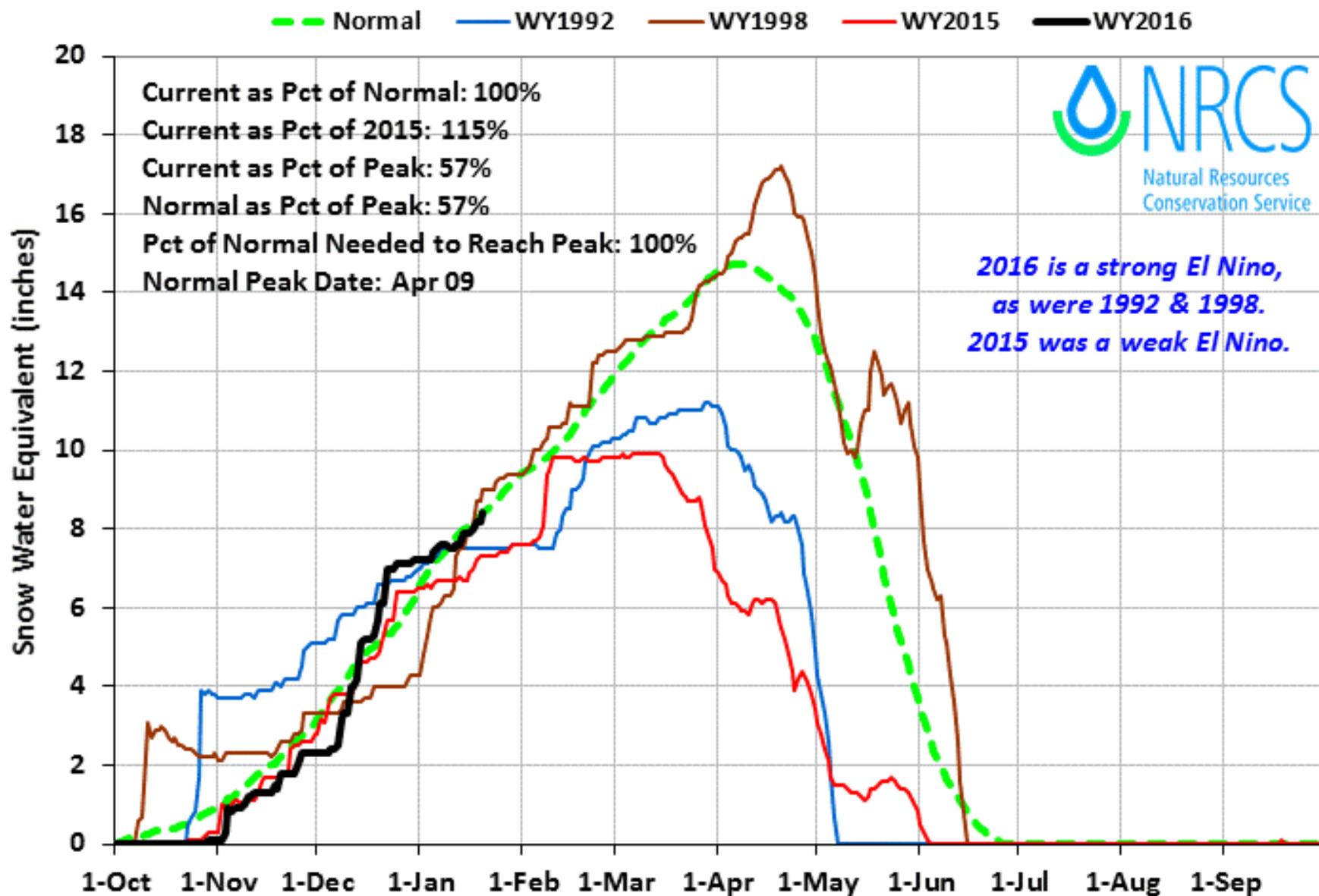
**Jan 2016 Streamflow
Forecasts
115% of Average**

StreamFlow Apr-Sep
Reservoir 31-Dec



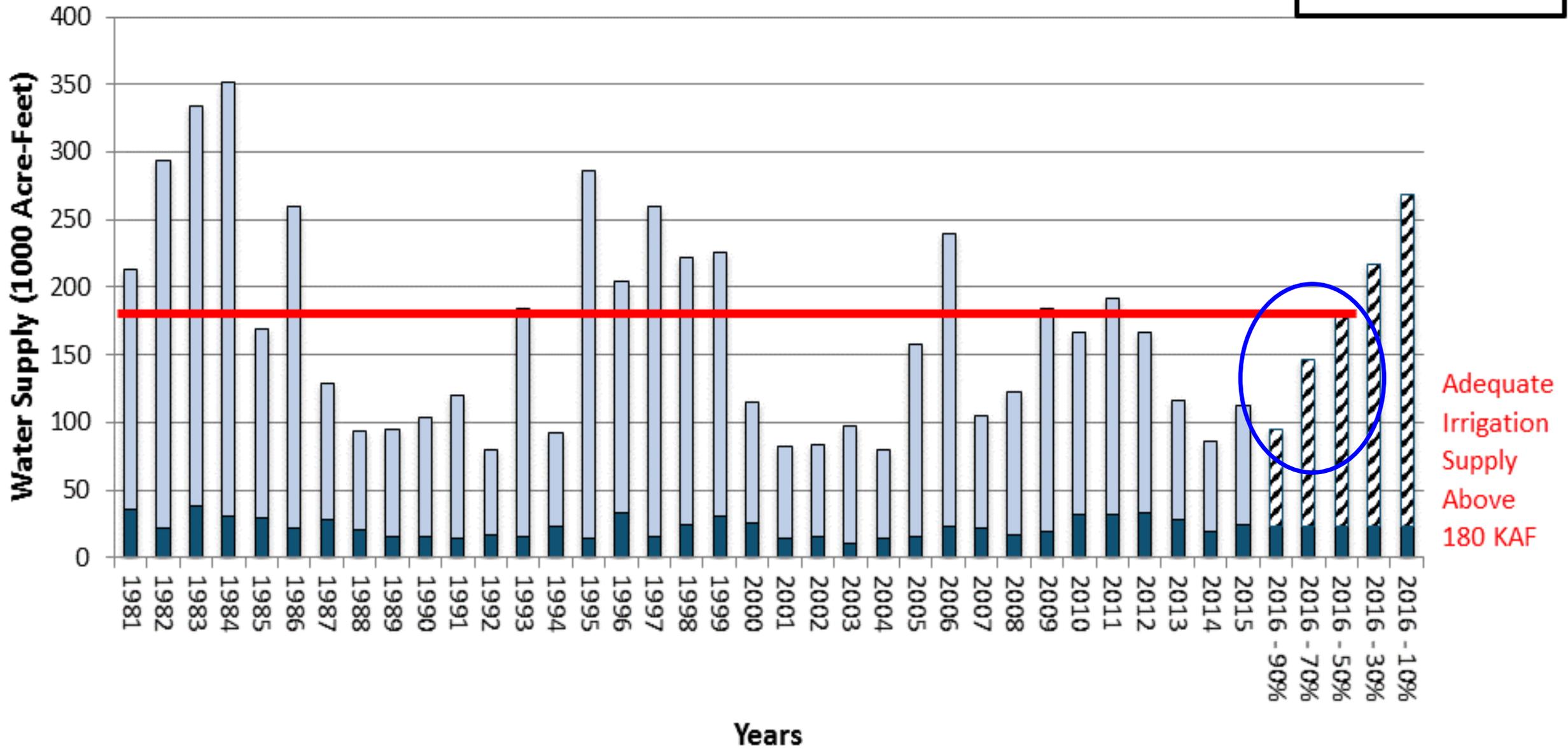
Big Lost Basin 2016 Snowpack Comparison Graph (5 sites)

