

# What Happened to our Water Supplies in 2014 & Early 2015 Outlook



**Natural Resources Interim  
Committee, State Capitol  
Boise, Idaho September 17, 2014**

**Picture from Teton  
National Park  
Thanksgiving Nov 2013**

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



**United States Department of Agriculture**

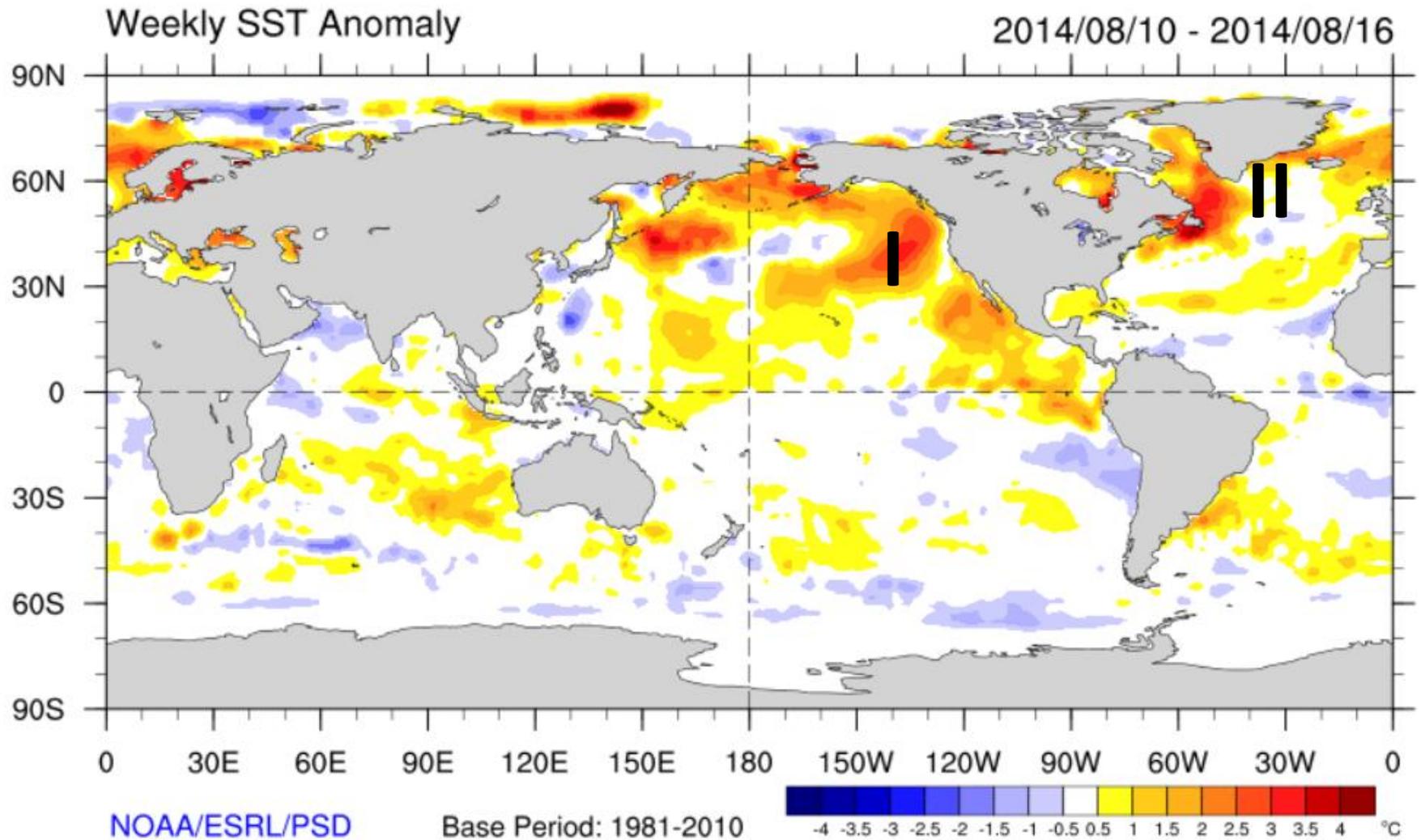
## Topics:

