



**22nd Annual
Idaho
AG Summit
Conference**

**February 16
2016
Boise
Idaho**

This is What We are Seeing

**Ron Abramovich
Water Supply Specialist
Snow Survey Boise, Idaho**



Water Year 2015 Summary of Climate, Hydrology & Snowpack Observations

Water year 2015 was very unique in terms of climate variability in Idaho.

November arctic cold spell

‘Snow Drought’

Two Atmospheric River events produced early runoff

A dry & warm March and April:

- closed ski areas early
- produced record high early irrigation demands

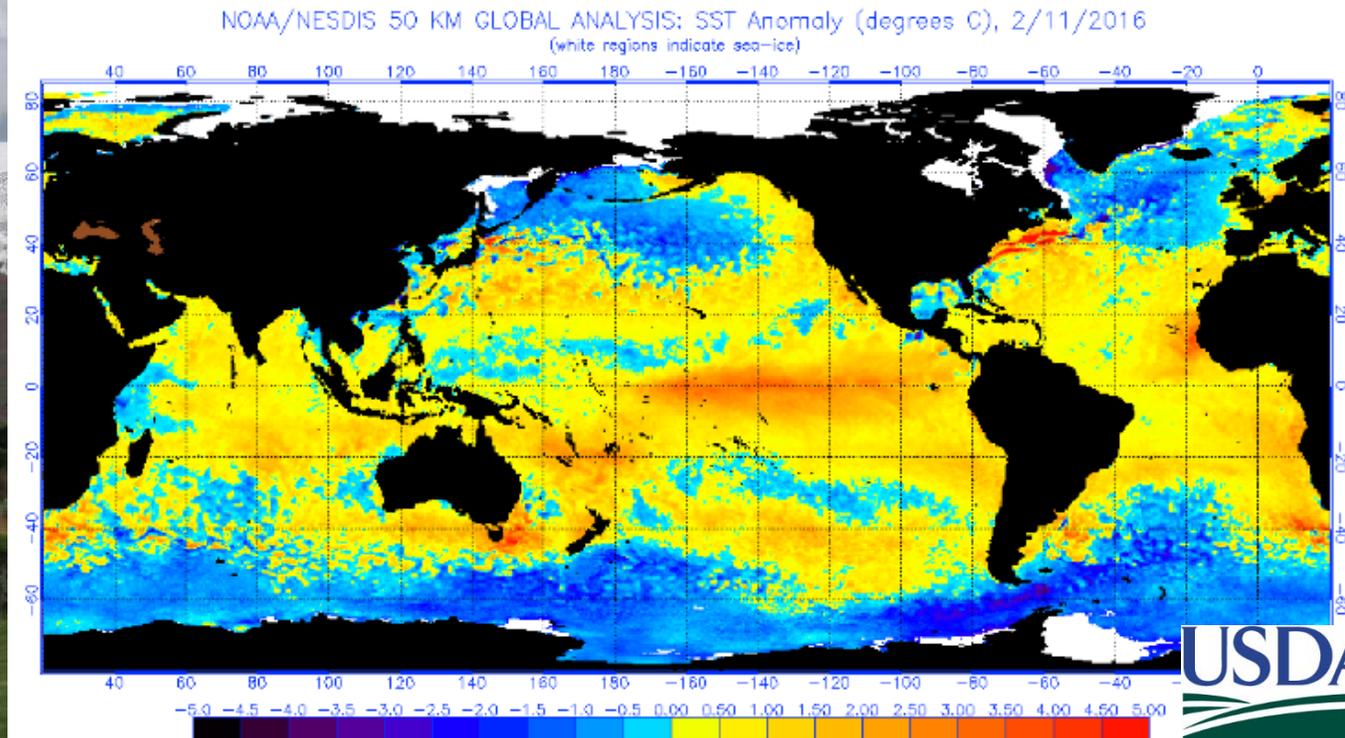
May’s rains provided some relief for southern Idaho irrigators.

Record high June temperatures gave way to more reasonable July temperatures as the summer fire season grew in intensity.

With an increase in climate variability...

Summary

Understanding the key climatological relationships in your basin or region provides a better understanding of what may happen when certain conditions occur.





- **Nov 2014 Arctic Cold Spell suddenly spilled into Idaho from Montana**
- **Boise went from 50s F to single digits in a few days**

- **MF Salmon River basically froze overnight & froze sap in trees**

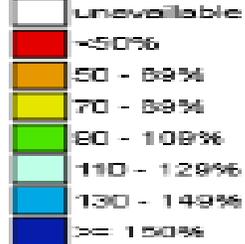


SNOTEL Mountain Precipitation Water Year to Date: Jan 15, 2015

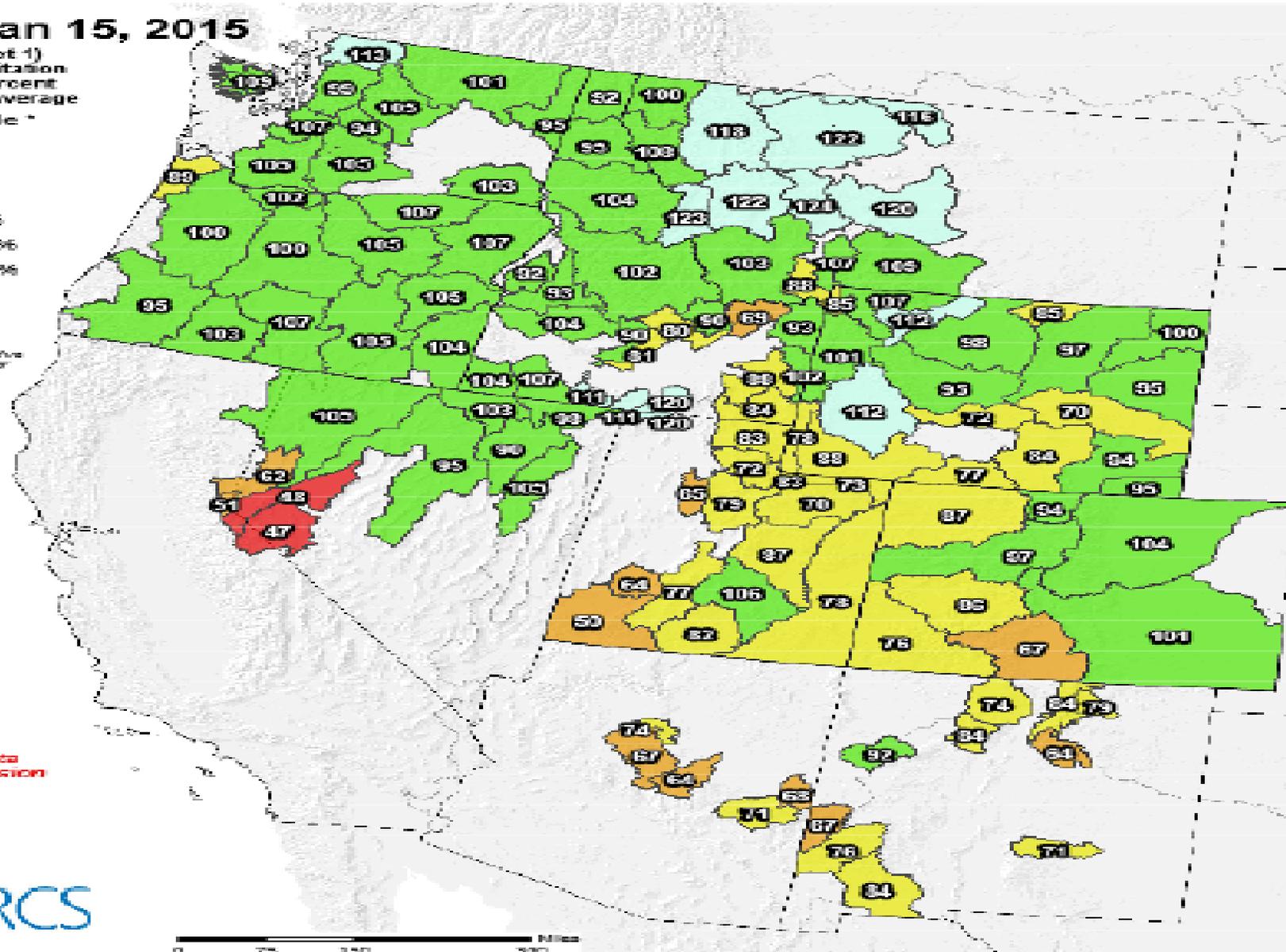
Westwide SNOTEL Water Year (Oct 1) to Date Precipitation % of Normal

Jan 15, 2015

Water Year (Oct 1)
to Date Precipitation
Basin-wide Percent
of 1981-2010 Average



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



Provisional data
subject to revision



The water year to date precipitation percent of normal represents the accumulated precipitation found at selected SNOTEL sites in or near the basin compared to the average value for those sites over the data time period.

Prepared by:
USDA/NRCS National Water and Climate Center
Bozeman, Oregon

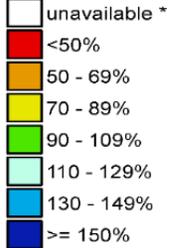
Normal or
better across
Pacific NW

NOT a
Precipitation
Drought

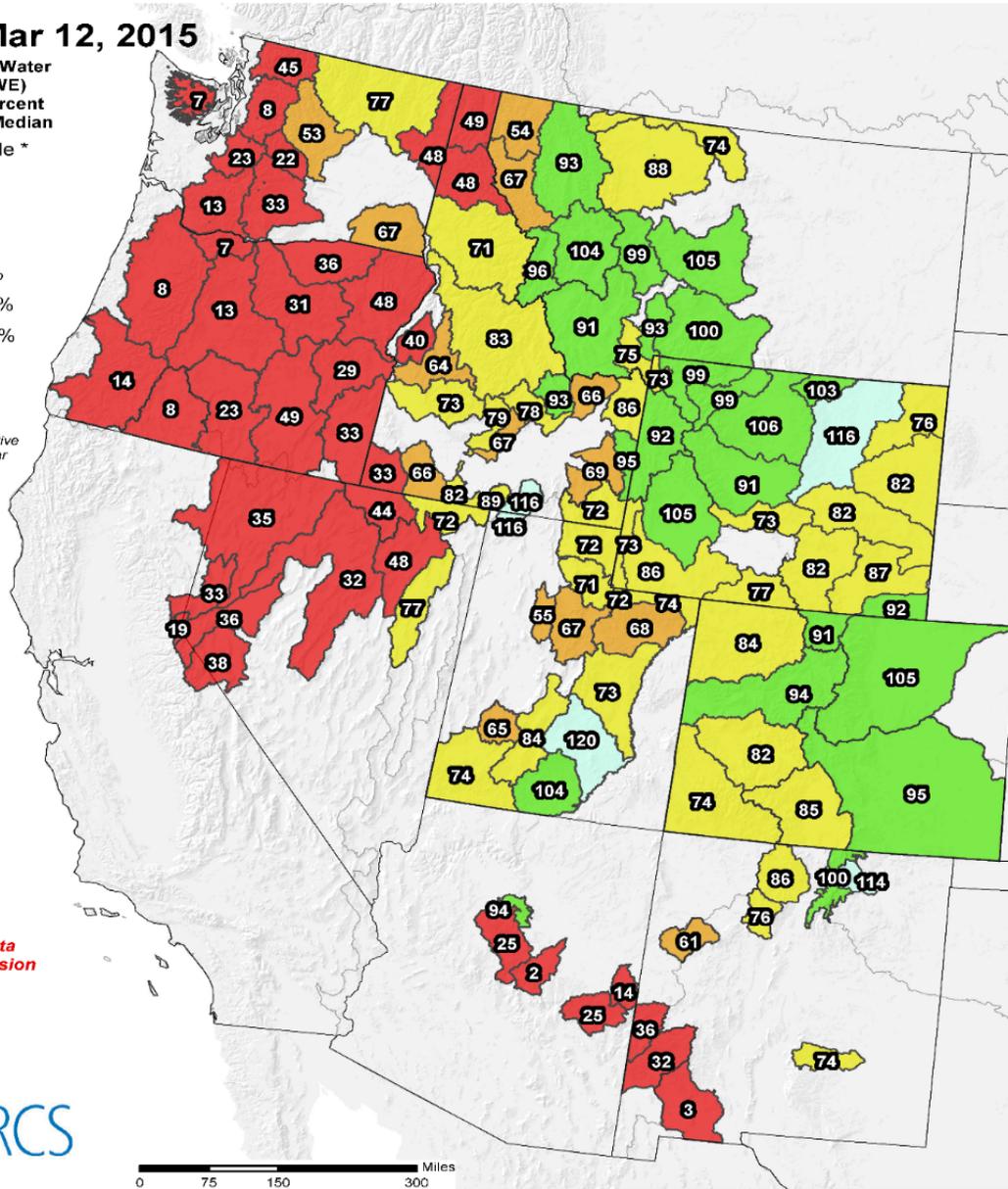
Westwide SNOTEL Current Snow Water Equivalent (SWE) % of Normal

Mar 12, 2015

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>

March 11, 2015 Looking east in the Big Wood Valley over Sun Valley Resort

Lack of mid – elevation snow for 2nd consecutive year

Lost-Wood Divide SNOTEL Site



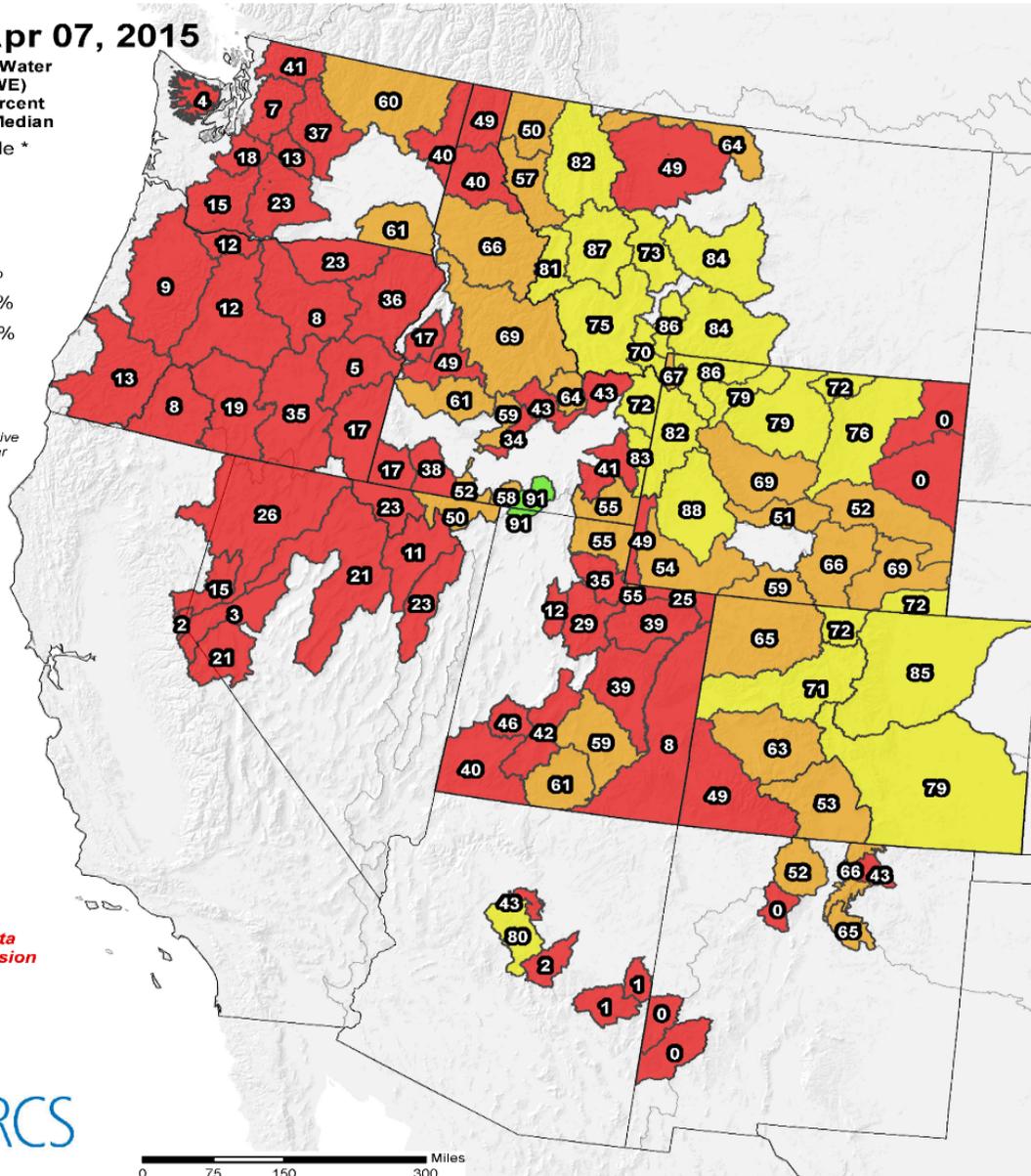
Westwide SNOTEL Current Snow Water Equivalent (SWE) % of Normal

Apr 07, 2015

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

- unavailable *
- <50%
- 50 - 69%
- 70 - 89%
- 90 - 109%
- 110 - 129%
- 130 - 149%
- >= 150%

* 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>

April 7, 2015 -- Record Low Snow

SNOTEL Current Snow Water Equivalent (SWE) Records

Apr 07, 2015

NOTE: Until further notice, record calculations are based on period of record through water year 2012; water years 2013 and 2014 are not analyzed.