Based on Provisional SNOTEL data as of Jan 20, 2016



Jan 1 Historic and Forecasted Surface Water Supply Big Lost River Basin

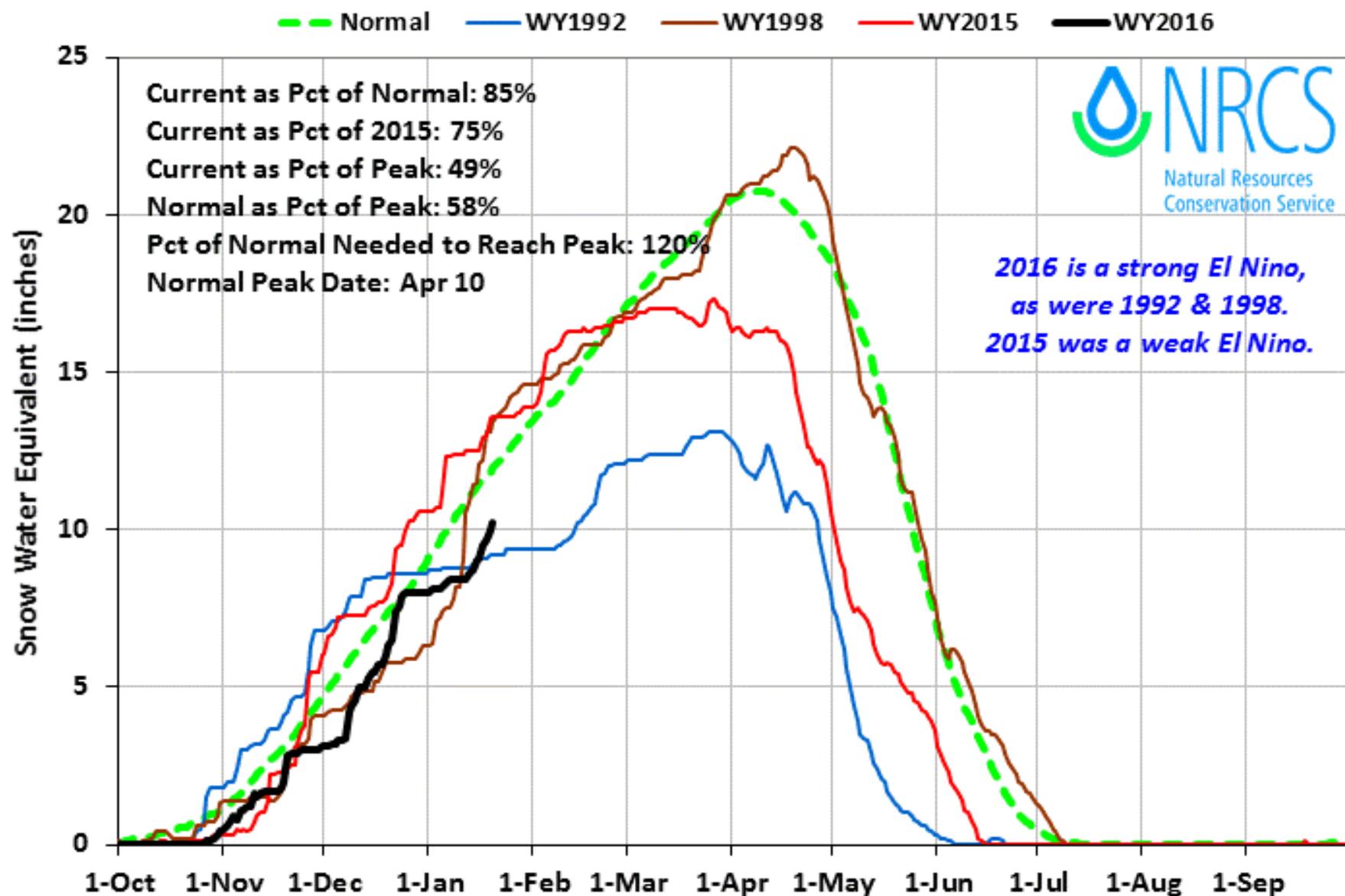
StreamFlow Apr-Sep
 Reservoir 31-Dec



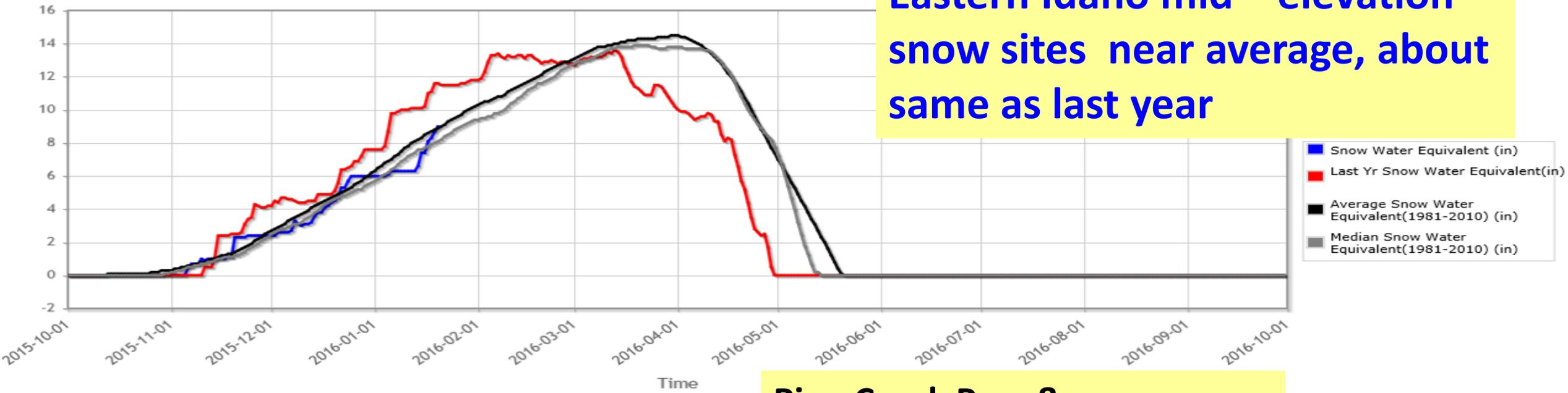
Adequate
 Irrigation
 Supply
 Above
 180 KAF

Snake Basin above Palisades 2016 Snowpack Comparison Graph (18 sites)

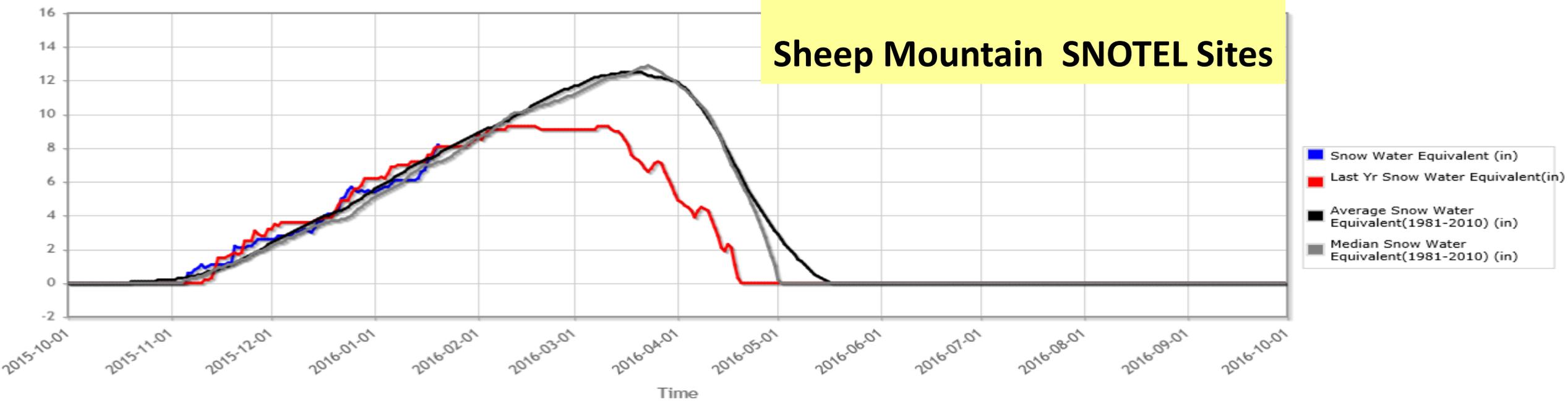
Based on Provisional SNOTEL data as of Jan 20, 2016



Pine Creek Pass (695) Idaho SNOTEL Site - 6720 ft



Sheep Mtn. (749) Idaho SNOTEL Site - 6570 ft



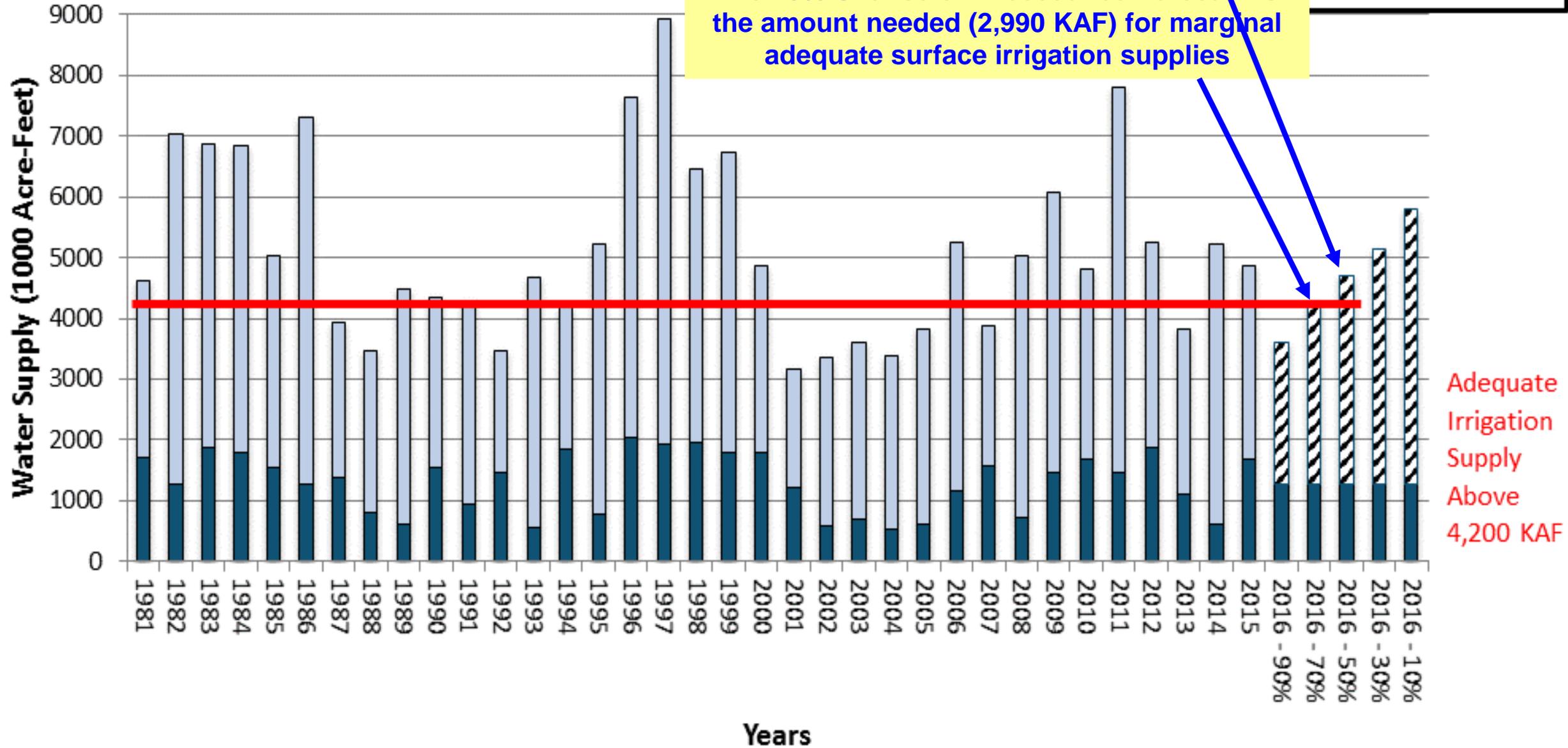
Jan 1 Historic and Forecasted Surface Water Snake River Near Heise

January 1, 2016 Heise Streamflow Forecast was 91% for Apr-Sep

The 70% Chance of Exceedance Forecast is the amount needed (2,990 KAF) for marginal adequate surface irrigation supplies