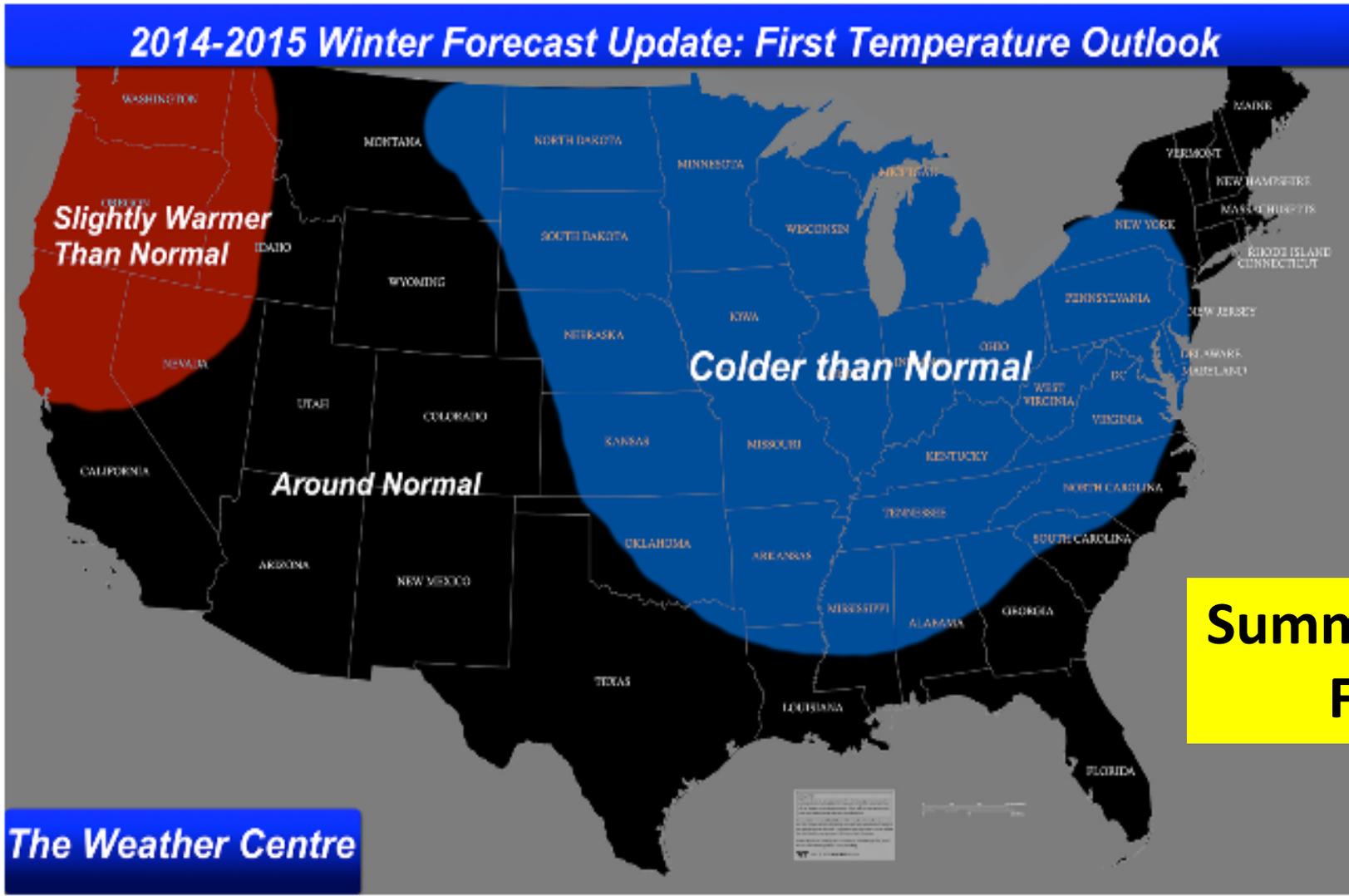
- **Summary First & Early 2015 Outlook**
- **Review of Major Teleconnections Climate Indices**
  - **Pacific Decadal Oscillation (PDO) - past cycles & trends**
  - **ENSO Correlations – El Nino – Neutral – La Nina**
- **Fall Forecasts for Winter of 2013/2014**
  - **6 different forecasts & several different opinions**
  - **Which forecasts worked & why**
- **Past Research & Current Examples of Climate Variability**
  - **Streamflow forecast accuracy & increase in spring precipitation variability**
- **Winter 2013/2014 - What Happened & When Did We Learn What We Now Know?**
  - **Surf's Up – January's change in weather pattern**
  - **Lessons learned & precipitation patterns to watch in the future**
  - **Predicting surplus volumes**
- **Why Winter 2014/2015 is Setting up to be Similar to Winter 2013/2014**