Current Snow Water (SWE) Equivalent Records

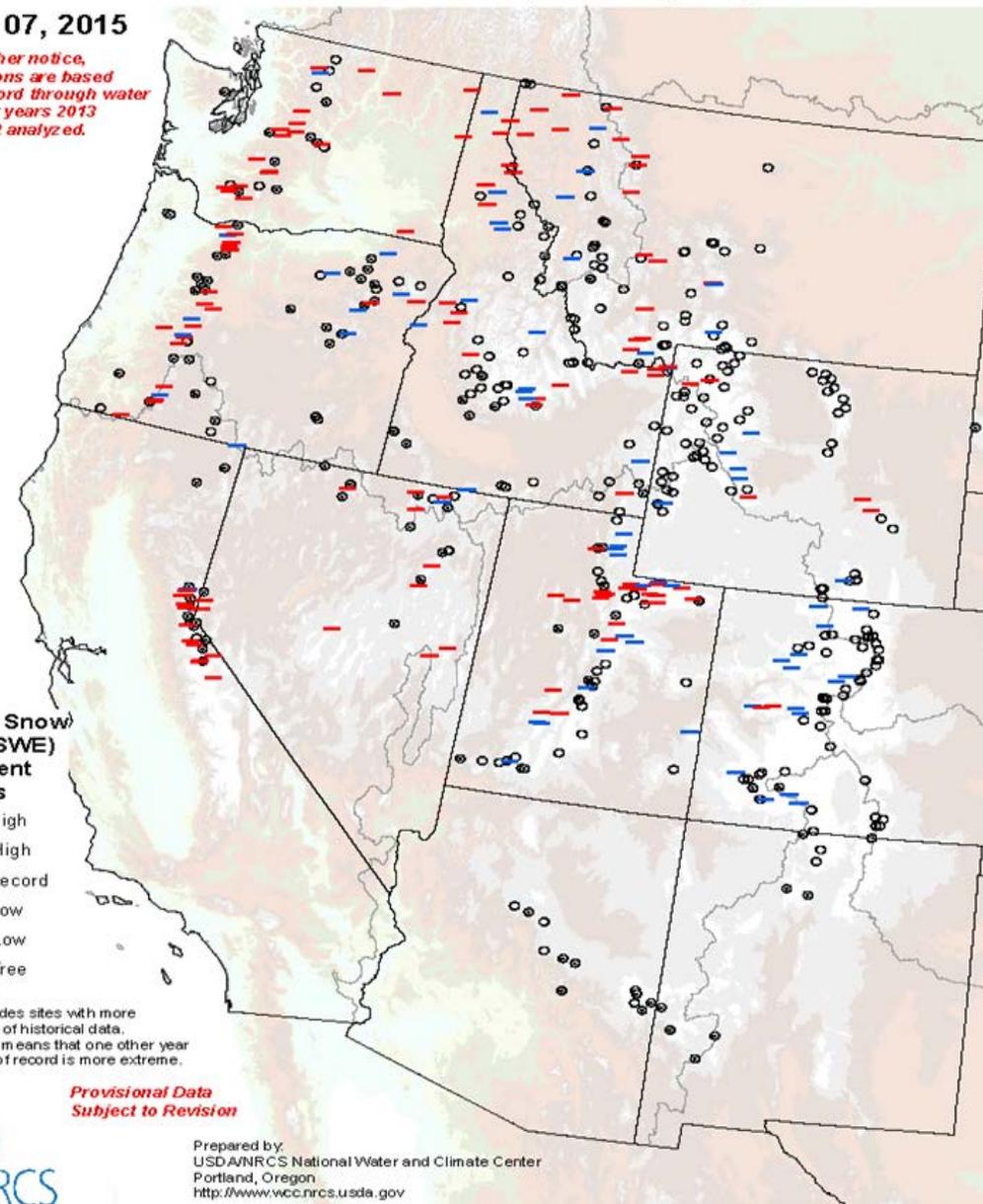
- Red cross: New High
- Blue cross: Near High
- Black circle: Non-Record
- Red dash: New Low
- Blue dash: Near Low
- Black circle with dot: snow free

Analysis includes sites with more than 20 years of historical data. "Near" record means that one other year of the period of record is more extreme.



Provisional Data Subject to Revision

Prepared by:
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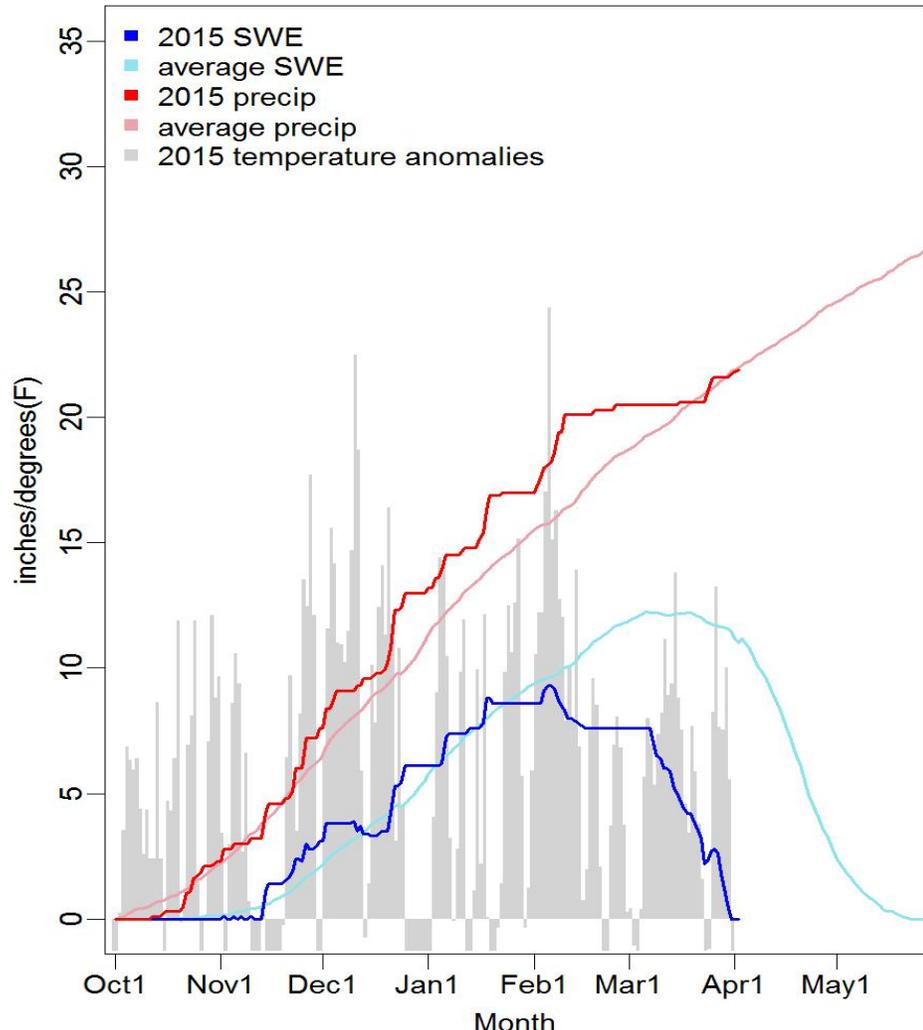
Idaho --- Mean temperature departure & precipitation falling normal Nov 1 – Mar 31:

Graham Guard: + 4.9 F

Normally 75% precip falls as snow

2015 60% fell as snow

Graham Guard SNOTEL, 5690ft

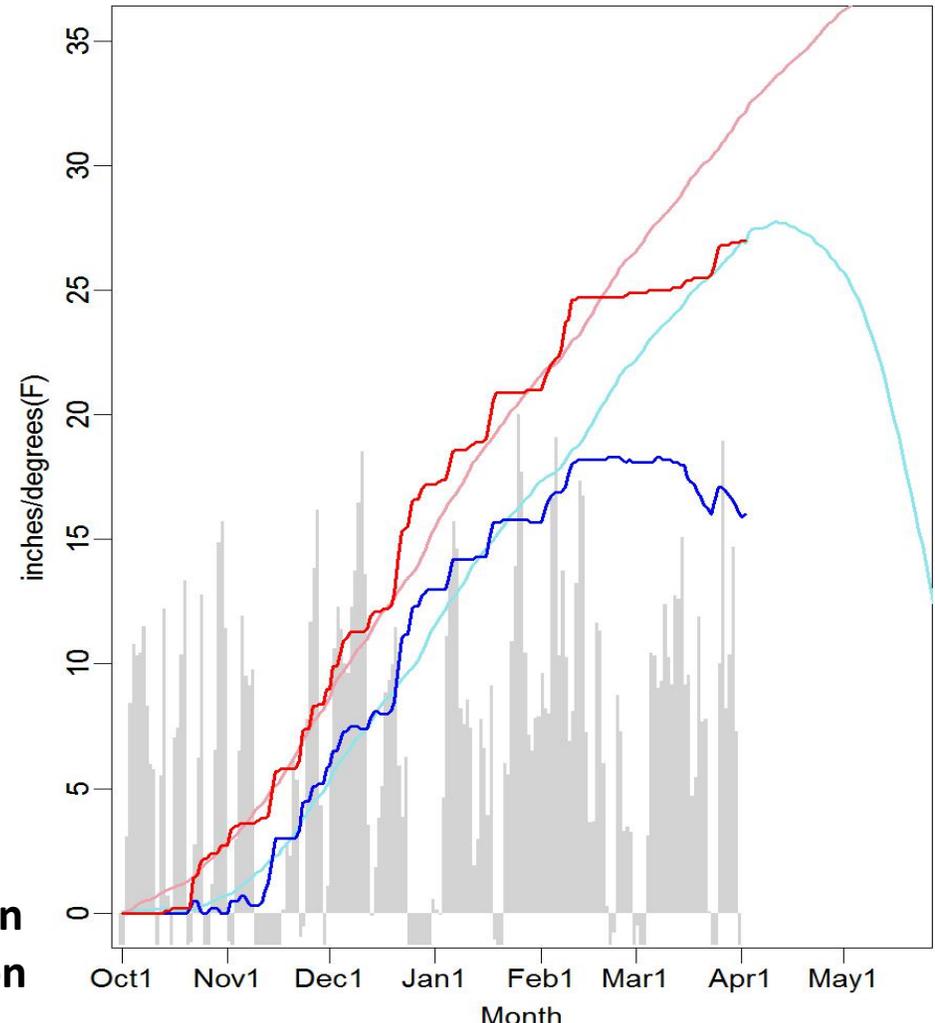


Jackson Peak: + 5.1 F

Normally 92% precip falls as snow

2015 84% fell as snow

Jackson Peak SNOTEL, 7070ft



From USFS
Rocky Mountain
Research Station

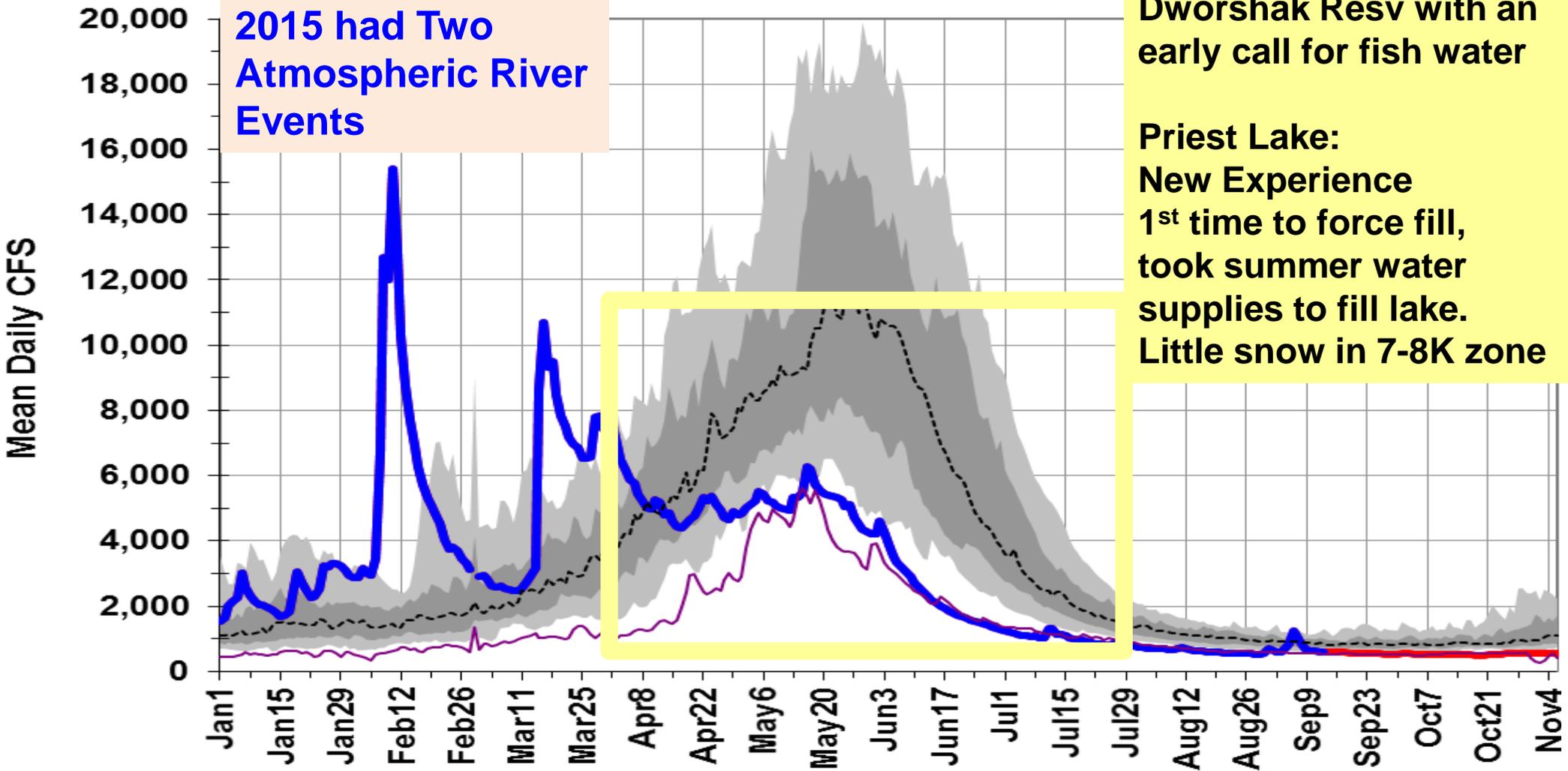


13340600 id: nf clearwater river nr canyon

Challenges: filling Dworshak Resv with an early call for fish water



- 10-25-75-90
- Norm75
- Norm25
- Norm10
- Estimated
- SimilarYr
- Last Yr
- Projected
- Current
- Median



2015 had Two Atmospheric River Events

Priest Lake: New Experience 1st time to force fill, took summer water supplies to fill lake. Little snow in 7-8K zone