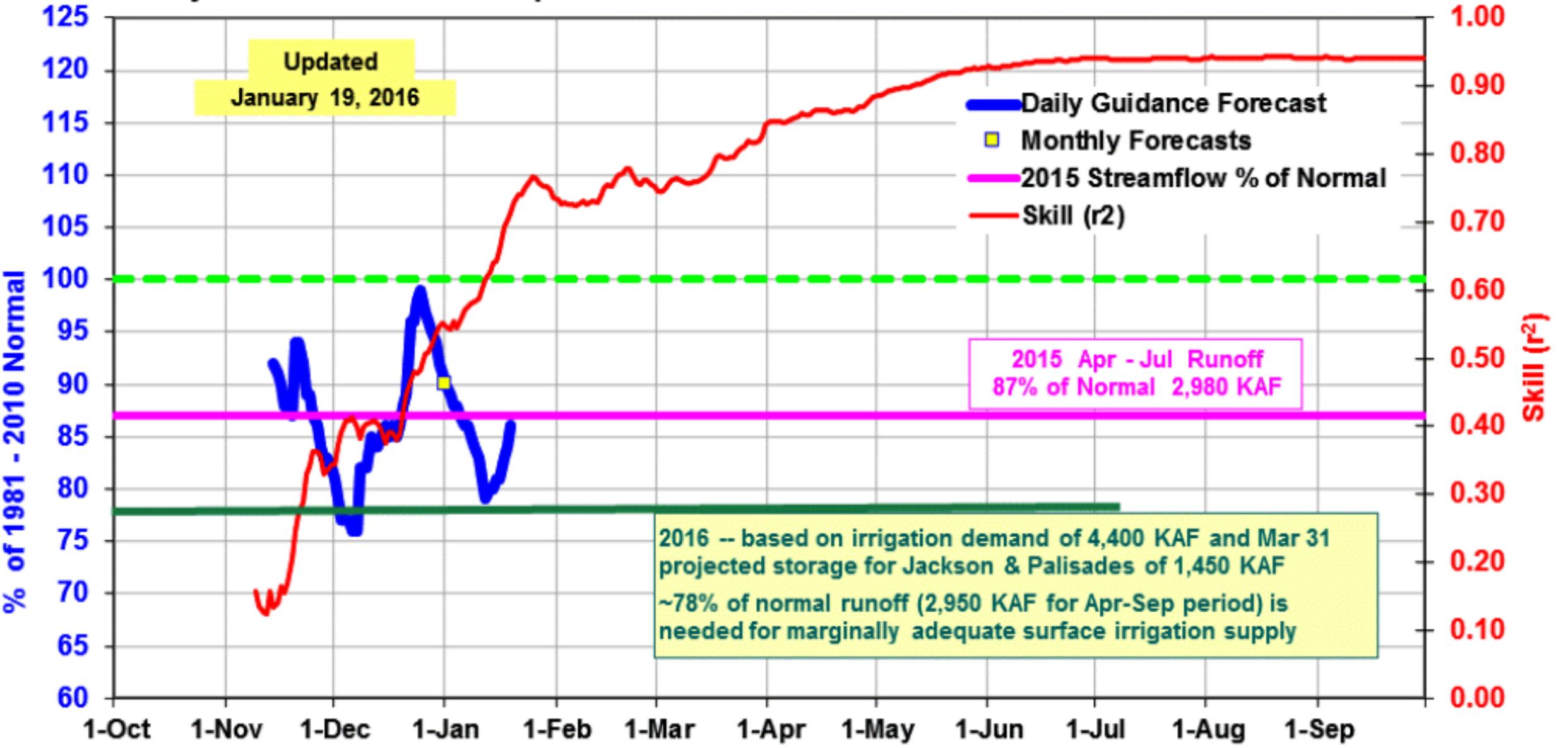
□ StreamFlow Apr-Sep

■ Reservoir 31-Dec

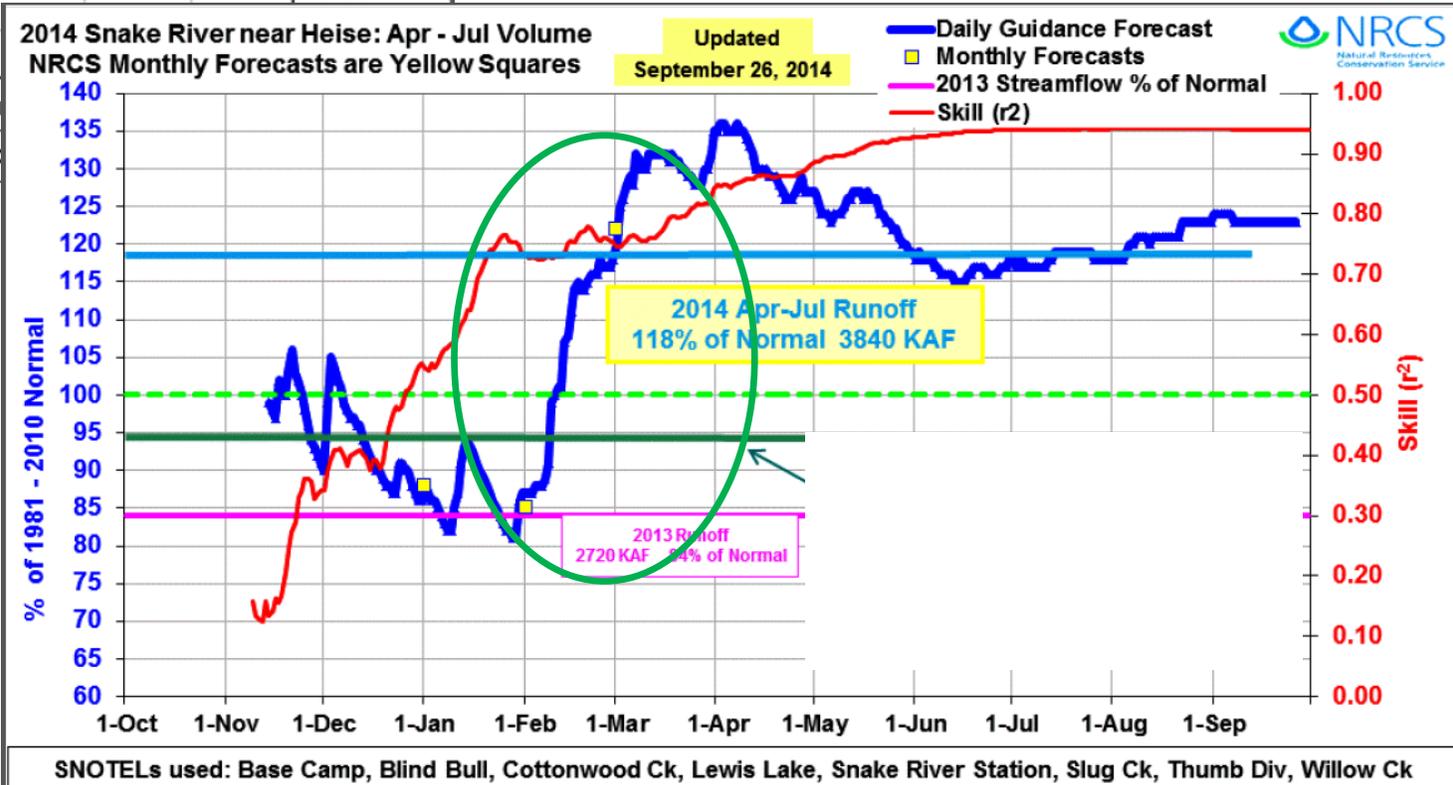
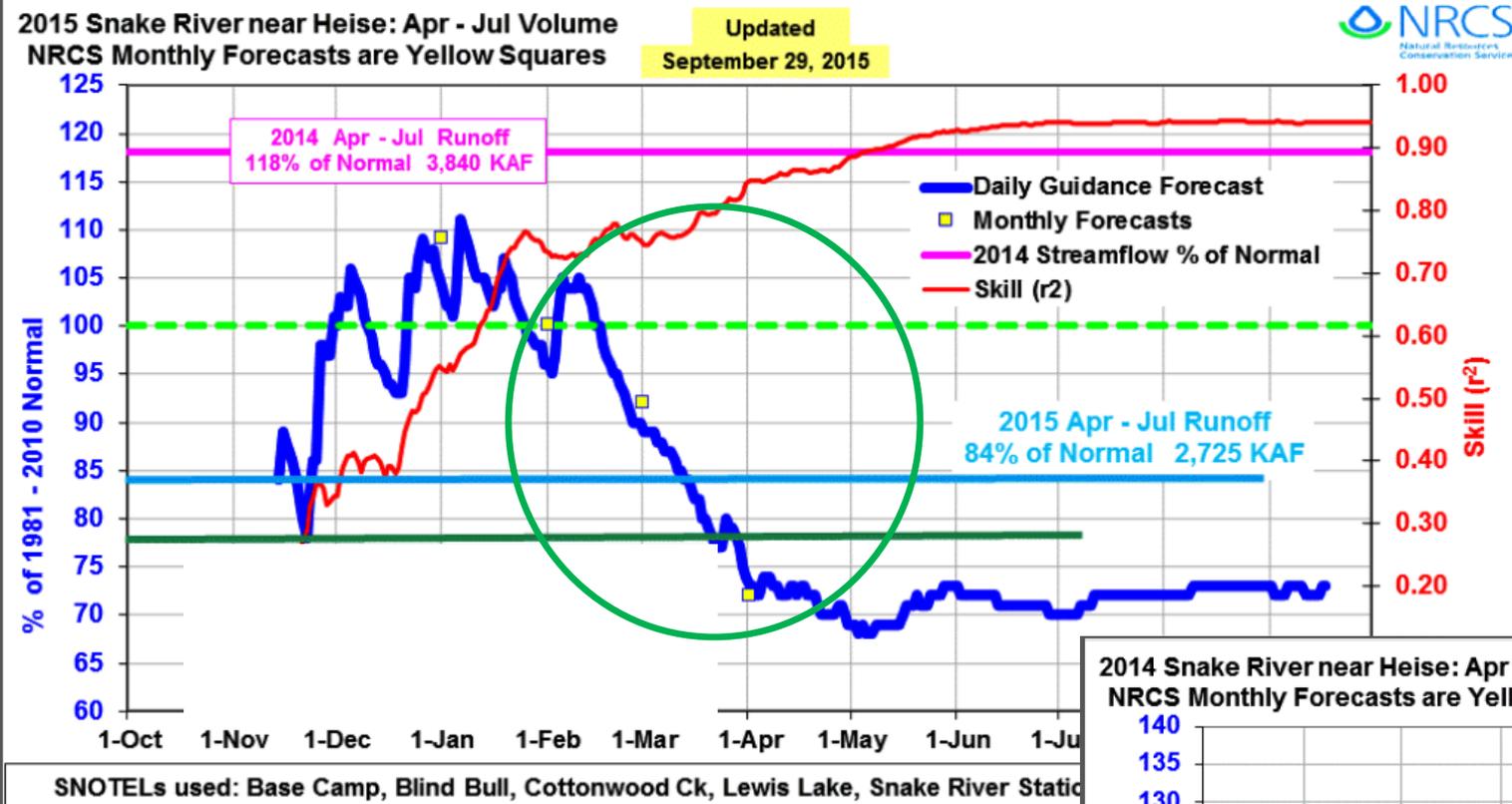