**Summary  
First**

**2014-2015 Winter Forecast Update: First Maps & Outlooks Released**

Posted: 25 Aug 2014 02:29 PM PDT





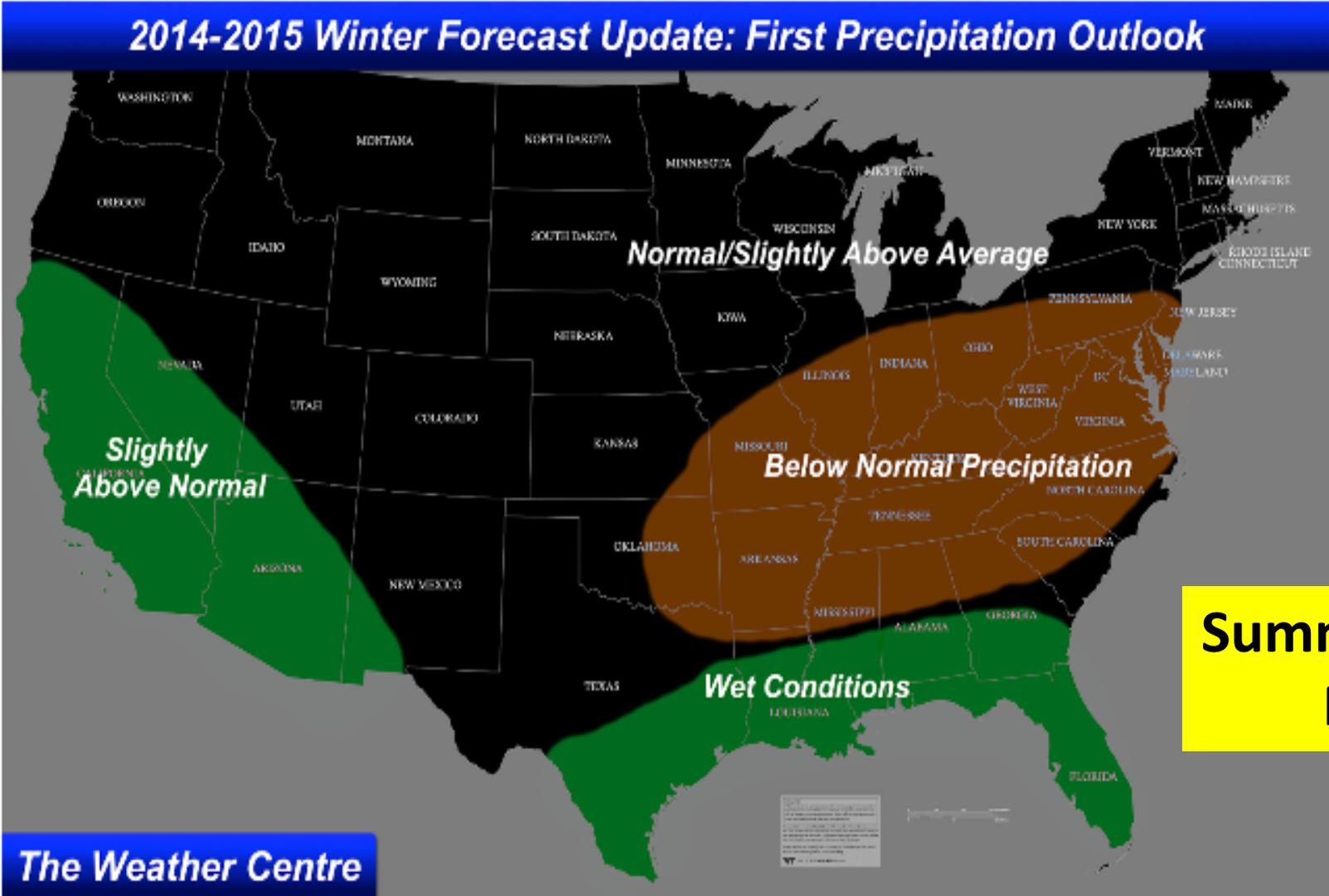
**Summary First**

Subject to potentially drastic change  
Click to enlarge

My first outlook places the Pacific Northwest in slightly warmer than normal conditions due to the aforementioned warm pool in the Pacific Northeast and Gulf of Alaska, where a sustained ridge may form. The majority of the Rockies

Because some of the other variables are still too uncertain to definitively forecast on, I made this outlook based predominantly off of the analog year of 1958-1959, typical precipitation patterns with ridging in the northeast Pacific, as well as a couple other factors that are expected to play into this winter.