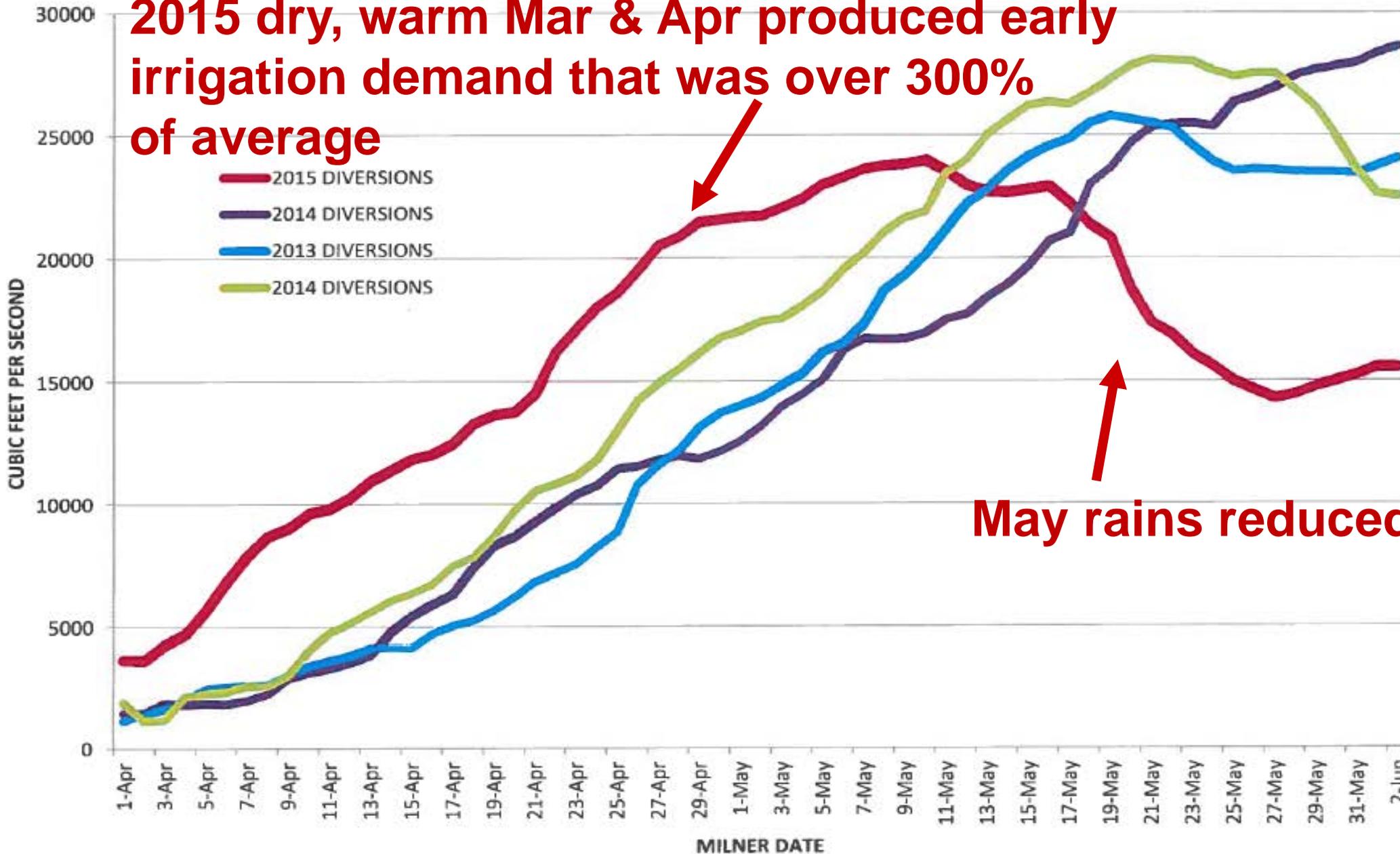
Dworshak Inflow in Thousands of Acre-Feet for Water Year 2015

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
76	169	256	266	586	569	455	429	162	41	30	17

2015 monthly volumes peaked in Feb & Mar instead of May & Jun

2012, 2013, 2014, & 2015 TOTAL DIVERSION COMPARISON

2015 dry, warm Mar & Apr produced early irrigation demand that was over 300% of average

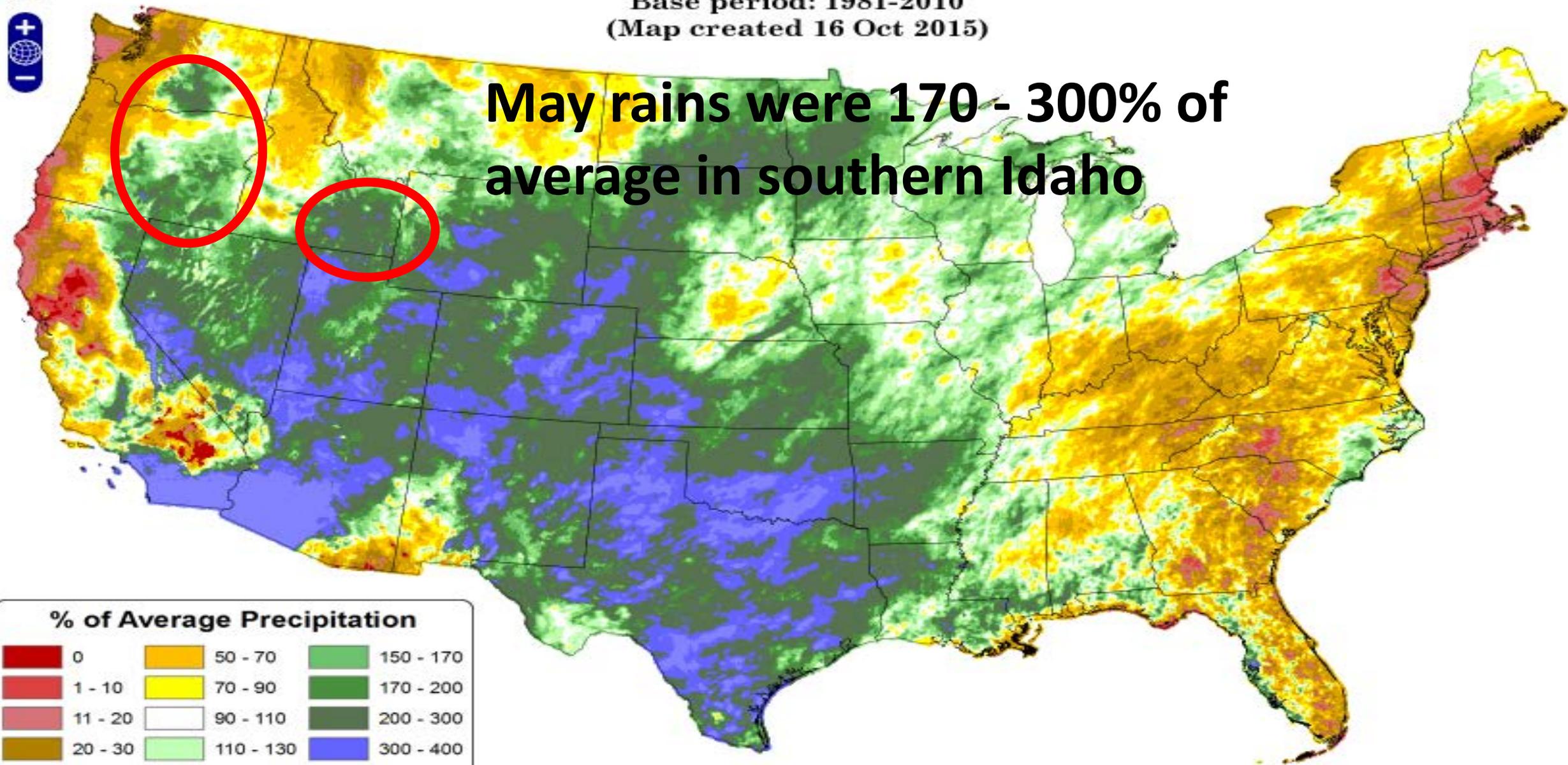


May rains reduced demand



Total Precipitation Anomaly: May 2015
Period ending 7 AM EST 31 May 2015
Base period: 1981-2010
(Map created 16 Oct 2015)

May rains were 170 - 300% of average in southern Idaho



% of Average Precipitation		
0	50 - 70	150 - 170
1 - 10	70 - 90	170 - 200
11 - 20	90 - 110	200 - 300
20 - 30	110 - 130	300 - 400
30 - 50	130 - 150	> 400

Benefits of May Rains for One Farmer in South Central Idaho

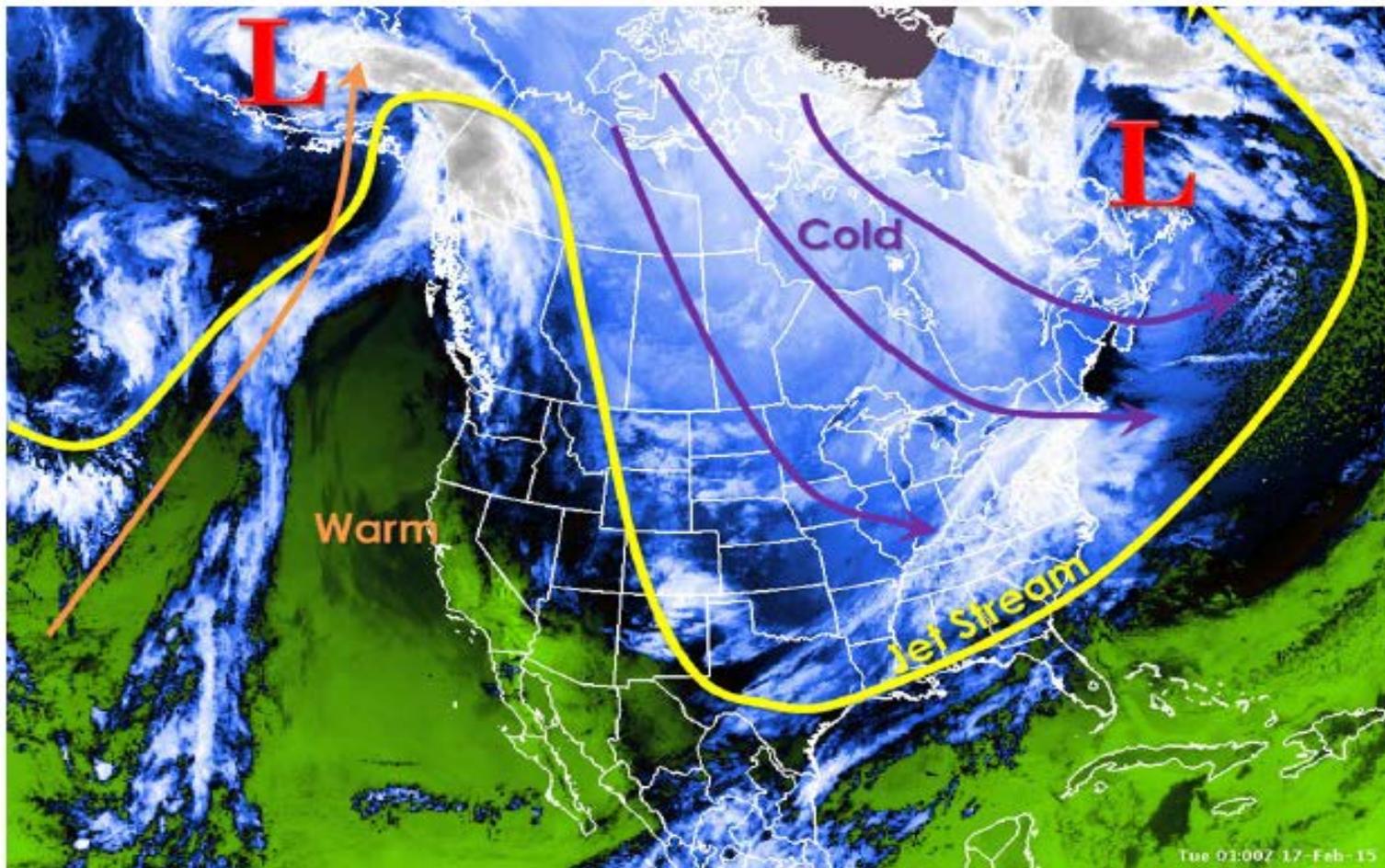
Fish Creek – Small Reservoir – Water Allotment was 12% of normal

**May rains provided additional moisture for growing
and cuttings of Organic Feed**

Brought in \$100K for One Producer

Water Allotment was kept at 12%





NWS Example of weather pattern for 2015 & 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.

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 3/2/2015

(white regions indicate sea-ice)

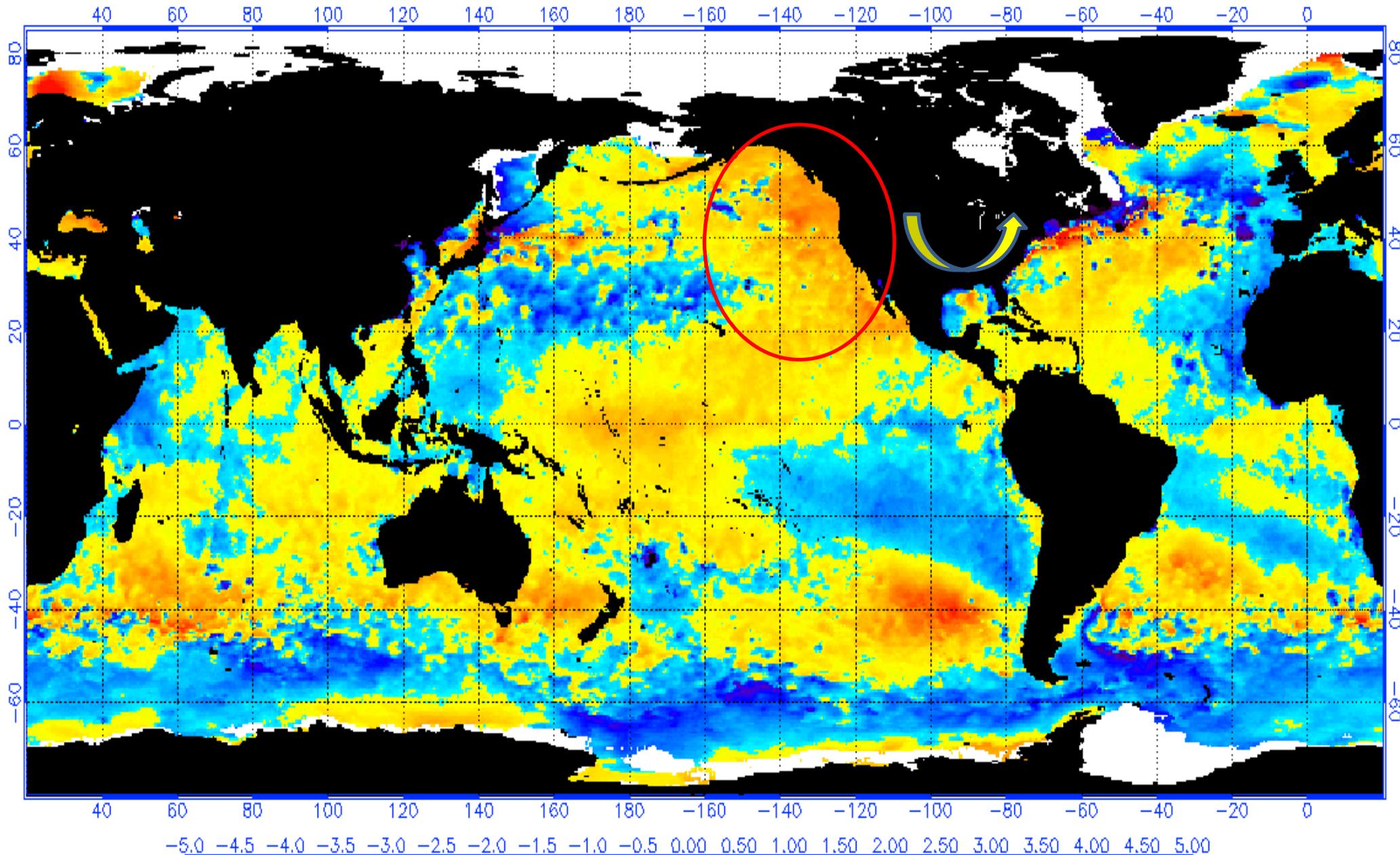
March 2, 2015

Winter 2014-15

ENSO Ocean Conditions:

- Neutral to slight El Nino

-- Warm Pacific Decadal Oscillation (PDO)

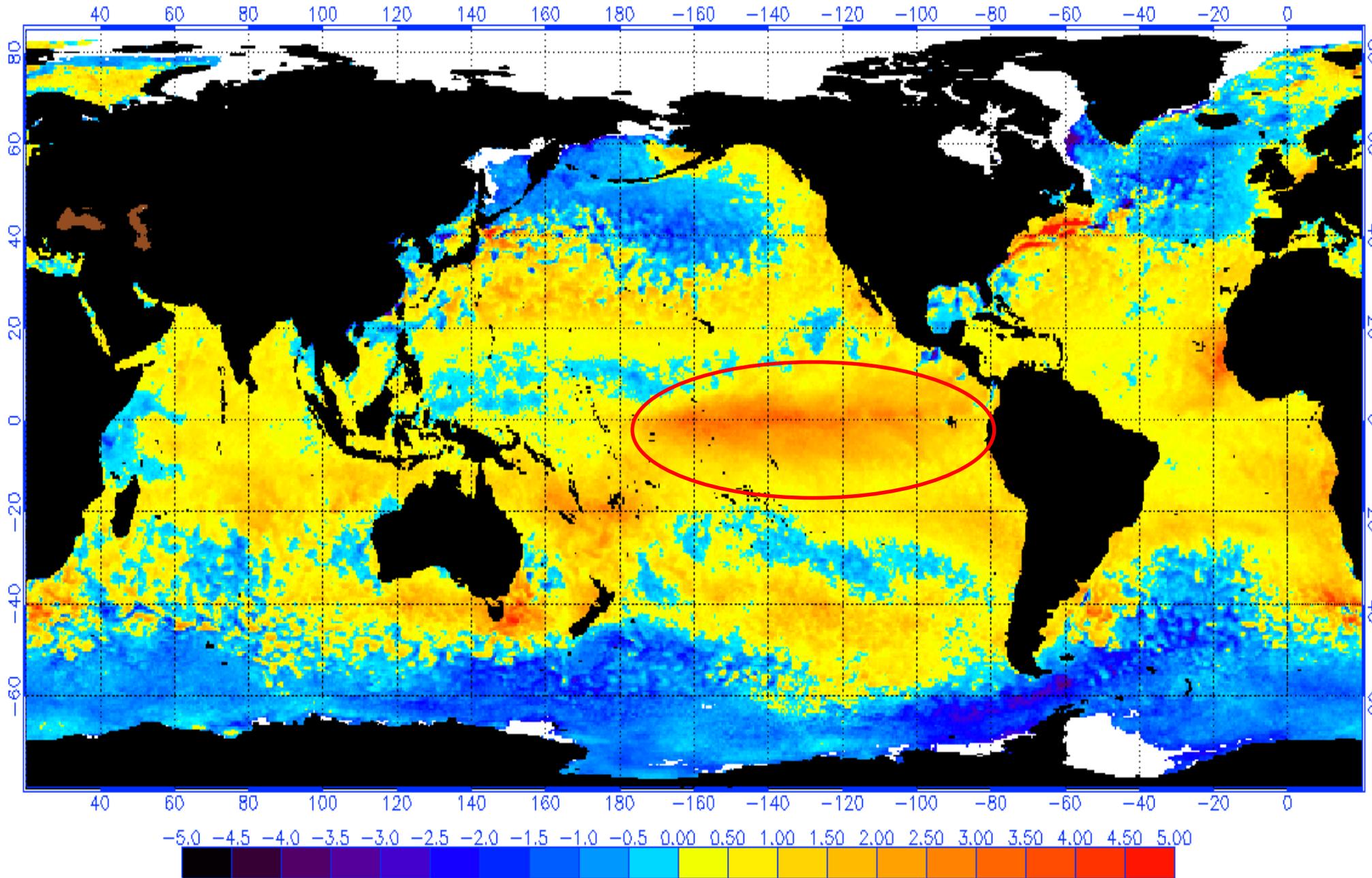


NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 2/11/2016
(white regions indicate sea-ice)

February 11, 2016

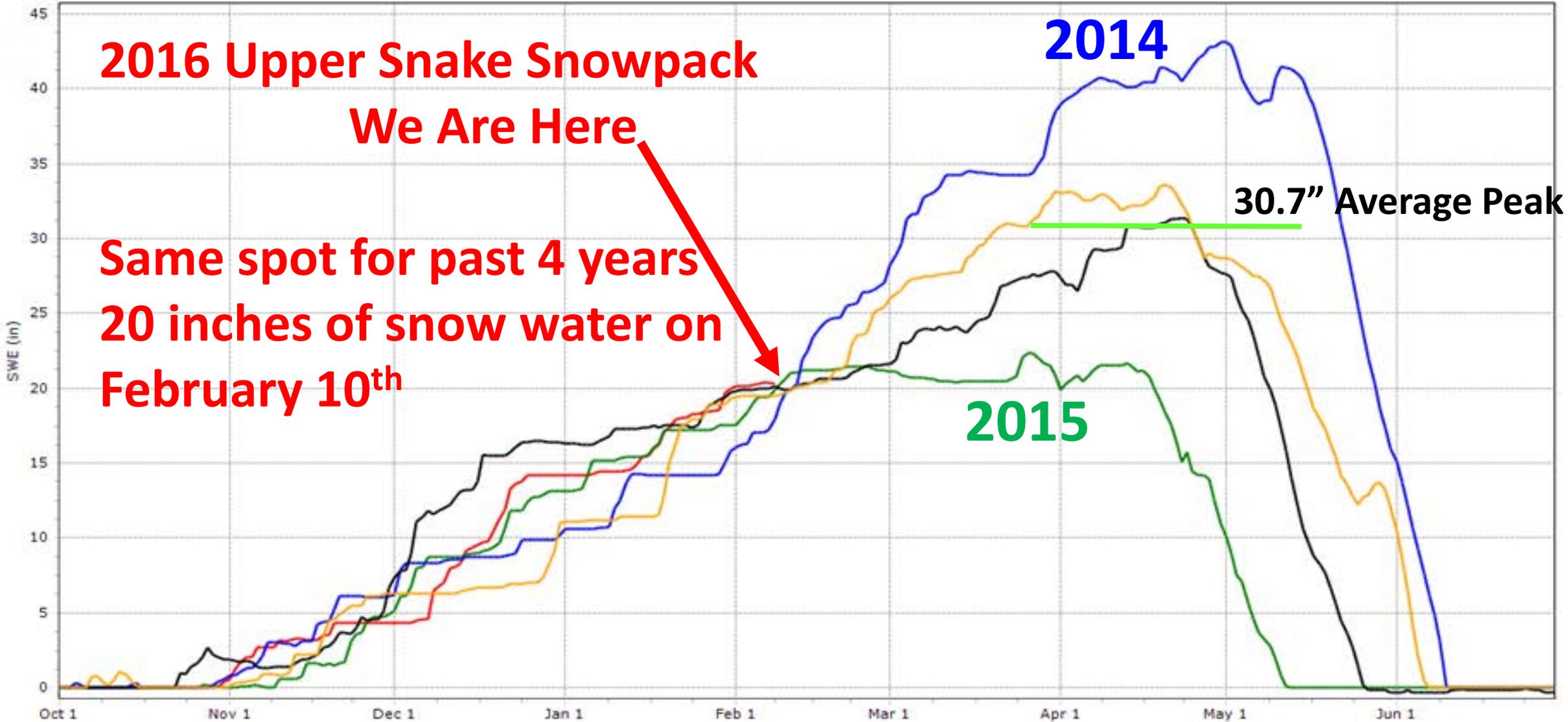
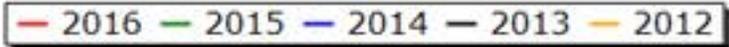
Winter 2015-16

ENSO Ocean
Conditions:
– Strong El Nino
Neutral



LEWIS LAKE DIVIDE

(Elevation: 7,850 ft)