2016 Snake River near Heise: Apr - Jul Volume

NRCS Monthly Forecasts are Yellow Squares

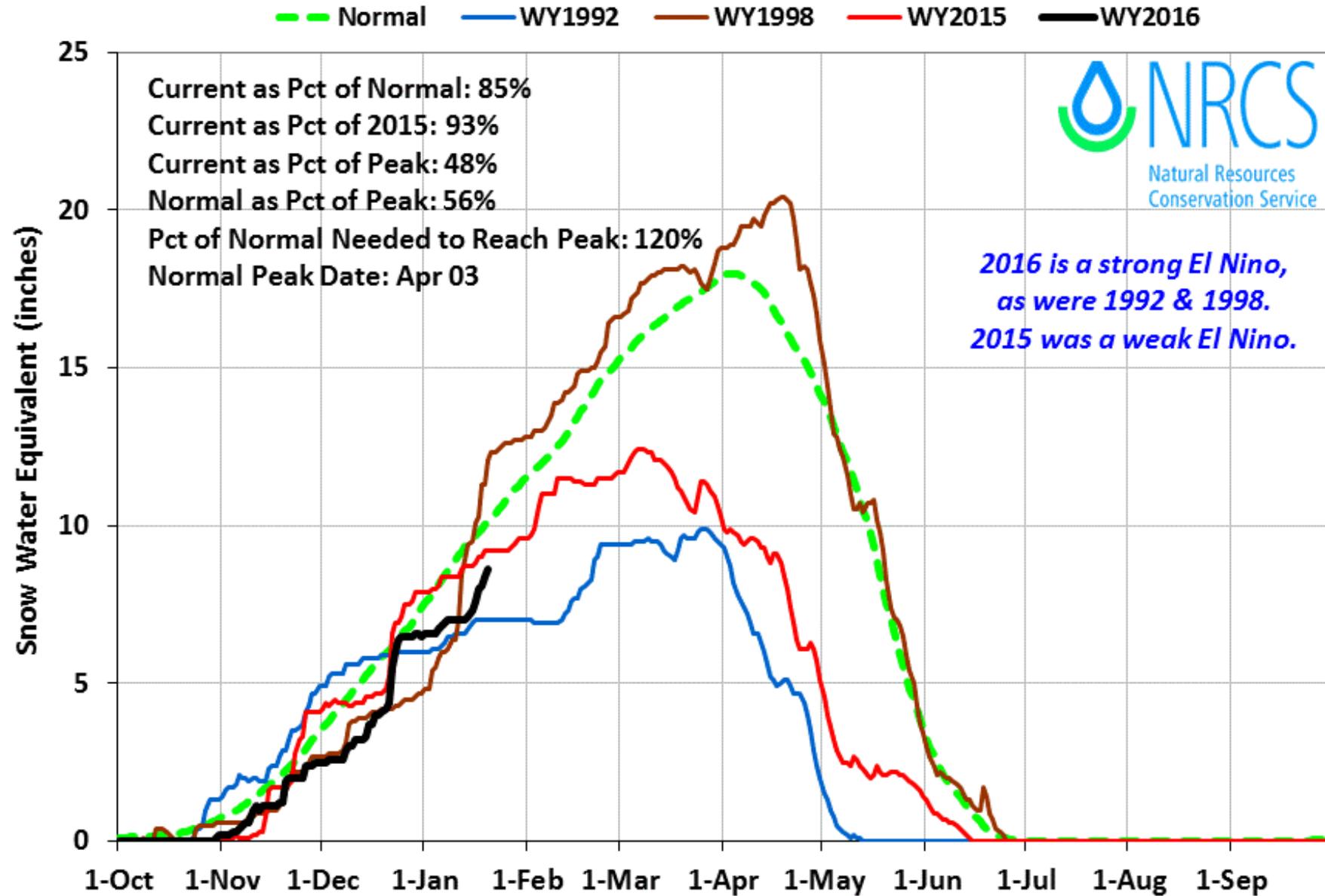


SNOTELs used: Base Camp, Blind Bull, Cottonwood Ck, Lewis Lake, Snake River Station, Slug Ck, Thumb Div, Willow Ck



Bear Basin 2016 Snowpack Comparison Graph (15 sites)

Based on Provisional SNOTEL data as of Jan 20, 2016

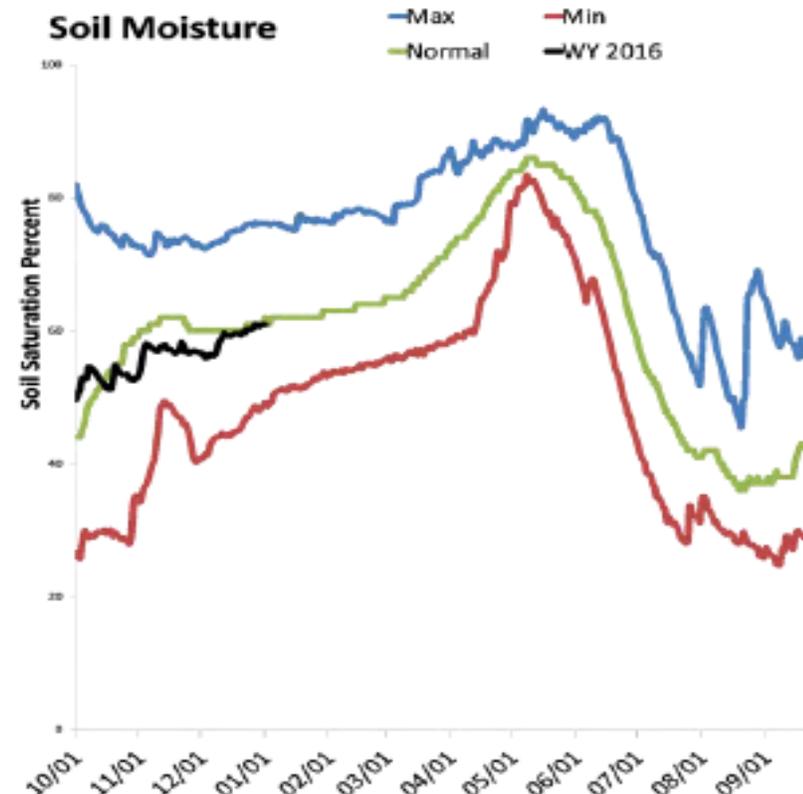
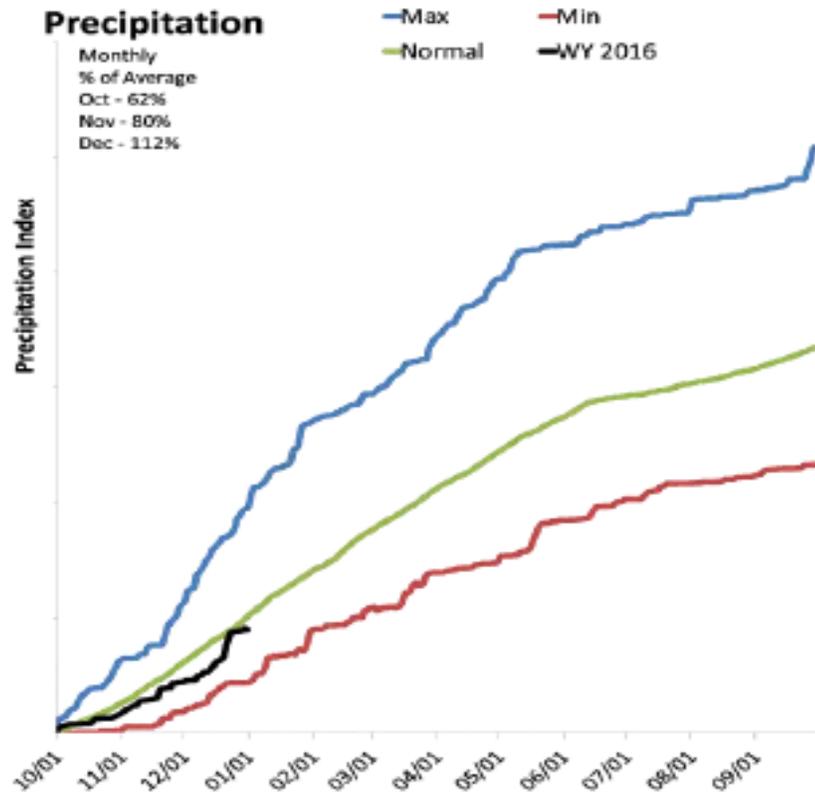


As of January 1, 2016 Soil Moisture is 59% compared to 57% last year in the Bear River Basin – Utah Water Supply Report