From Andrew at The Weather Centre Aug 25, 2014



**Summary  
First**

**Subject to potentially drastic change.**

# Teleconnections – climatic indexes

Key is understanding their correlations AND influence on current weather, snowfall, streamflow & more

---

## Primary Ones:

**PDO** Pacific Decadal Oscillation – 20 to 30 year cycle

**ENSO** 3 to 5 year cycle

El Nino/Neutral/La Nina - measure of Sea Surface Temperature(SST)

**SOI** Southern Oscillation Index (SOI) measure of barometric pressure difference between in south Pacific (Darwin & Tahiti)

---

**NAO** North Atlantic Oscillation

Key to 2014 winter – went negative for handful of months...

In May it was declared back in positive phase

---

## Additional Climate Indices:

**AMO** Atlantic Multidecadal Oscillation

**AO** Artic Oscillation

**SSW** Sudden Stratospheric Warming

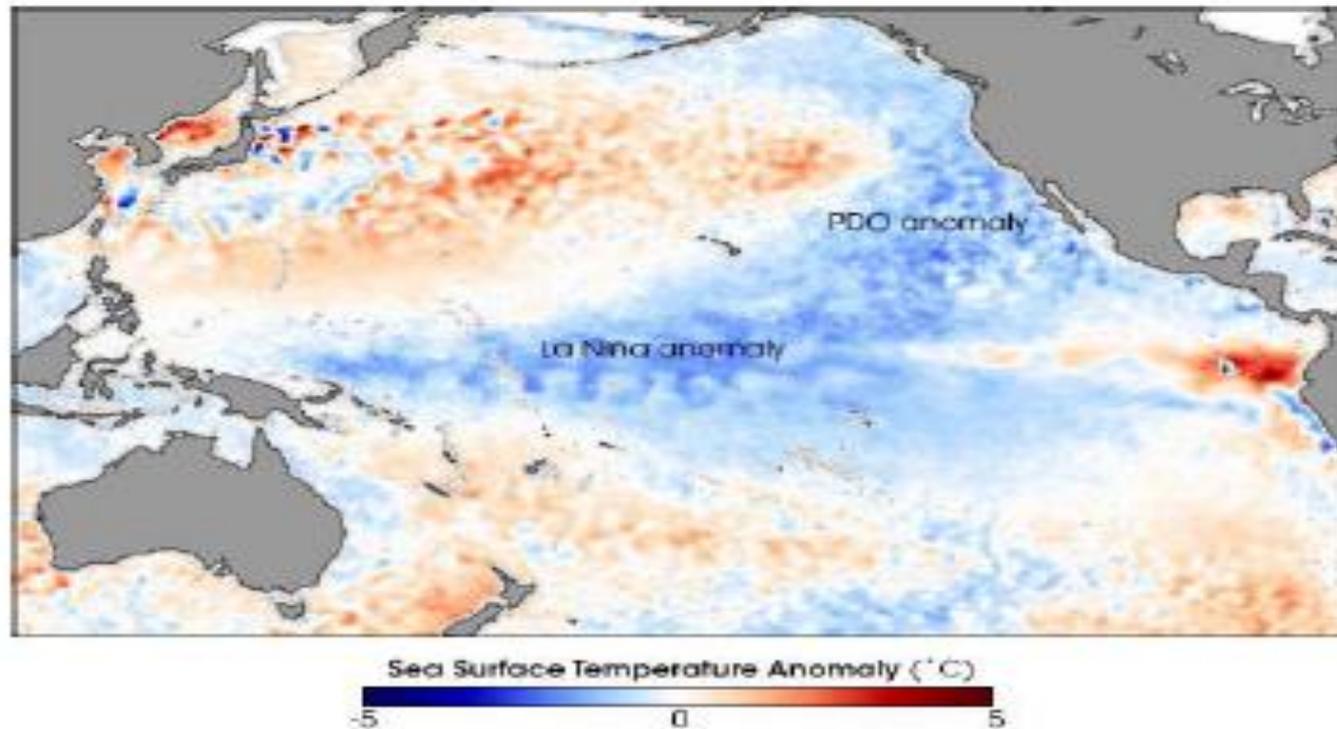
Sun Spots, Solar Activity, Polar Vortex, Volcanoes & more...