2016 Upper Snake Snowpack

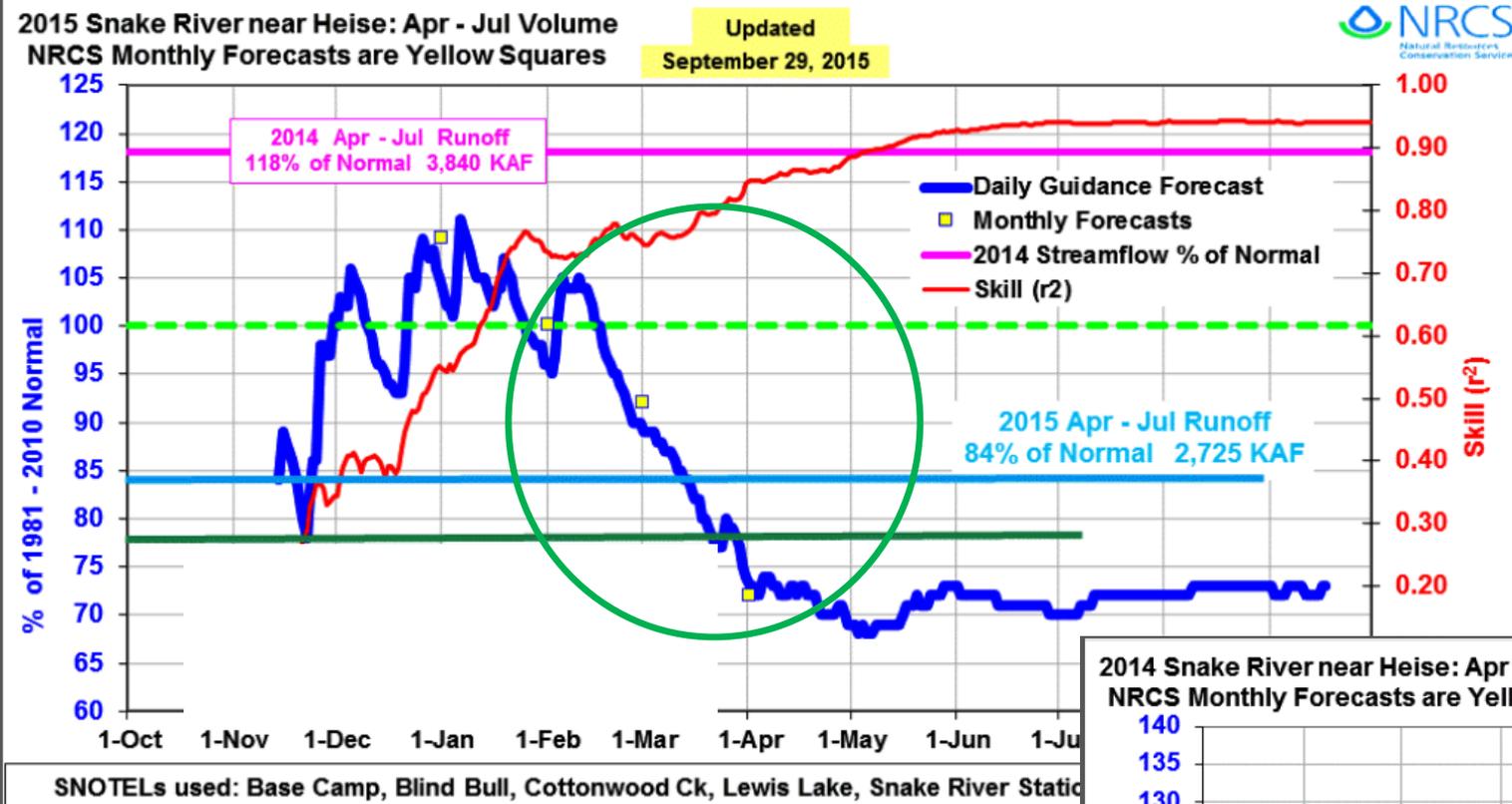
We Are Here

**Same spot for past 4 years
20 inches of snow water on
February 10th**

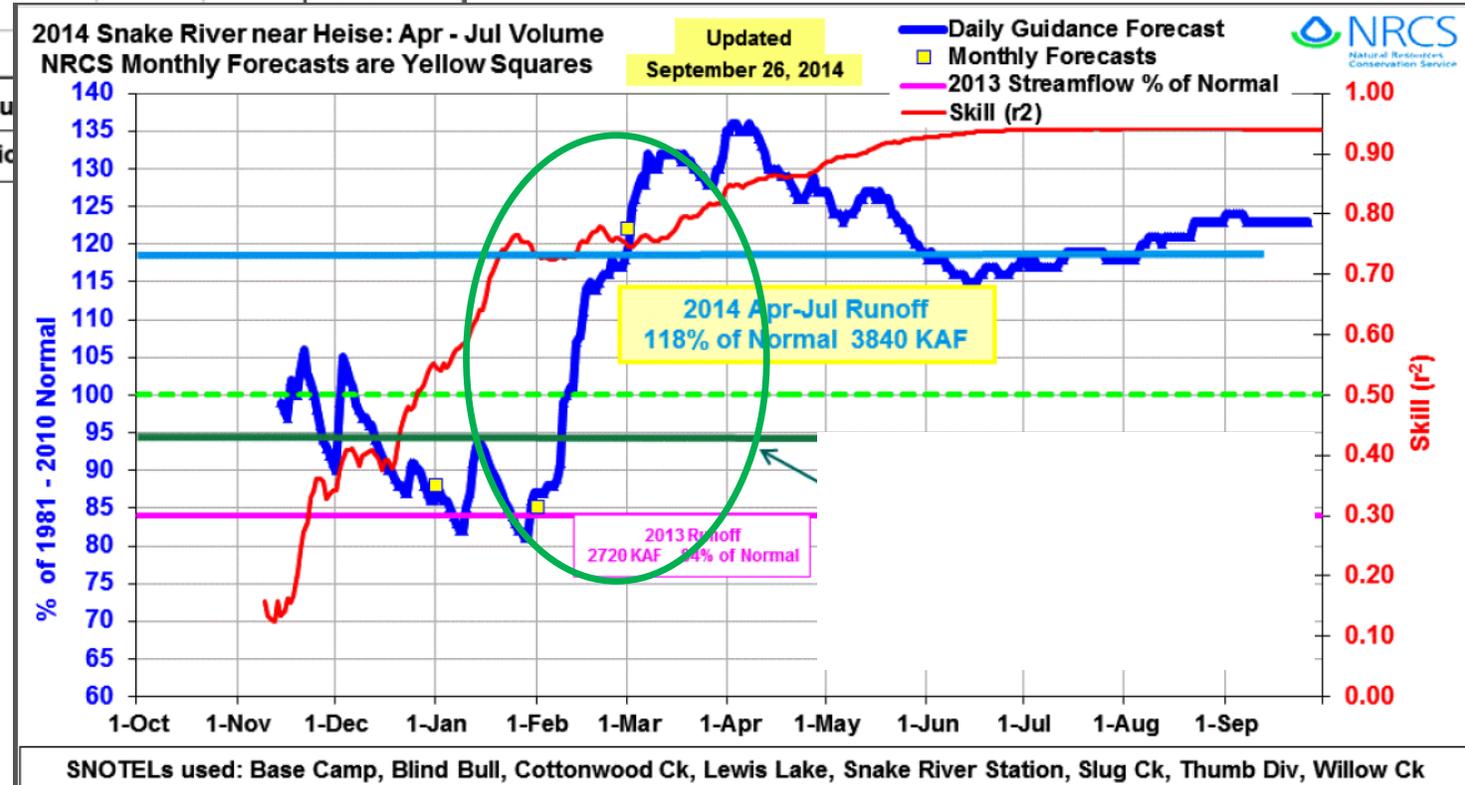
2014

2015

30.7" Average Peak



2015 Warm Pacific
 Ocean temperatures
 created western high
 pressure ridge

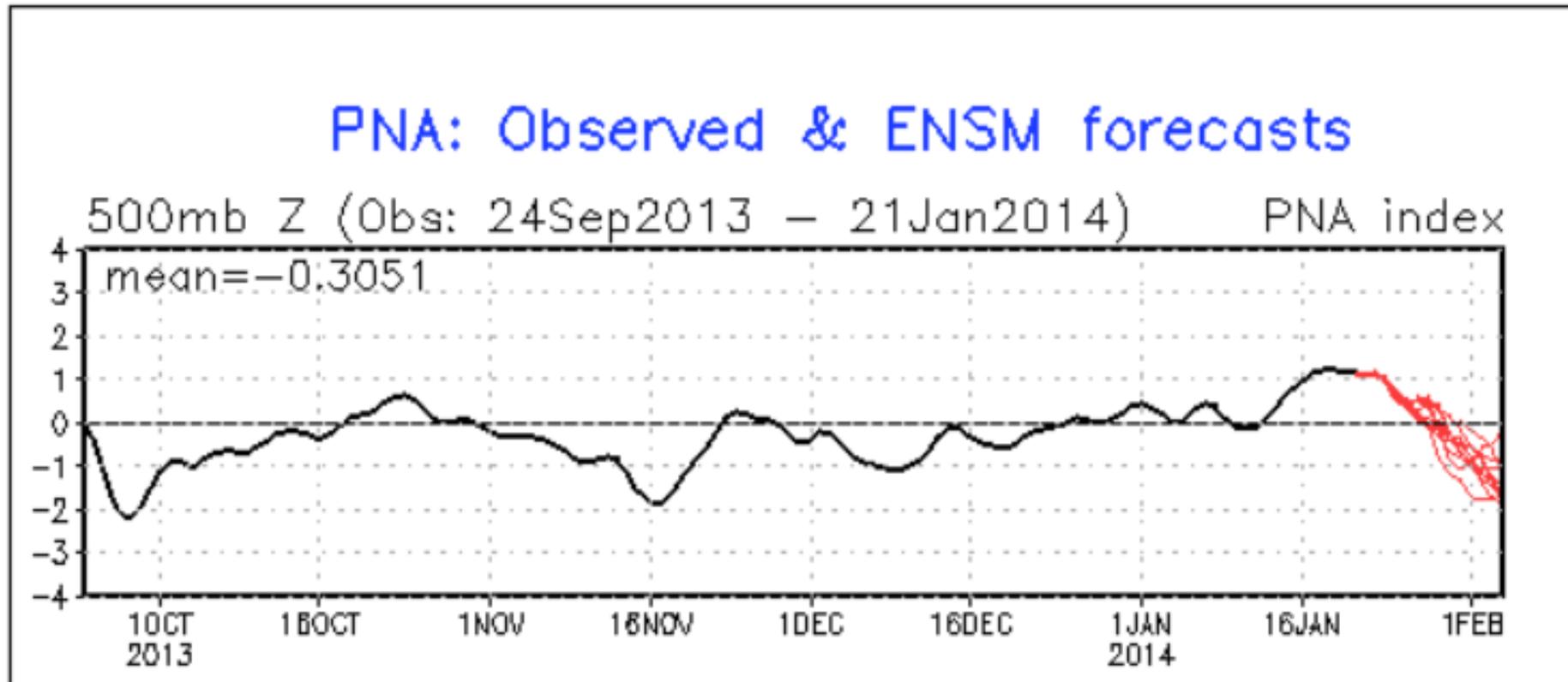


2014
 PNA went negative from
 Feb - May impacting our
 weather by bringing more
 moisture into Idaho

From January 21, 2014 – USDA Meteorologist – Jan Curtis

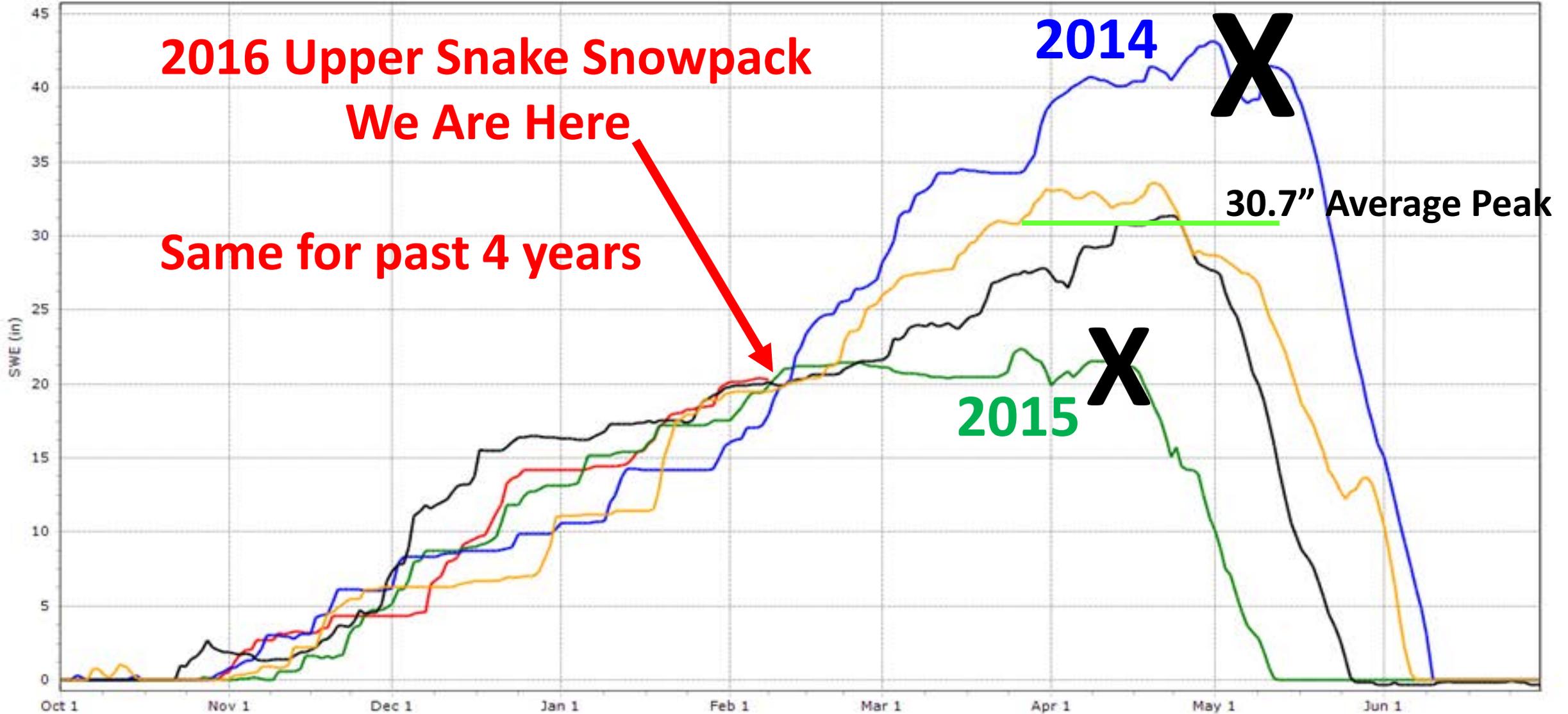
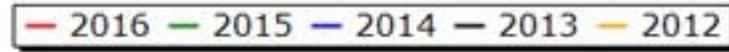
The PNA is getting interestingly negative:

Pacific North American Index is one parameter (index) that helps for moisture in the Pacific NW but there are others that are needed too.



LEWIS LAKE DIVIDE

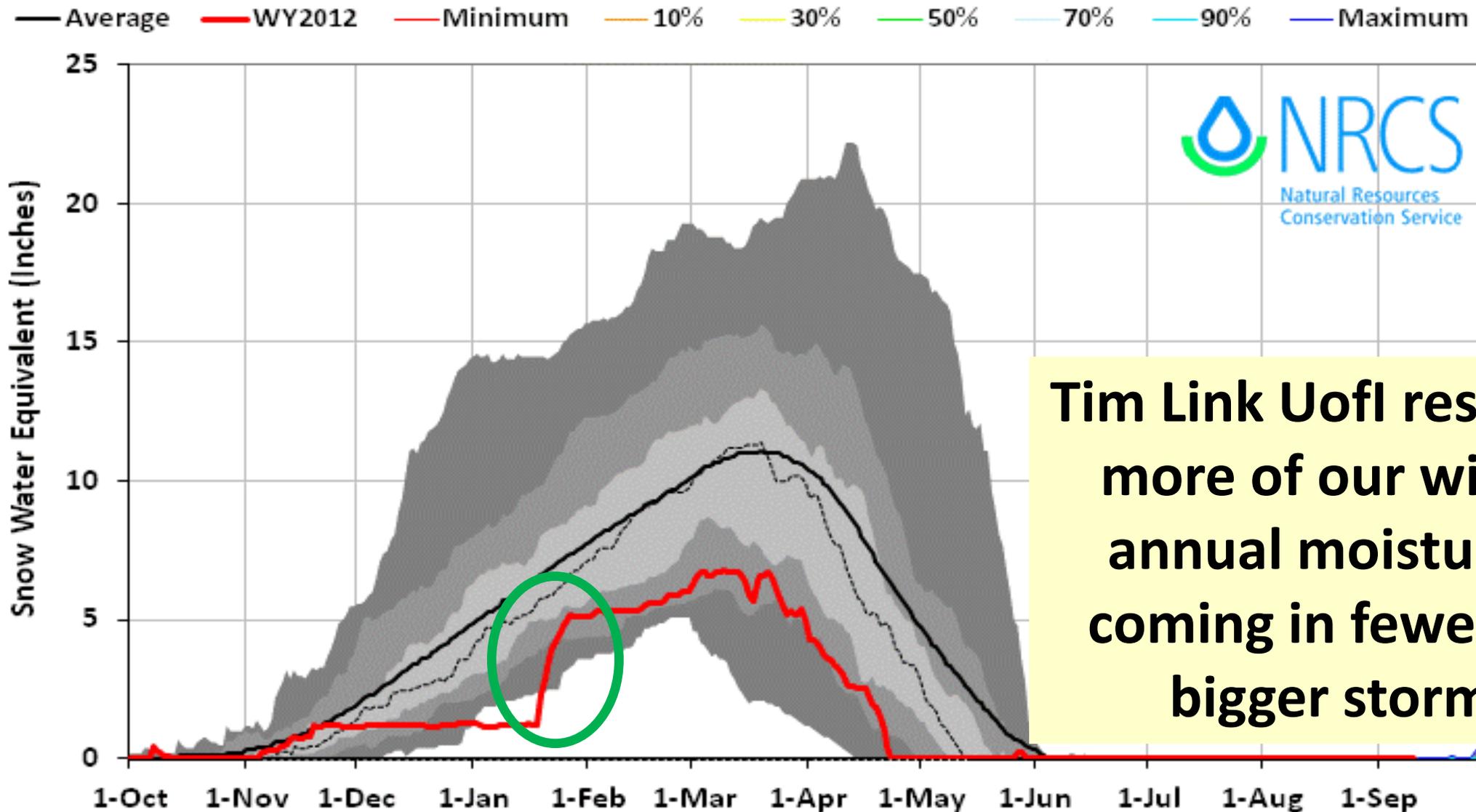
(Elevation: 7,850 ft)



2012 Owyhee Basin 7 Station Snow Index at record low levels

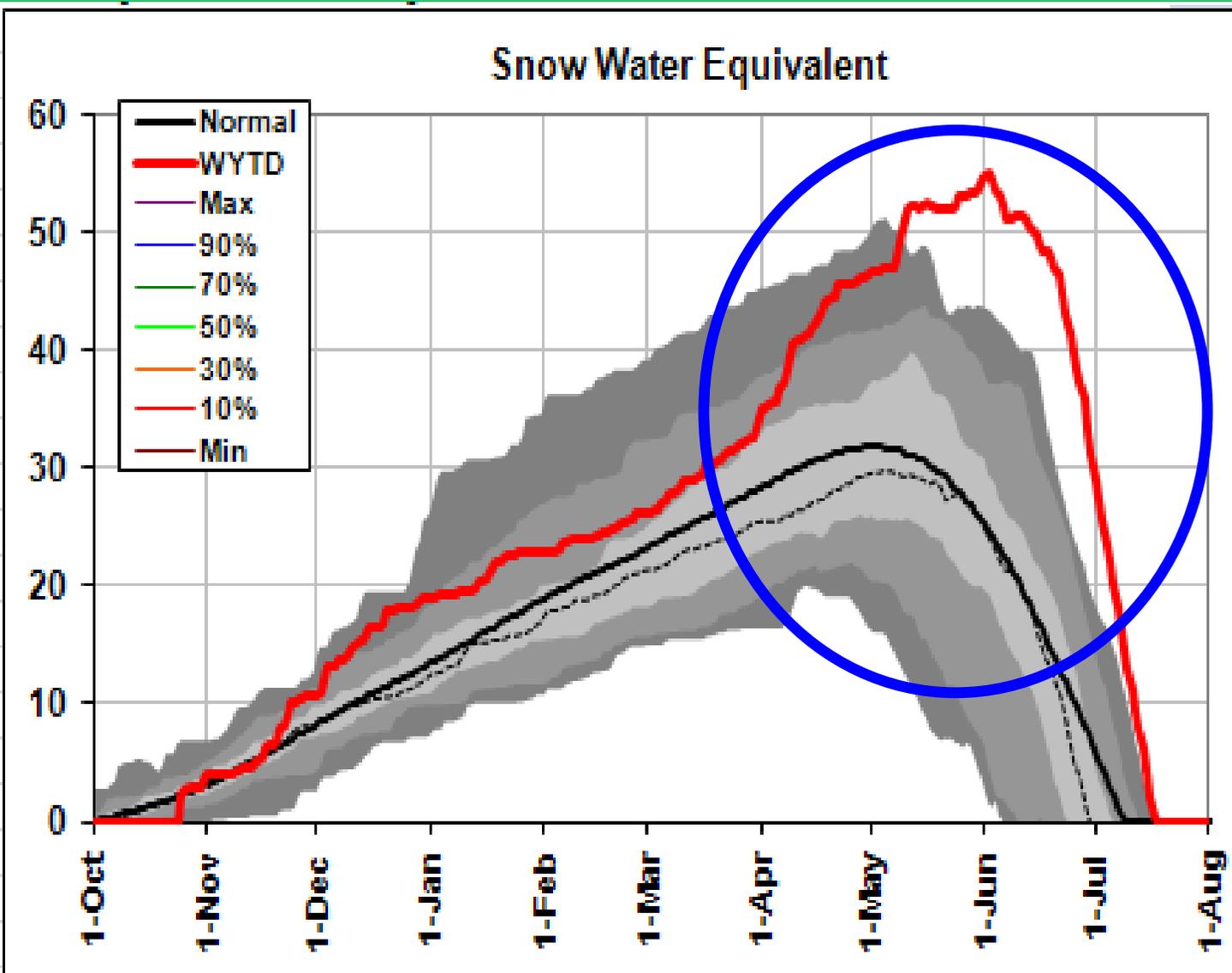
Owyhee Basin 2012 Snow Water with Non-Exceedence Projections (7 sites)