Bear River Basin

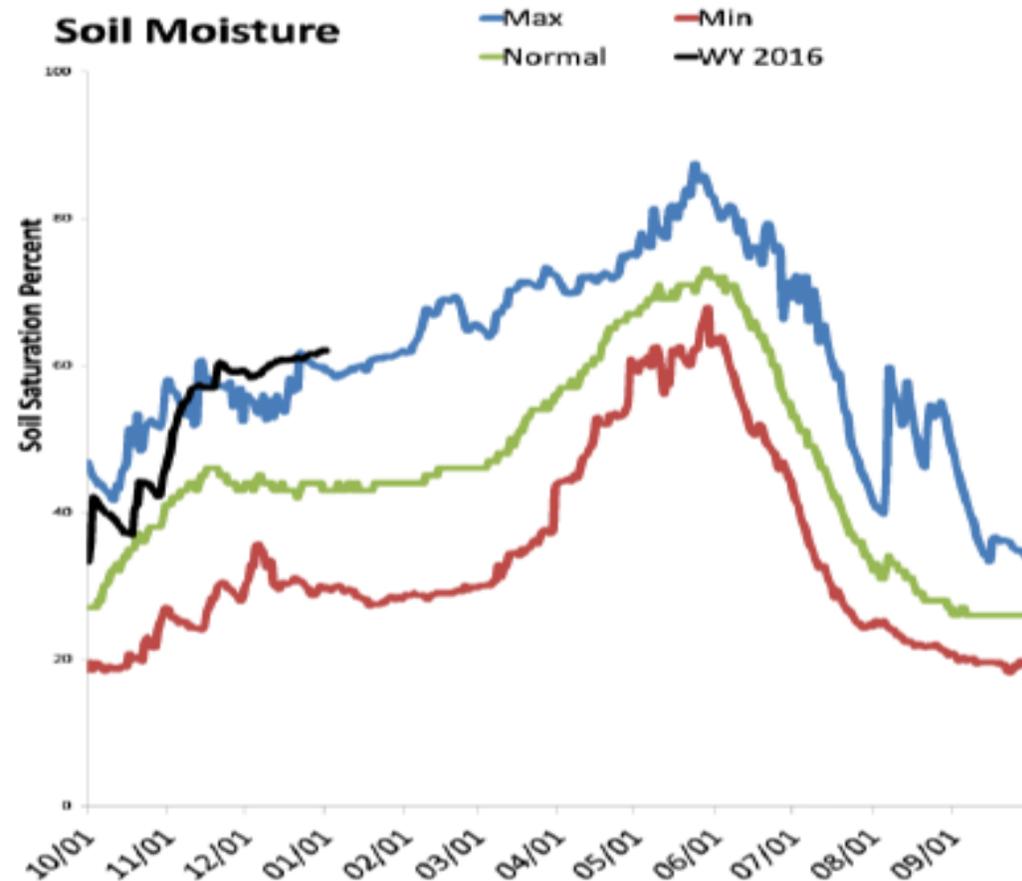
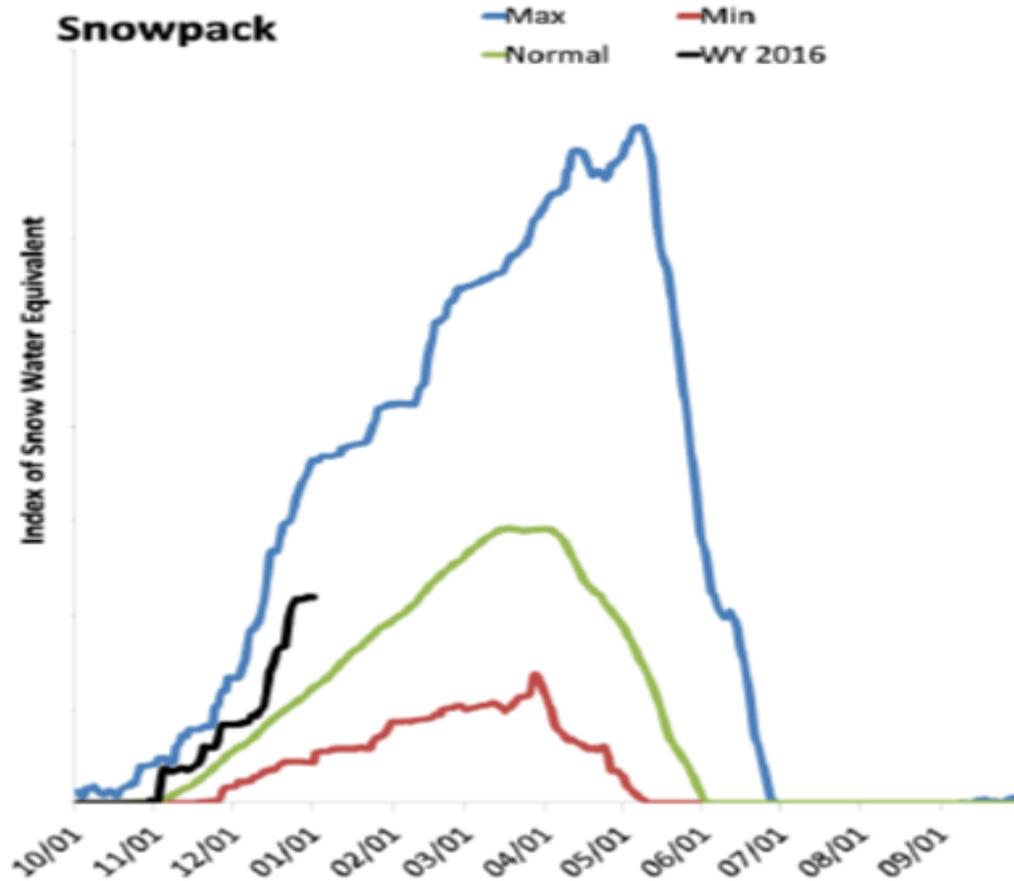
1/1/2016

Precipitation in December was above average at 113%, which brings the seasonal accumulation (Oct-Dec) to 89% of average. Soil moisture is at 59% compared to 57% last year. Reservoir storage is at 37% of capacity, compared to 41% last year. The water availability index for the Bear River is 43%, 68% for Woodruff Narrows and 12% for the Little Bear.



As of January 1, 2016 Soil Moisture is 57% compared to 28% last year in the Salmon Falls basin in Northern Nevada

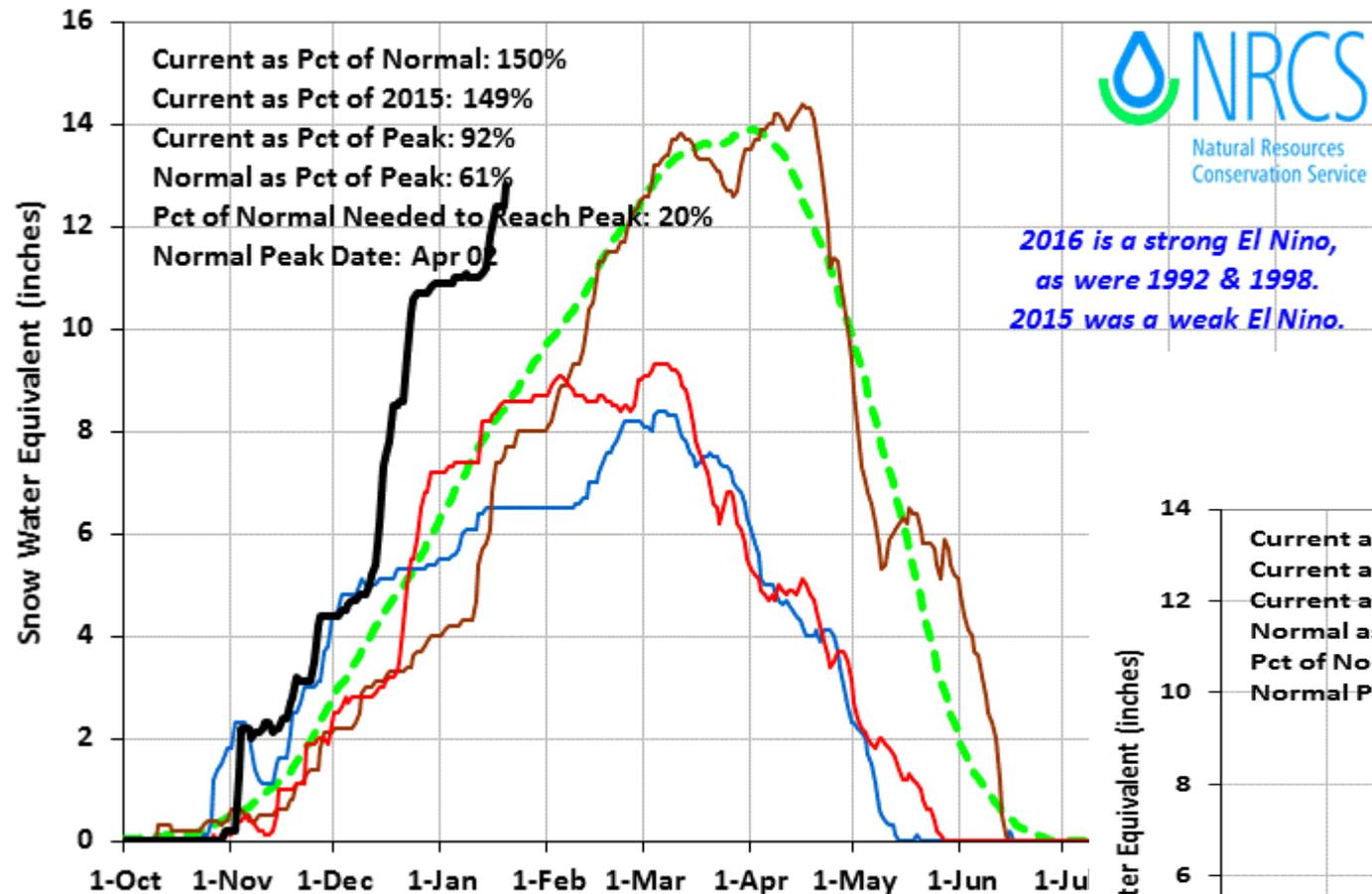
Snowpack in the Snake River Basin is much above normal at 183% of median, compared to 134% last year. Precipitation in December was much above average at 172%, which brings the seasonal accumulation (Oct-Dec) to 158% of average. Soil moisture is 57% compared to 28% last year. The forecast streamflow volume for Salmon Falls Creek is 159% of average.



Bruneau Basin 2016 Snowpack Comparison Graph (5 sites)

Based on Provisional SNOTEL data as of Jan 20, 2016

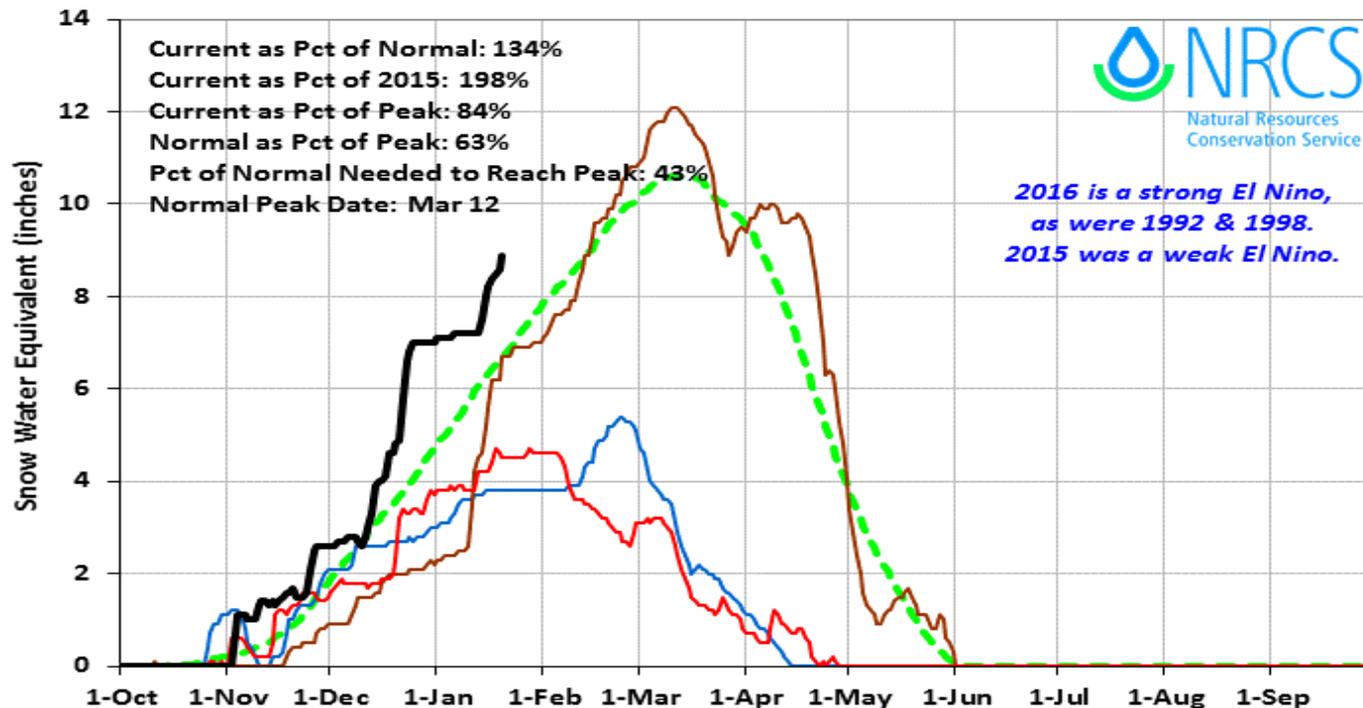
Normal WY1992 WY1998 WY2015 WY2016



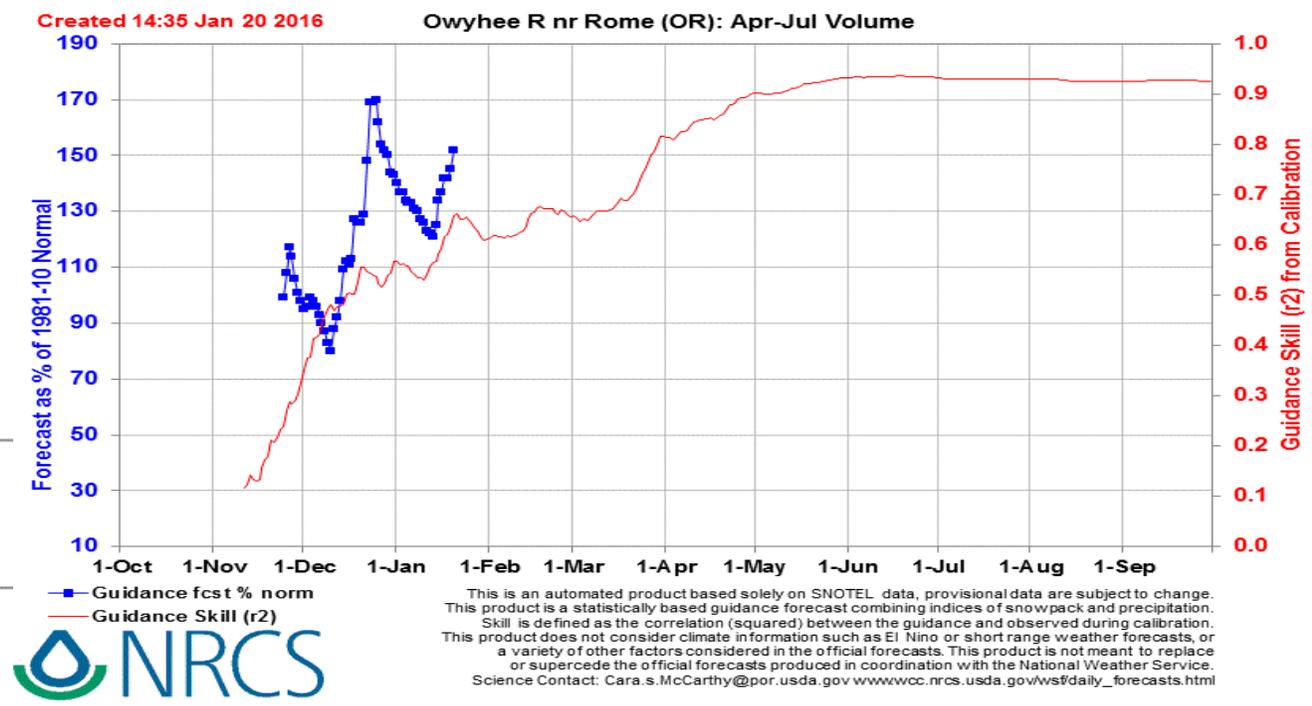
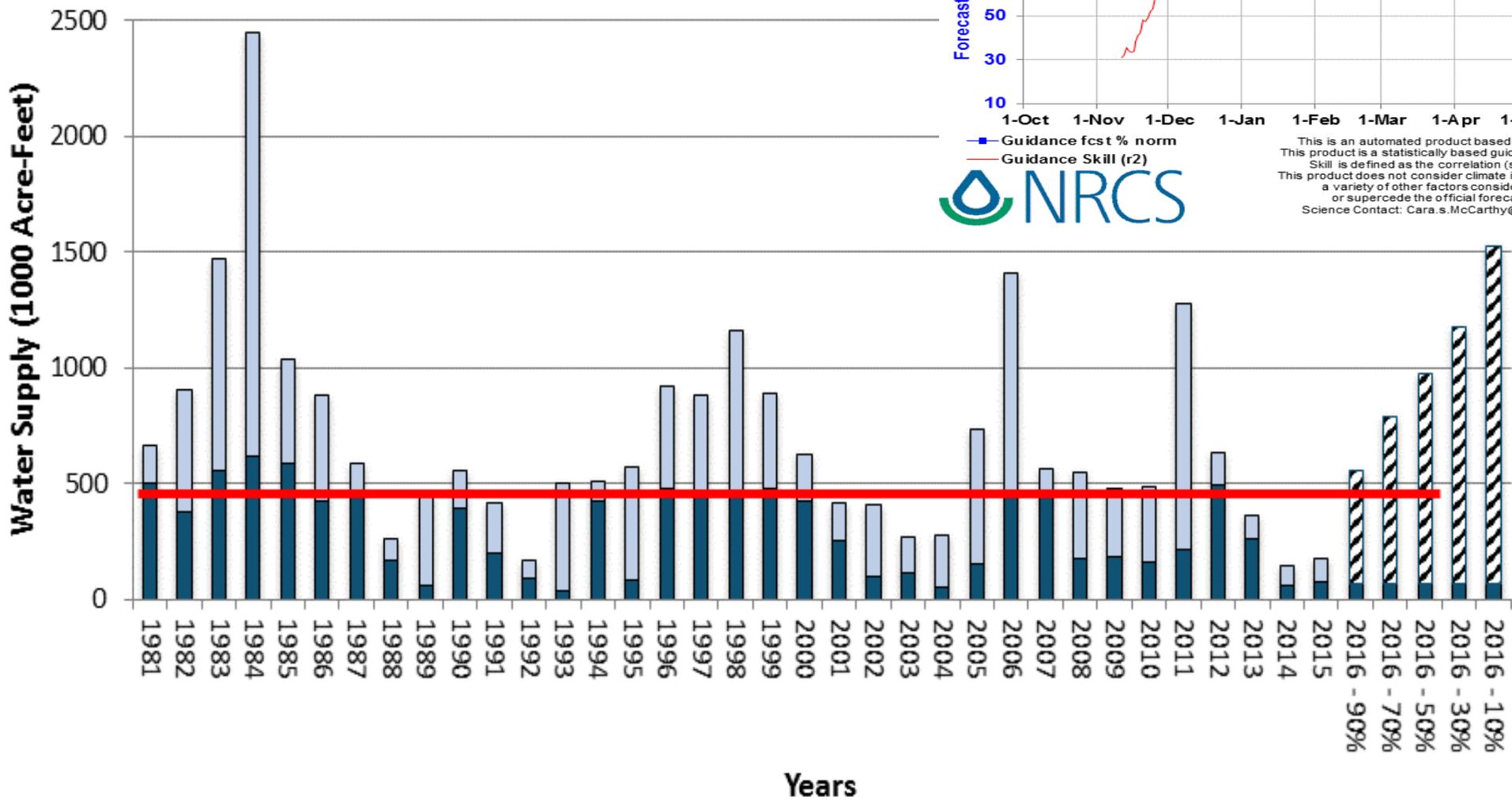
Owyhee Basin 2016 Snowpack Comparison Graph (7 sites)