Based on Provisional SNOTEL data as of Sep 10, 2012



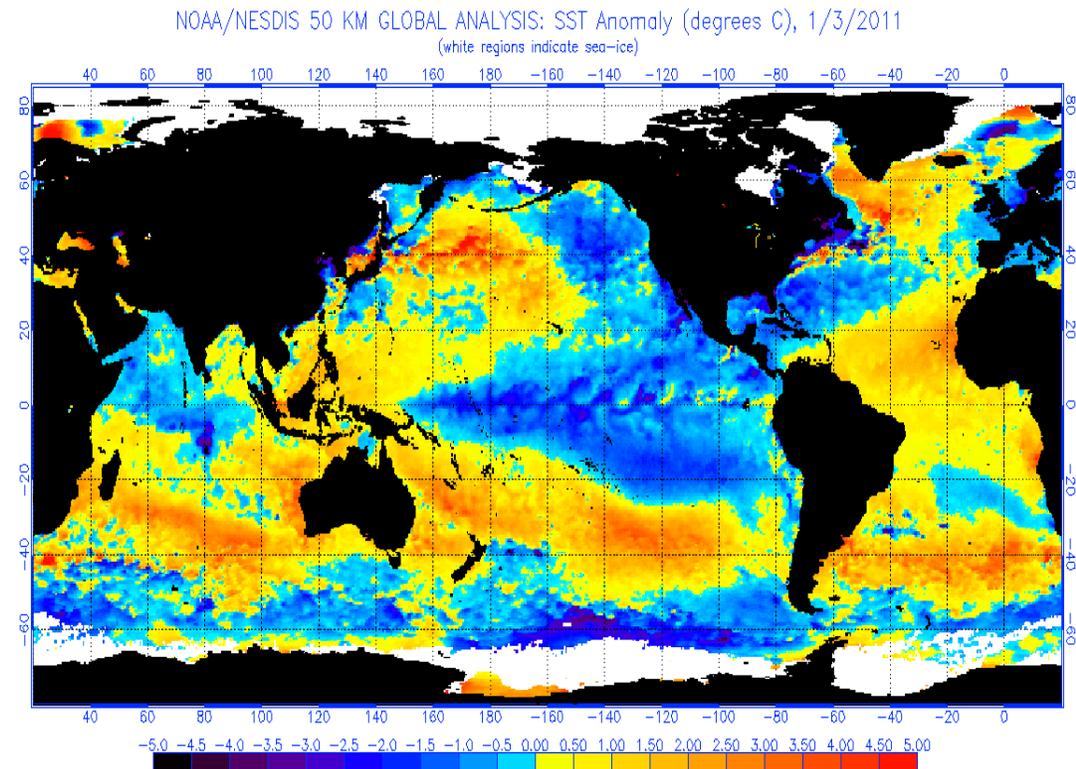
**Tim Link Uofl research:
more of our winter
annual moisture is
coming in fewer but
bigger storms**

2011: Snow Water Equivalent at Two Ocean Plateau SNOTEL Site Yellowstone N.P. Elev. 9,240 feet



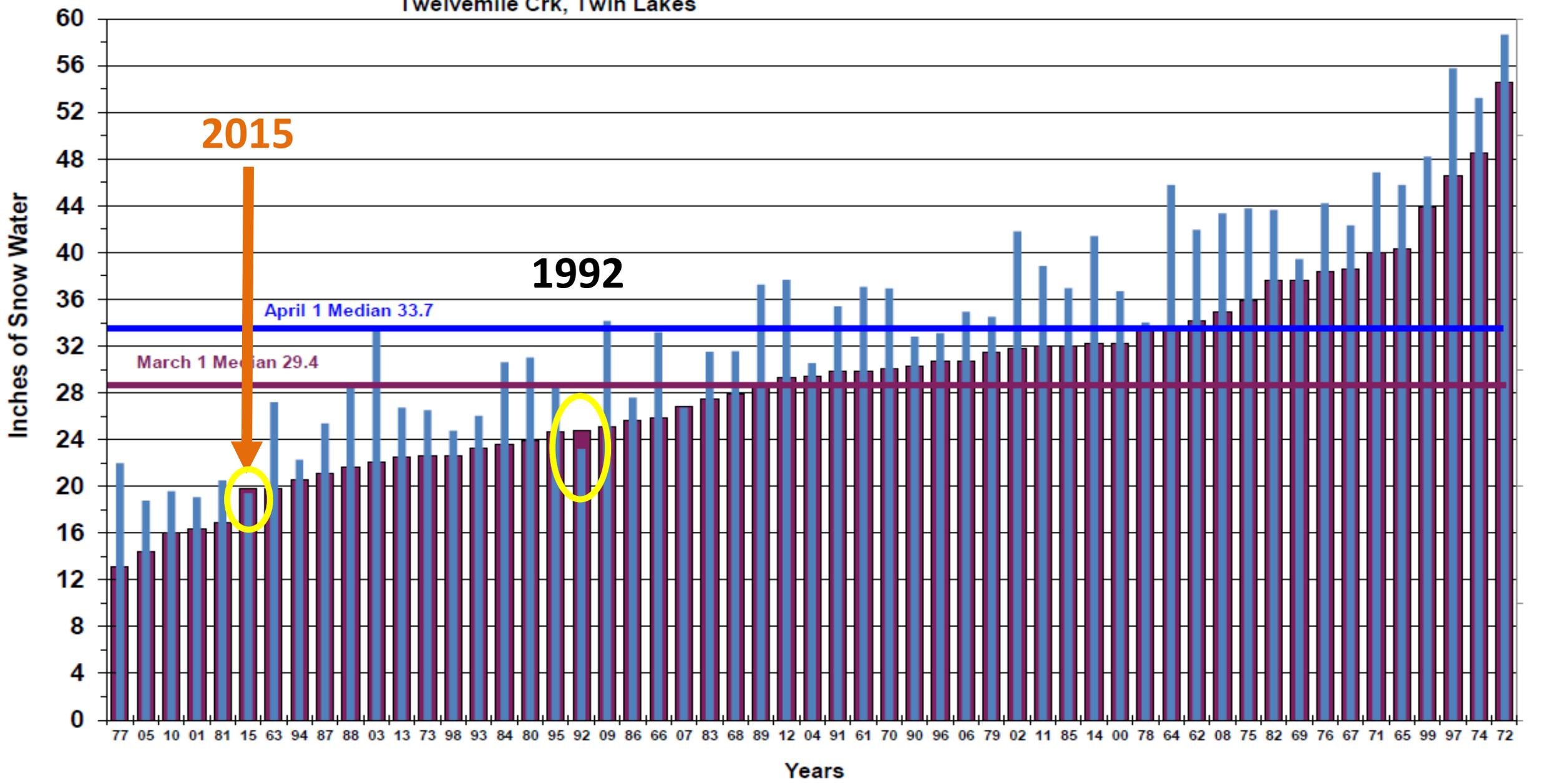
Winter 2010 - 2011 Sea Surface Temperatures

Cool PDO & Strongest La Nina since 1974



March Clearwater Basin 13 Station Snow Index for Years 1961 - 2015
 Cool Creek, Crater Meadows, Elk Butte, Hemlock Butte, Hoodoo Basin, Lolo Pass,
 Lost Lake, Nez Perce Camp, Savage Pass, Shanghi Summit, Sherwin,
 Twelvemile Crk, Twin Lakes

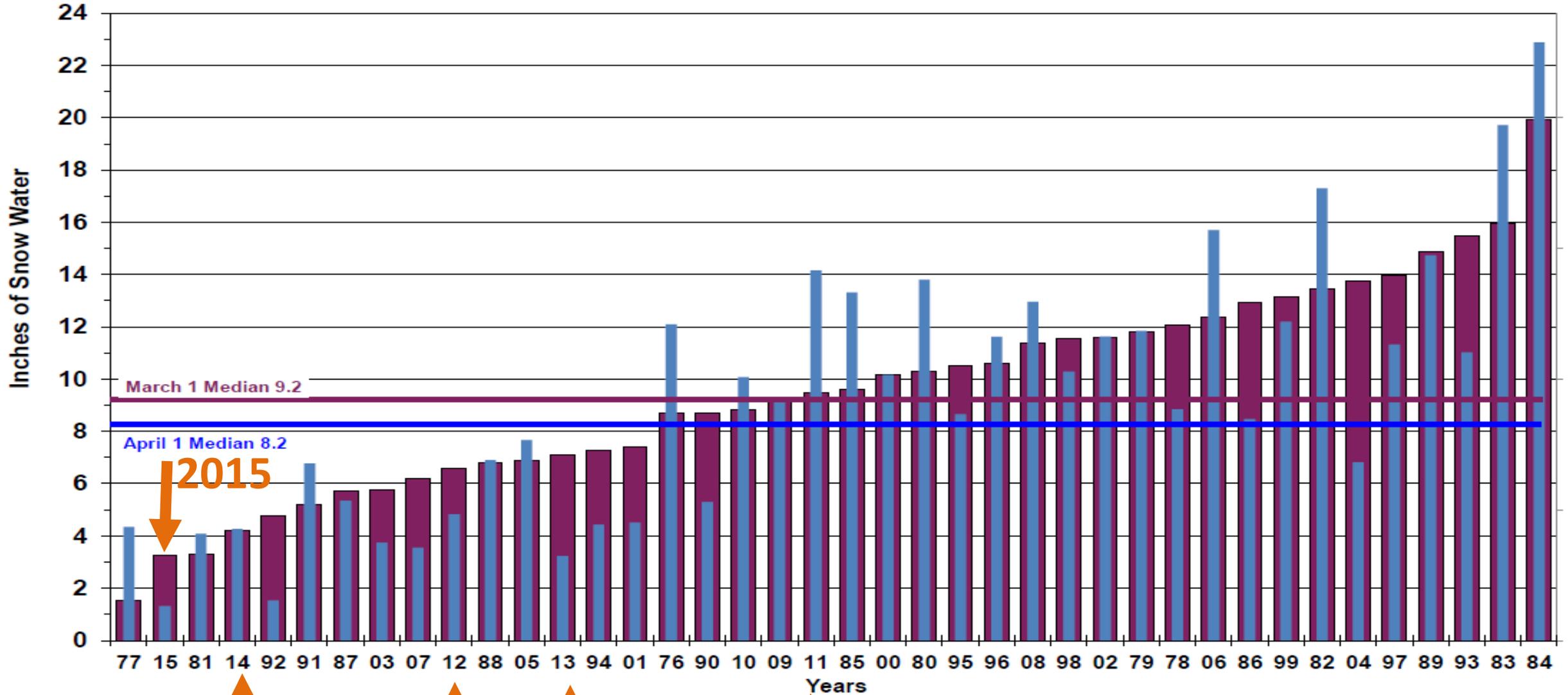
■ March 1 Snow Water
 ■ April 1 Snow Water



March Owyhee Basin 6 Station Snow Index for Years 1976 - 2015
 Big Bend, Jack Creek Upper, Laurel Draw, Mud Flat, South Mtn., Taylor Canyon



■ March 1 Snow Water
 ■ April 1 Snow Water



2015

2014

2012

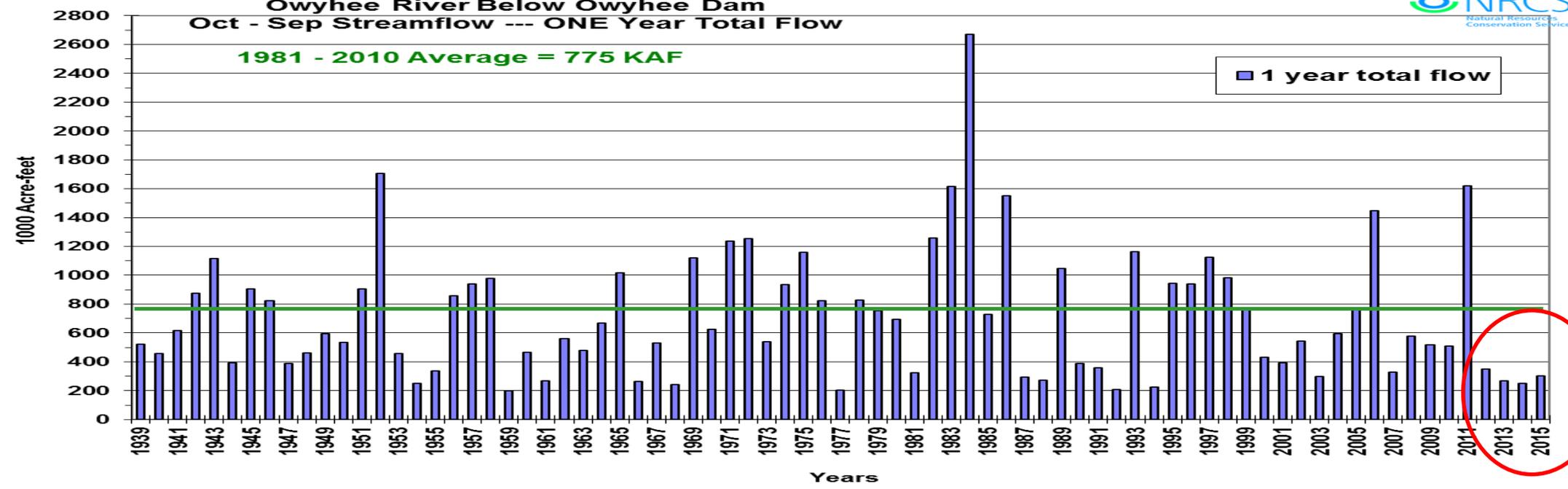
2013

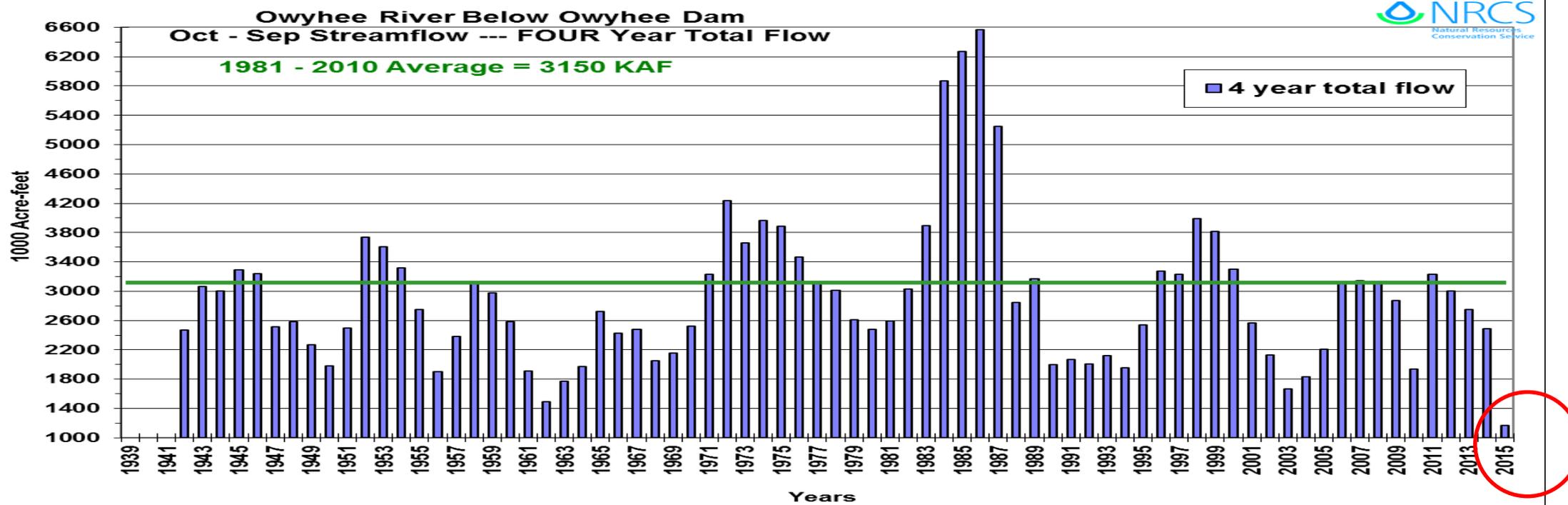
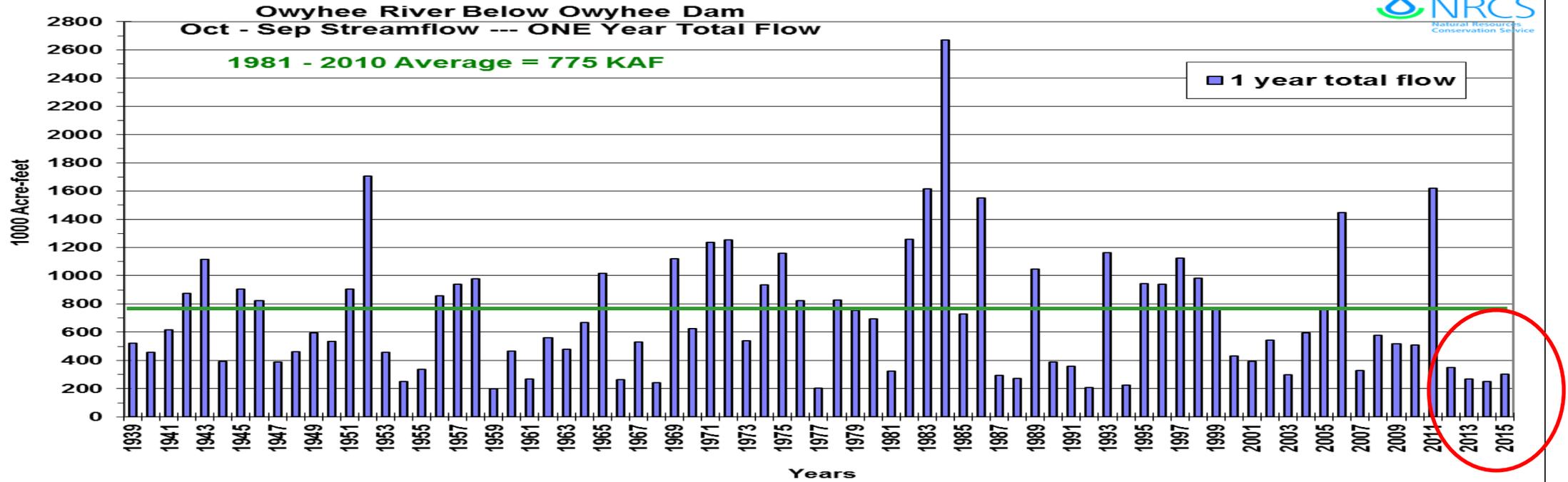
2011