Based on Provisional SNOTEL data as of Jan 20, 2016

Normal WY1992 WY1998 WY2015 WY2016



Jan 1 Historic and Forecasted Surface Water Supply Owyhee Basin



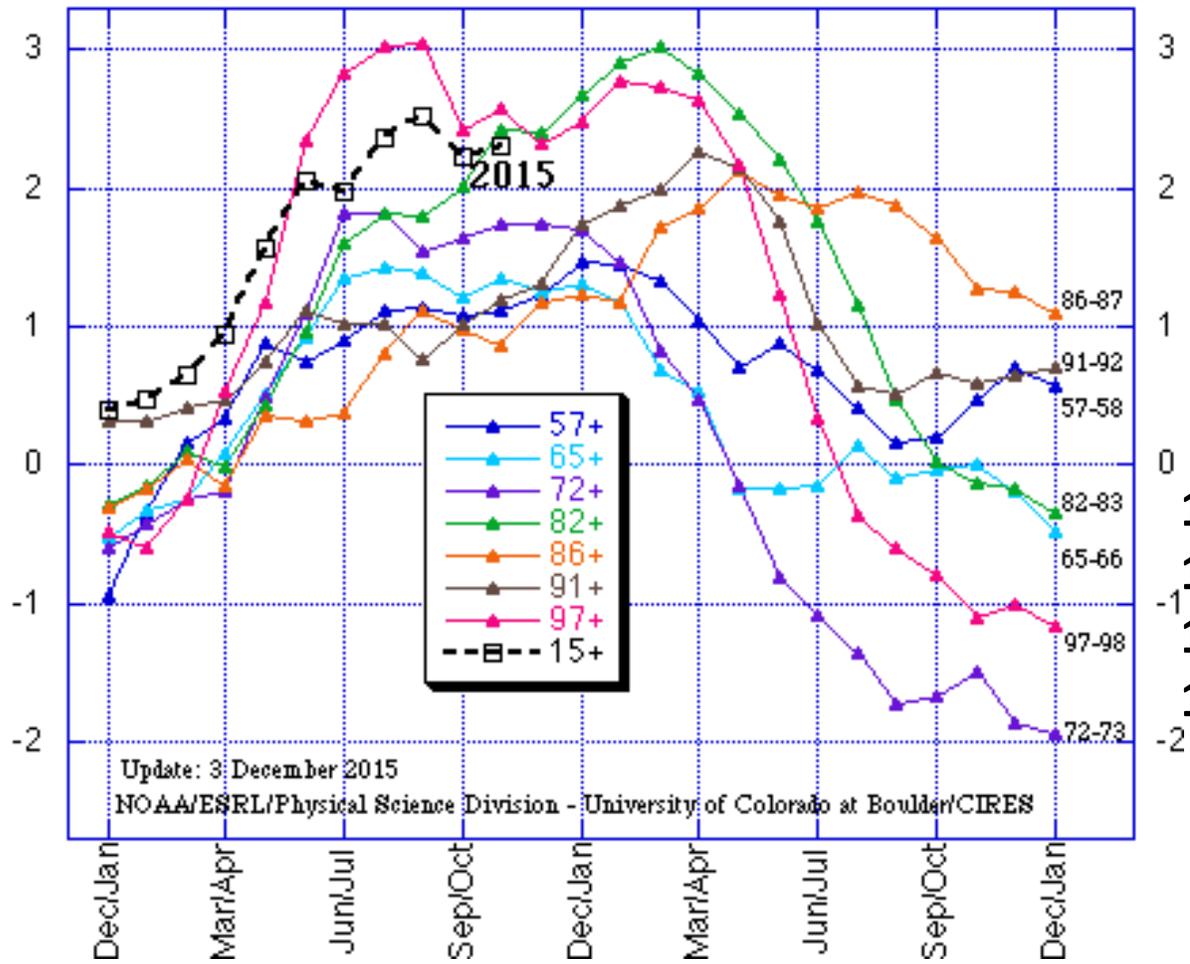
Adequate
 Irrigation
 Supply
 Above
 450 KAF



			Streamflow as % of 1981-2010 Average				
	ENSO	PDO	Feb-Sep	Apr-Sep	Apr-Sep	Apr-Sep	Apr-Sep
Year	SE Strong El Nino	pos or neg	Owyhee River blw Dam	Salmon Falls Creek	Big Wood River blw Magic Dam	Snake River nr Heise	Spokane River nr Post Falls
1994	SE	pos	23	36	12	61	51
1966	SE	neg	28	39	51	78	90
1988	SE	pos	30	65	24	70	71
1947	SE	pos / neg	44	50	59	108	90
1973	SE	pos / neg	61	114	51	79	45
1941	SE	pos	83	53	69	73	45
1978	SE	pos	110	112	140	133	99
1942	SE	pos	122	173	117	86	77
1995	SE	pos	124	135	195	118	70
1998	SE	pos	135	138	161	119	82
1983	SE	pos	221	157	282	132	91
1952	SE	neg	246	178	263	116	123
			sorted				
2016	SE	pos ?	?	?	?	?	?

Multivariate ENSO Index (MEI) for the seven strongest El Niño events since 1950 vs. 2015

Standardized Departure

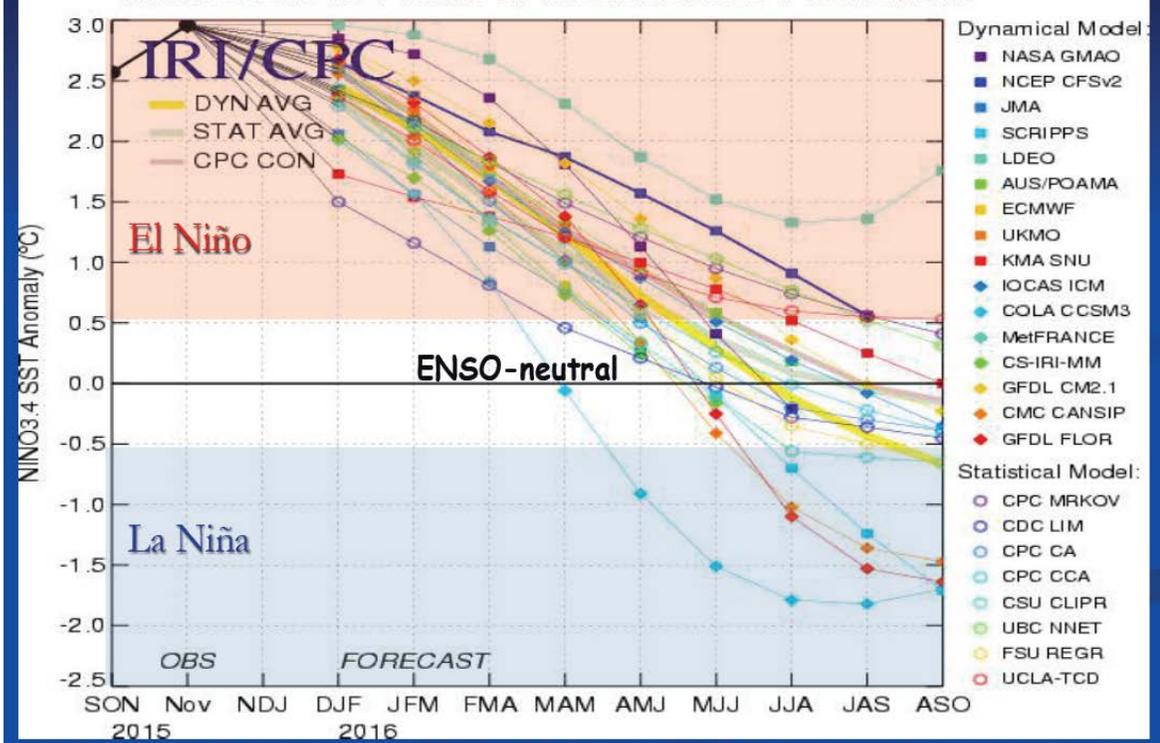


1984
1967
1999
1974

ENSO Predictive Models

El Niño appears to be peaking now and should weaken this spring...

Mid-Dec 2015 Plume of Model ENSO Predictions



"Base" Graphic Courtesy: <http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/>

			Streamflow as % of 1981-2010 Average					
	ENSO		ENSO	Feb-Sep	Apr-Sep	Apr-Sep	Apr-Sep	Apr-Sep
Curr ent Year	SE Strong El Nino	Year Folowing a Strong El Nino	SE Strong El Nino	Owyhee River blw Dam	Salmon Falls Creek	Big Wood River blw Magic Dam	SNAKE River nr Heise	Spokane River nr Post Falls
1952	SE	1953	N	56	76	92	92	108
1947	SE	1948	LN	58	86	66	97	176
1966	SE	1967	N	69	88	151	109	113
1978	SE	1979	N	97	116	34	90	105
1998	SE	1999 *	SL	100	108	158	131	129
1973	SE	1974	SL	120	111	184	147	193
1941	SE	1942	SE	122	173	117	86	77
1995	SE	1996	N	124	115	132	148	116
1994	SE	1995	SE	124	135	195	118	70
1942	SE	1943	N	137	150	259	144	150
1988	SE	1989	SL	145	100	75	102	116
1983	SE	1984 *	N	363	369	206	133	91
				sorted				
2016	SE	2017	????	?	?	?	?	?



BOISE STATE UNIVERSITY

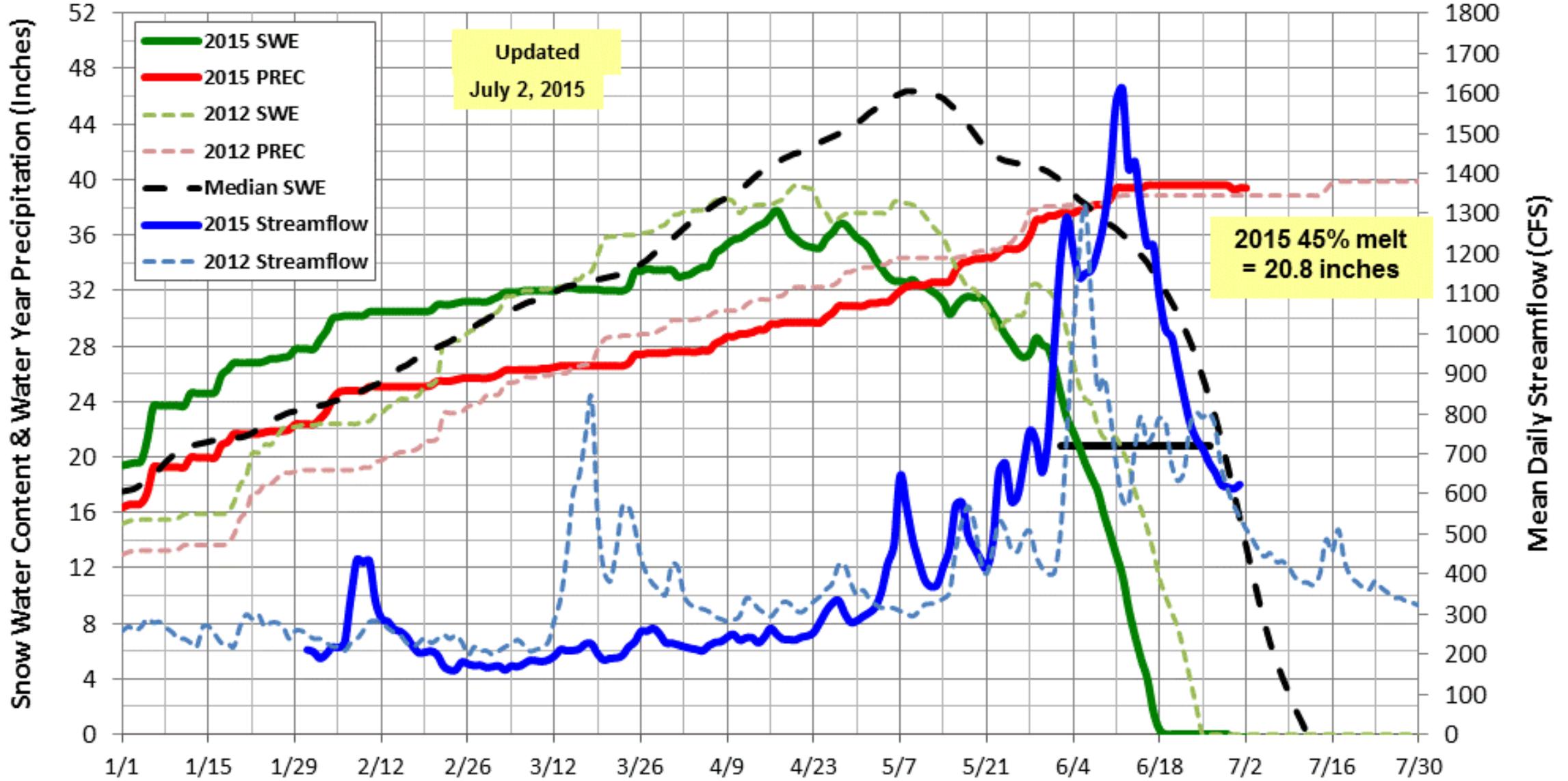
From Snow to Flow

1. Estimating the timing of peak streamflow using SNOTEL ablation curves

(Kara Ferguson & Dr. Jim McNamara)

2. Estimating critical flow magnitudes using SNOTEL data
(Becca Garst & Dr. Jim McNamara)

2015 & 2012 Grand Targhee SNOTEL and Teton River above Leigh Ck near Driggs



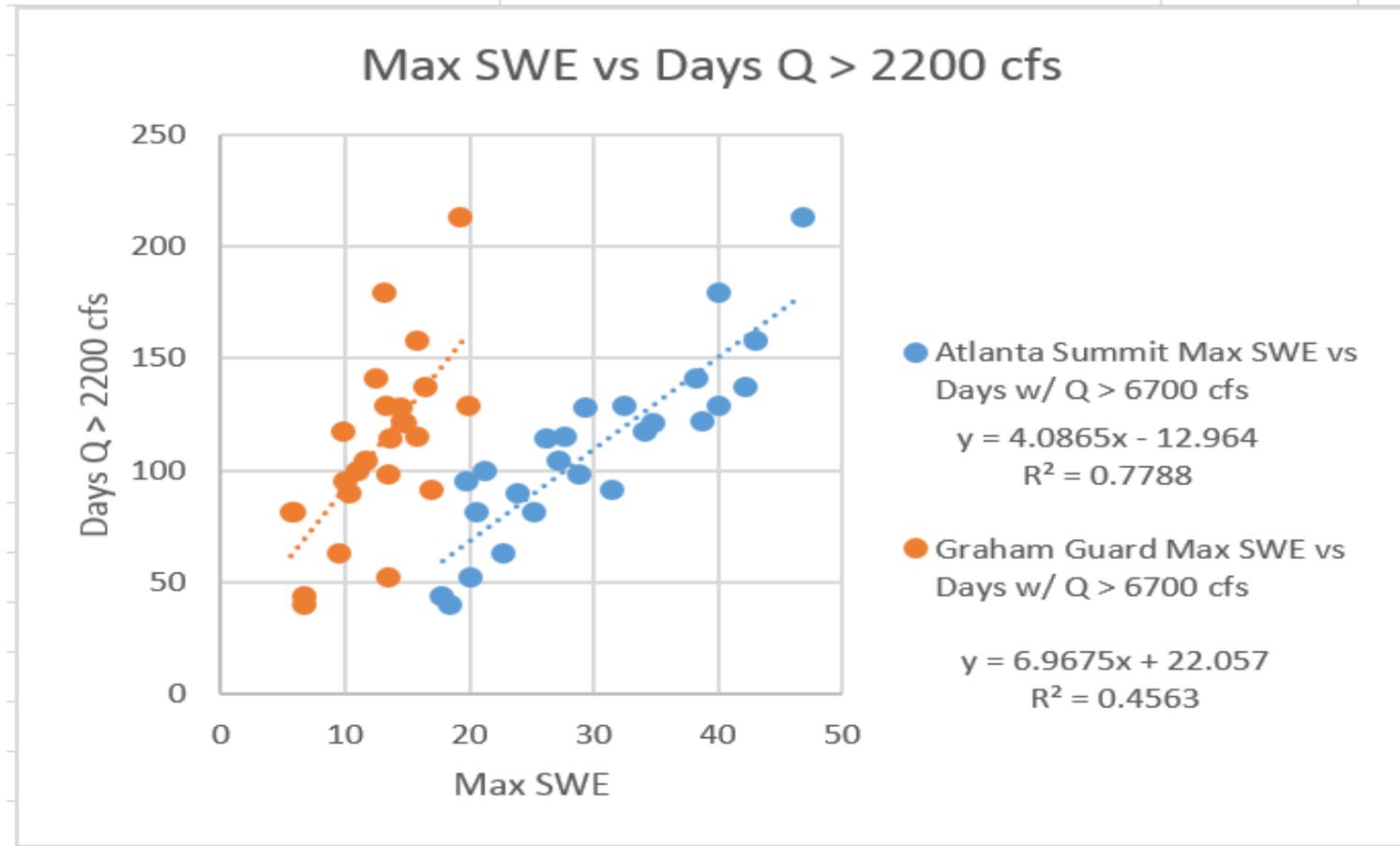
Teton River has an increase or the snowmelt peak occurs when Grand Targhee SNOTEL site is about 45% melted.

Day of Allocation Projections (Boise State Project)

Currently analyzing trends between:

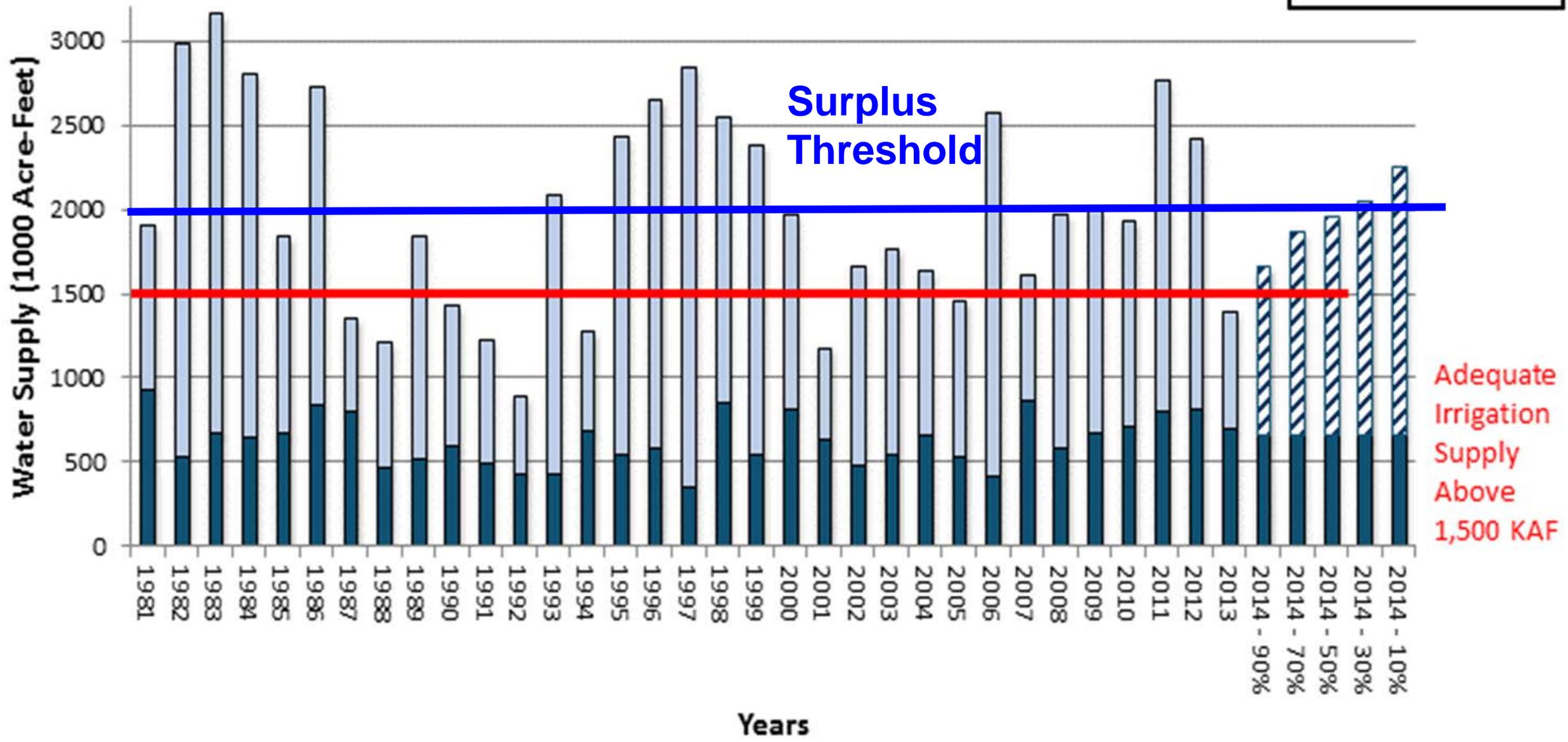
- Peak SWE to Date of Allocation
- Peak streamflow to Date of Allocation
- Various points in recession to Date of Allocation

Boise River
Natural Flow at
Lucky Peak



Apr 1 Historic and Forecasted Surface Water Supply Boise River Basin

StreamFlow Apr-Sep
 Reservoir 31-Mar





Think Snow!!