Owyhee River Below Owyhee Dam Oct - Sep Streamflow --- ONE Year Total Flow

1981 - 2010 Average = 775 KAF

1 year total flow





Troy Magney paper – Spatial & Seasonal Changes in Idaho's Max Daily Prec Events: Implications for Ag

Recent Research



Spatial and Seasonal Changes in Idaho's Maximum Daily Precipitation Events

Troy Magney ^{1,2,4}, John Abatzoglou ³, P. Zion Klos ⁴, Jan Eitel ^{1,2}, Lee Vierling ^{1,2}, Von Walden ³

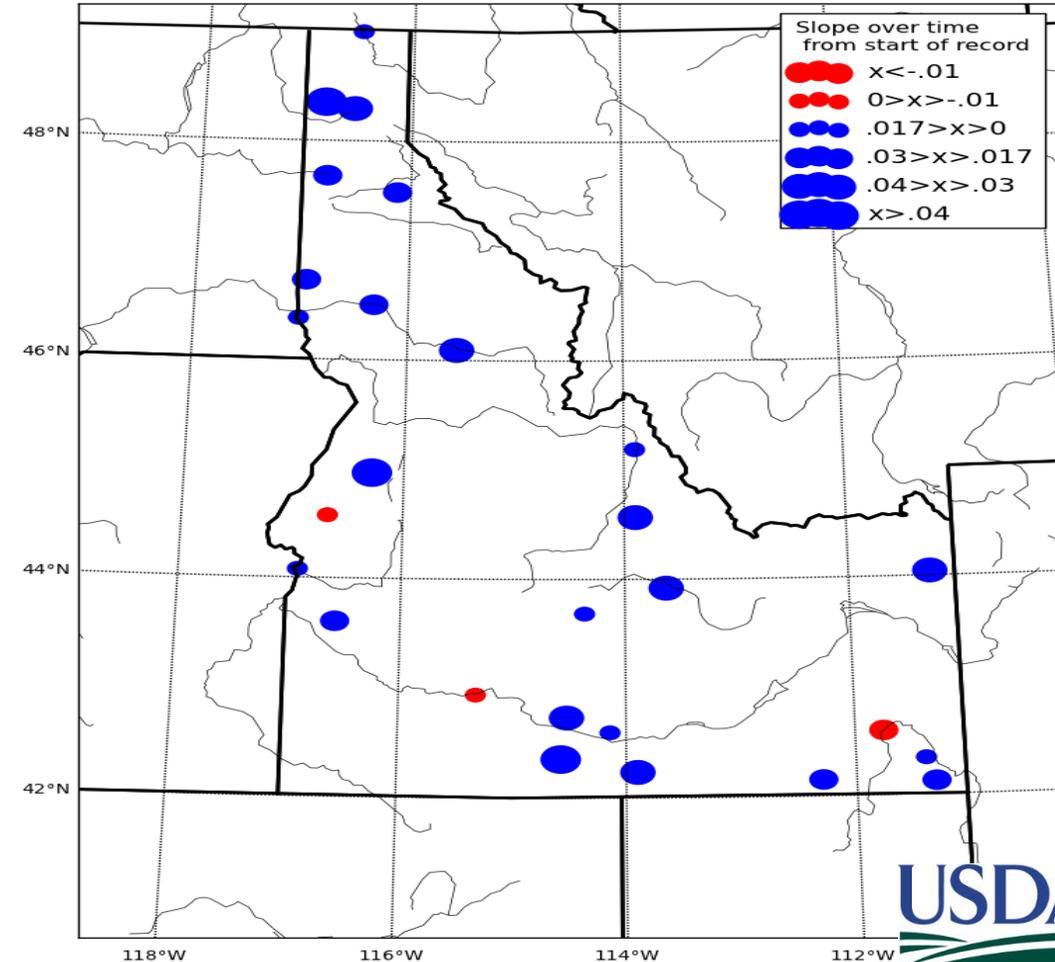


- Observed warming has led to an intensification of the largest precipitation events
- primarily in spring / summer

Impacts on: Ag, design, snowmelt

Use of daily SNOTEL precipitation data in designs

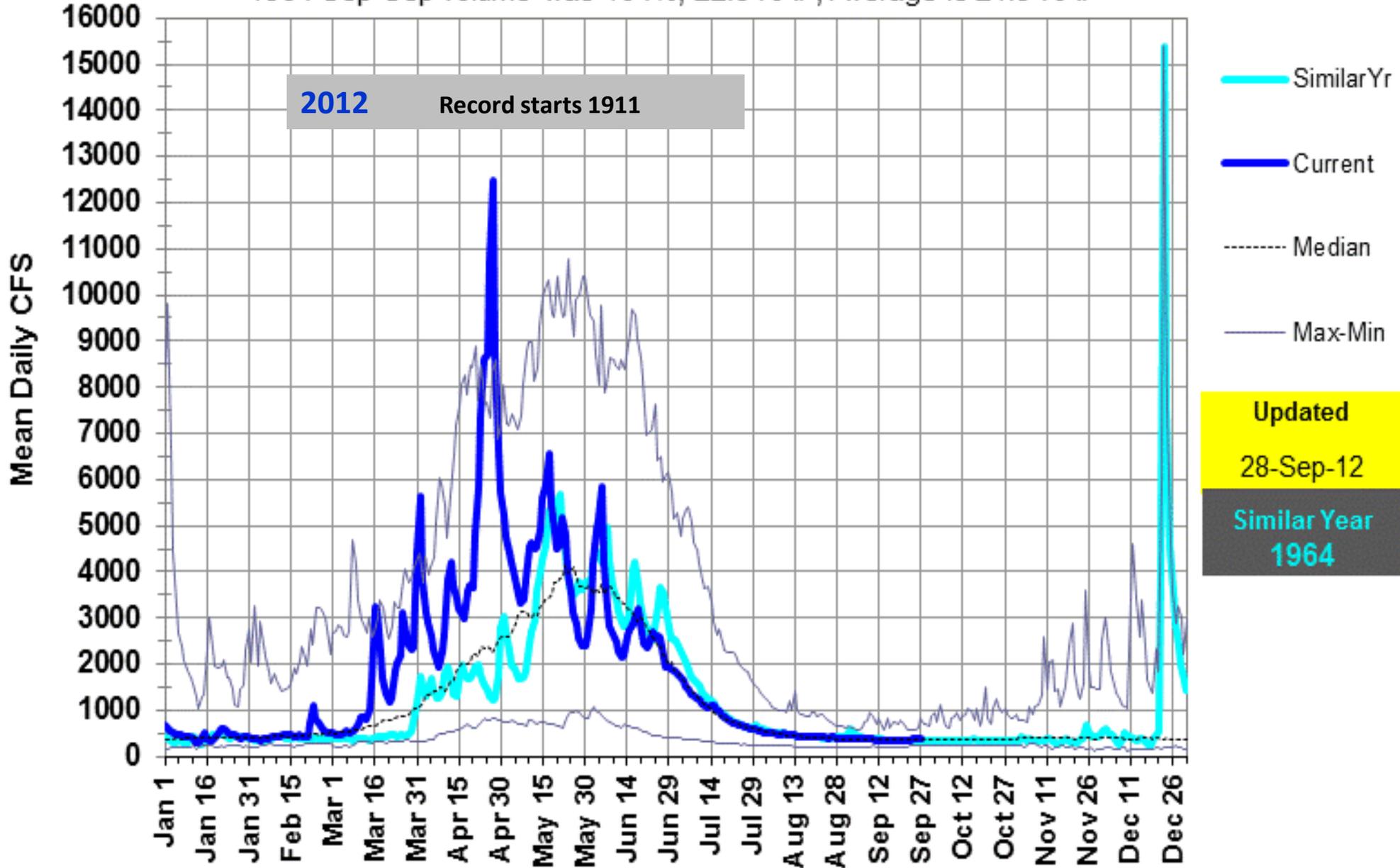
Degree of Change in Extreme Precipitation Events
Idaho: 1895-2012



2012

13185000: Boise R near Twin Springs, ID

1964 Sep-Sep volume was 104%, 22.8 KAF, Average is 21.9 KAF

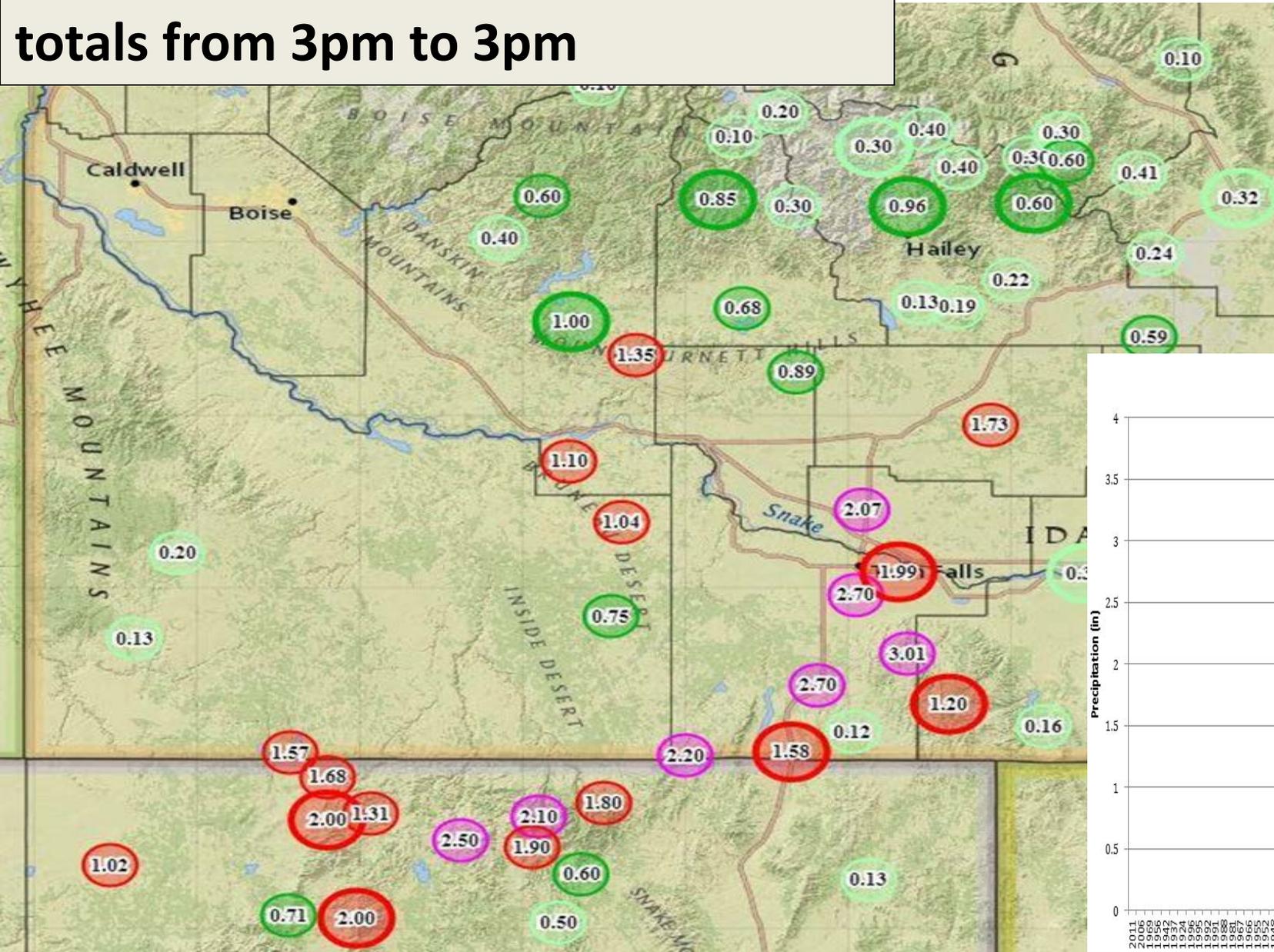


Early April
Record High
Temperatures

Followed by
1-2 Inches of
Rain

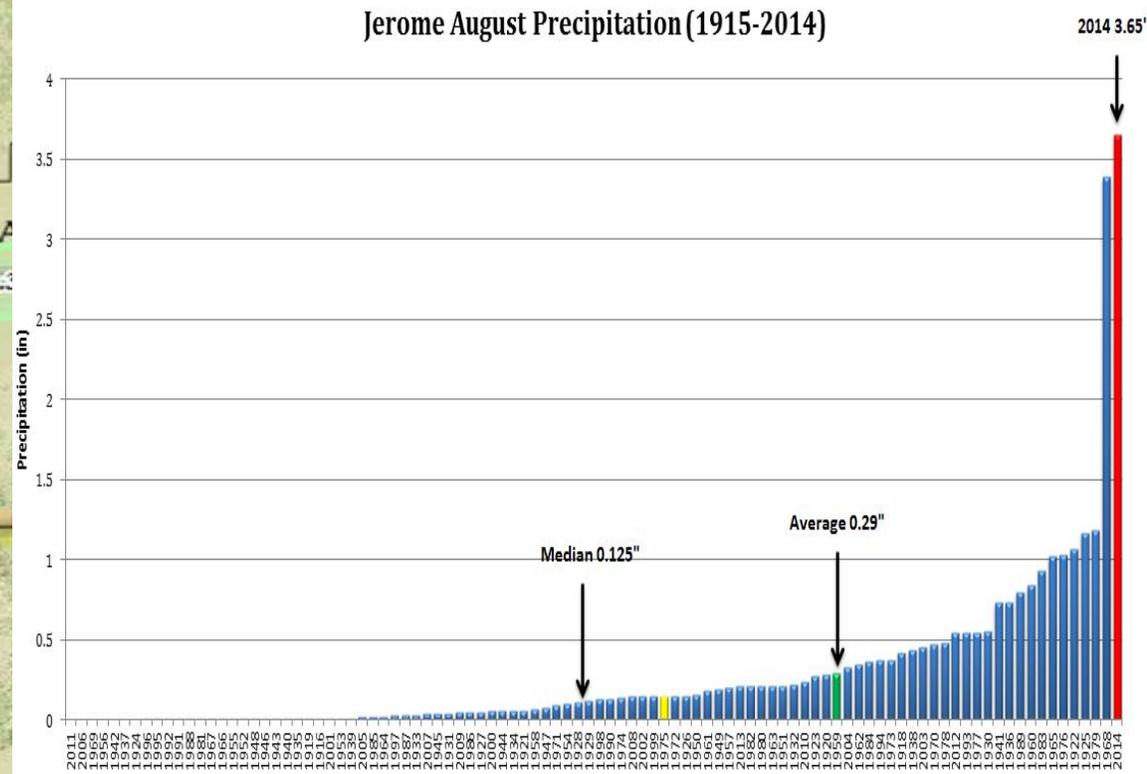
Produced 2nd
Highest Peak
Flow in the 100
Year Record

**August 5 - 6, 2014 from Boise NWS:
Southern Idaho 24 Hour rainfall
totals from 3pm to 3pm**

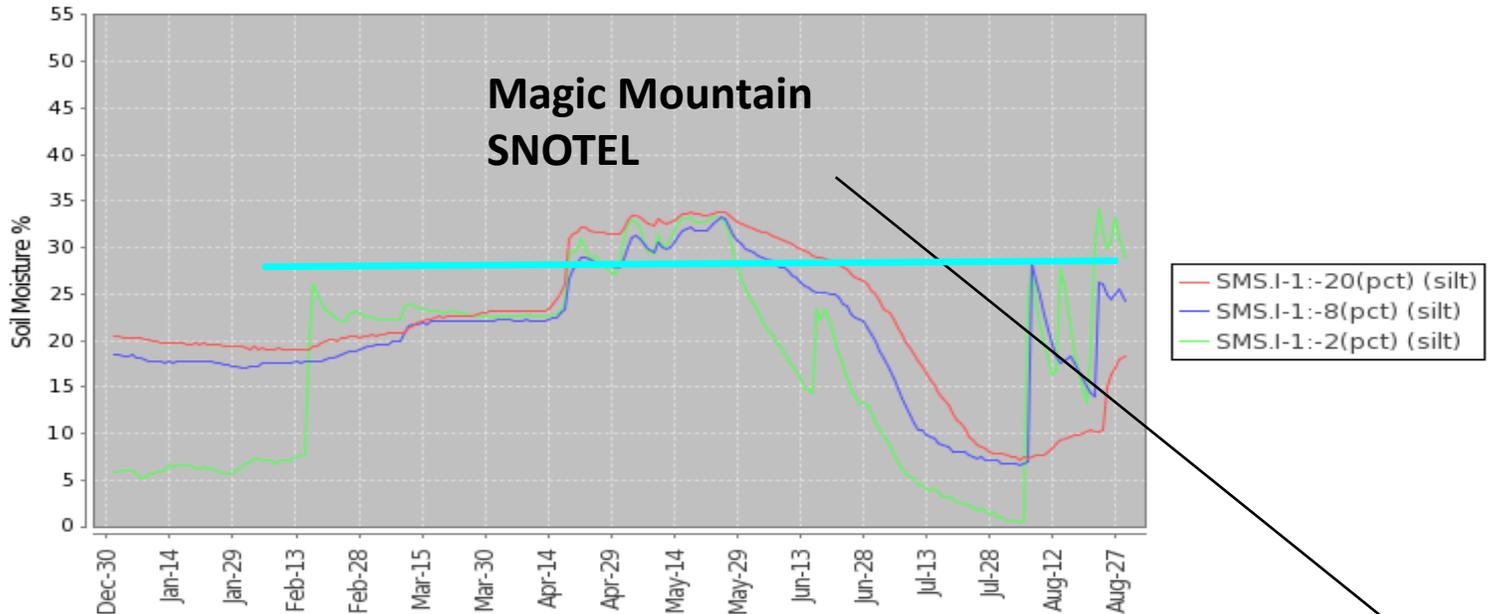


**August 2014
Precipitation
Event brought
5.57" to Twin
Falls**

Jerome August Precipitation (1915-2014)

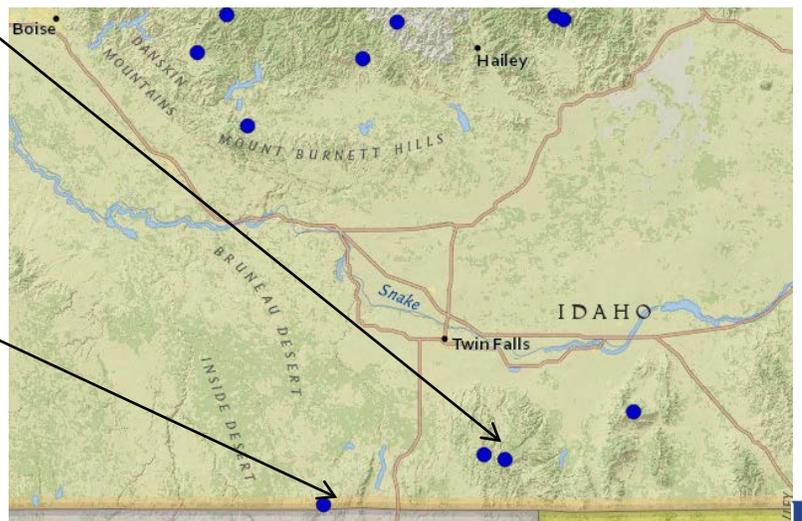
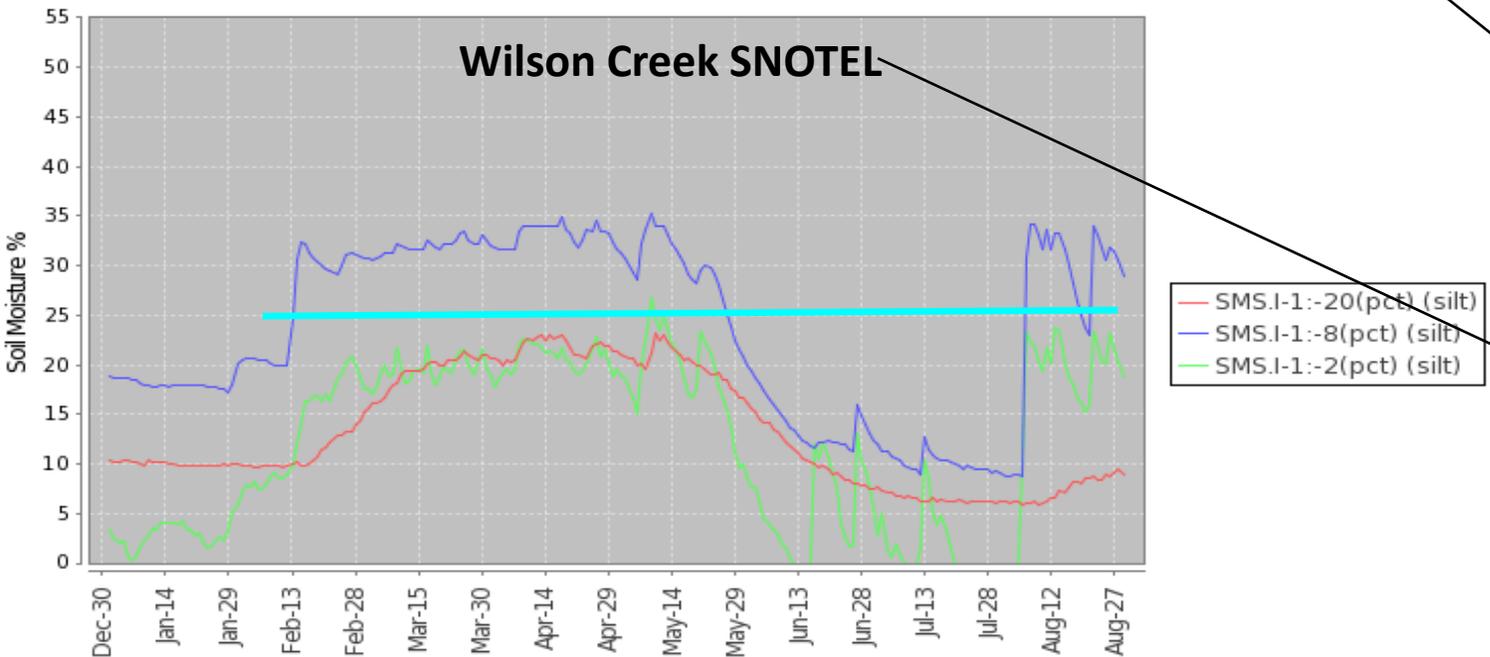


Station (610) YEAR=2014 (Daily) NRCS National Water and Climate Center - Provisional Data - subject to revision Fri Aug 29 12:39:45 PDT 2014

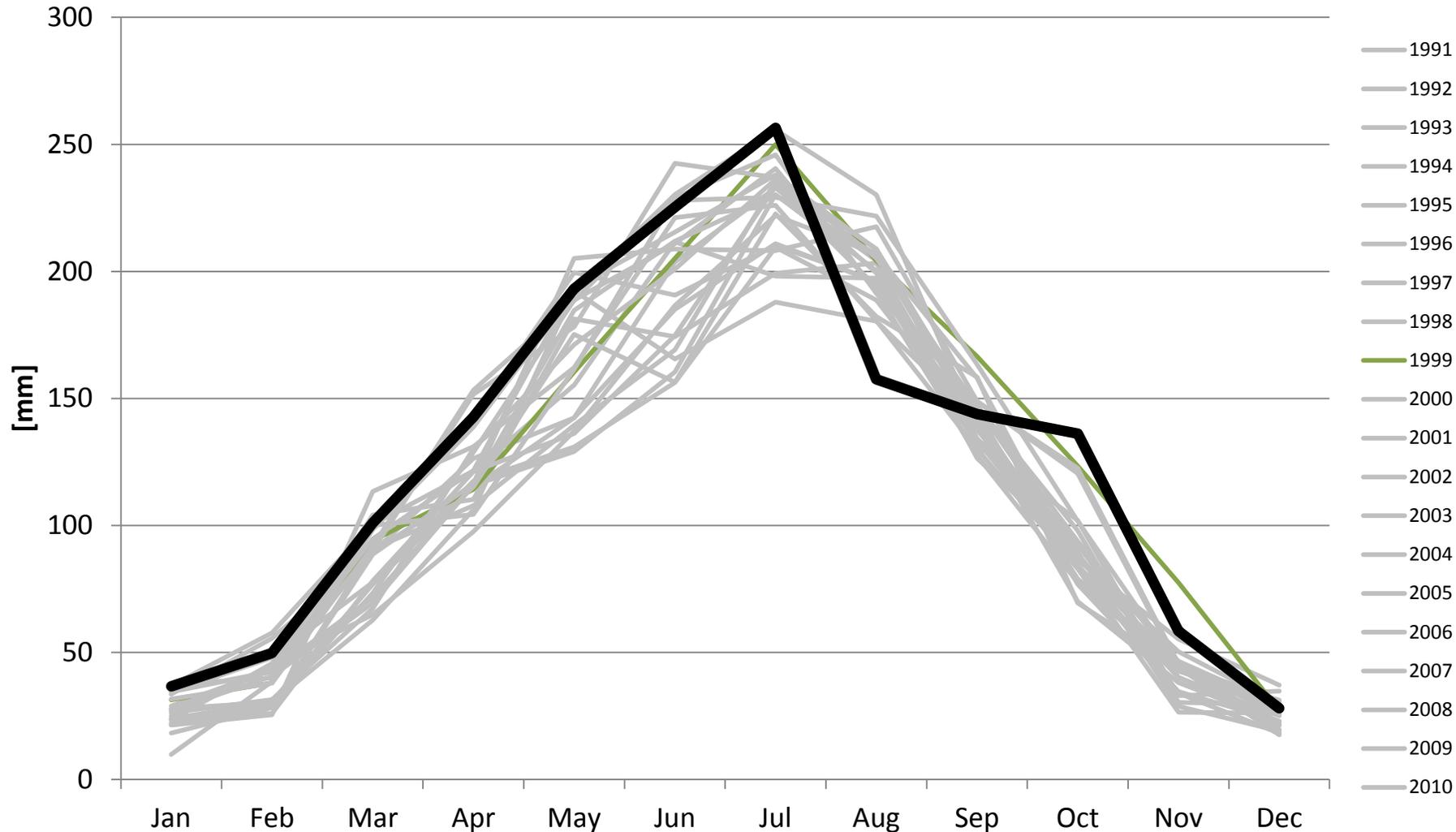


Southern Idaho:
Soil Moisture at 2 & 8 inch
depths increased to similar
 saturations as observed
 during snowmelt season

Station (871) YEAR=2014 (Daily) NRCS National Water and Climate Center - Provisional Data - subject to revision Fri Aug 29 12:22:36 PDT 2014



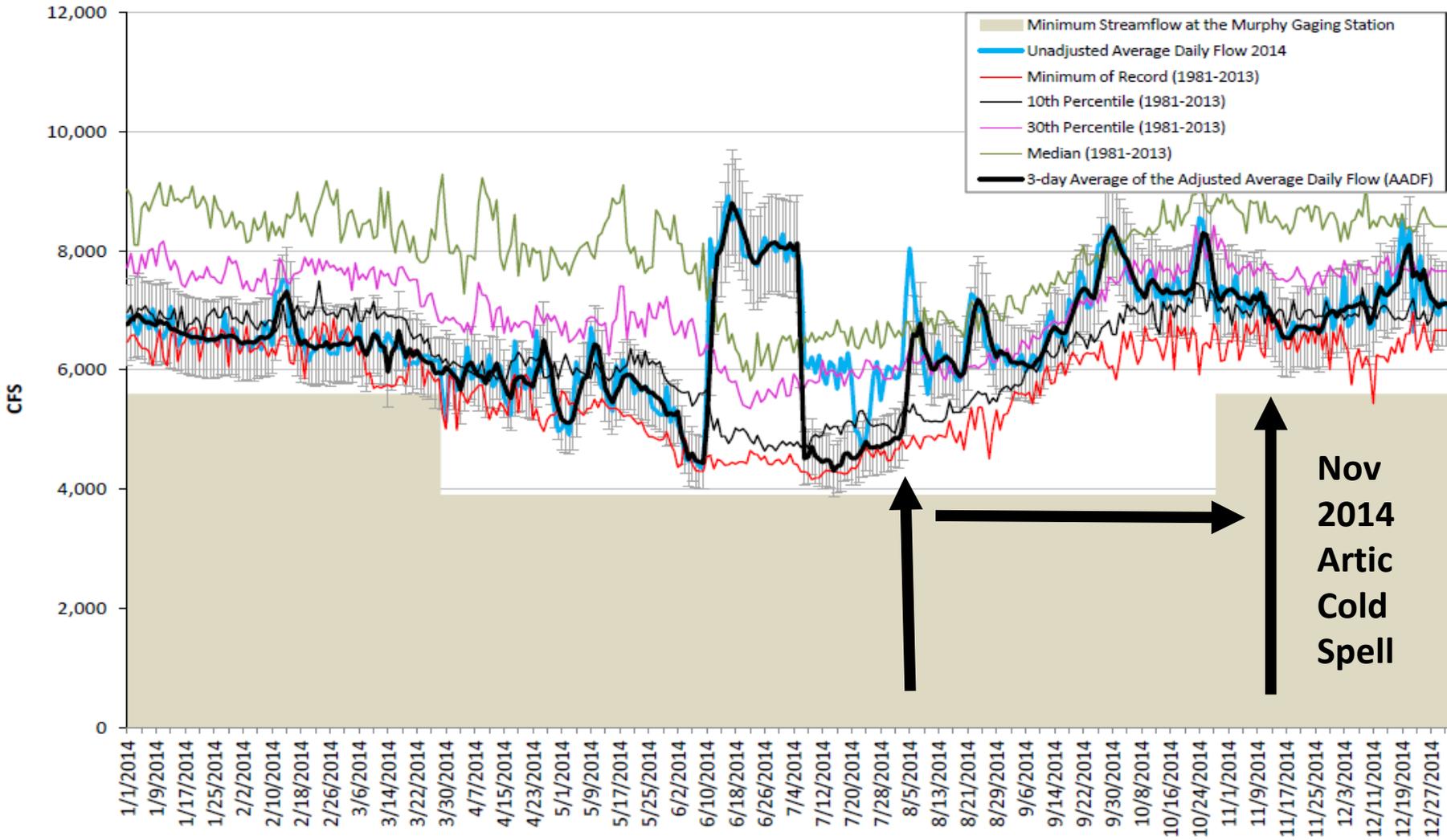
Monthly Evapotranspiration at the Twin Falls Agriment Station



2014 ET levels decreased

Other benefits: increased reservoir carryover storage for 2015 season

SUMMARY HYDROGRAPH SNAKE RIVER NR MURPHY 1981-2014



**2014 Snake River
flows near
Murphy
3-day average
flows**

**Increased until
early November
as August rains
moved through
the system**

A serene winter landscape featuring a small, snow-covered cabin nestled among tall evergreen trees. The ground is covered in a thick layer of snow, with tracks visible in the foreground. The sky is a clear, bright blue with a few wispy clouds. The overall scene is peaceful and idyllic.

Think
Snow