# La Nina and Pacific Decadal Oscillation (PDO)

## Cooling in the Pacific Ocean

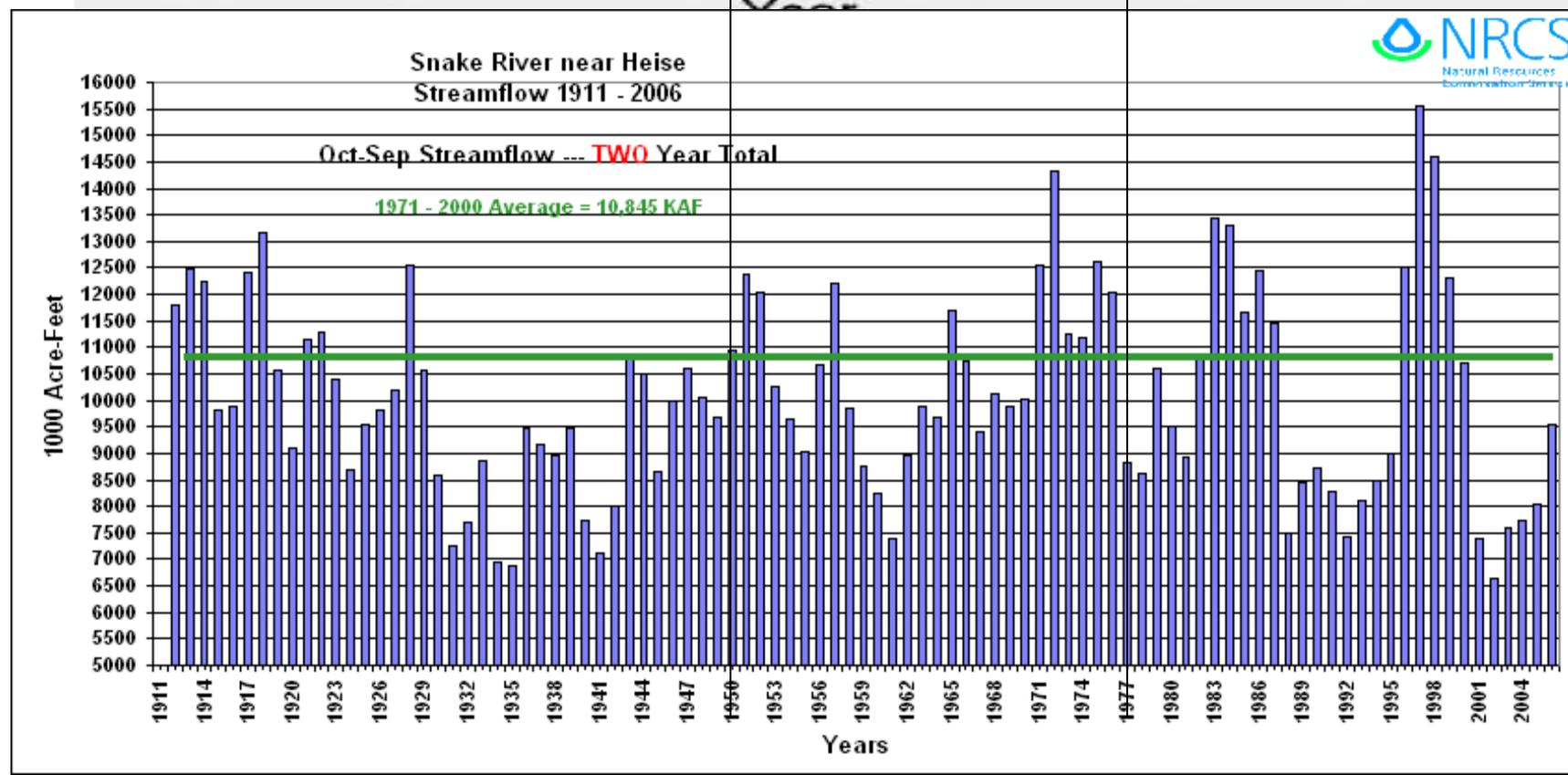
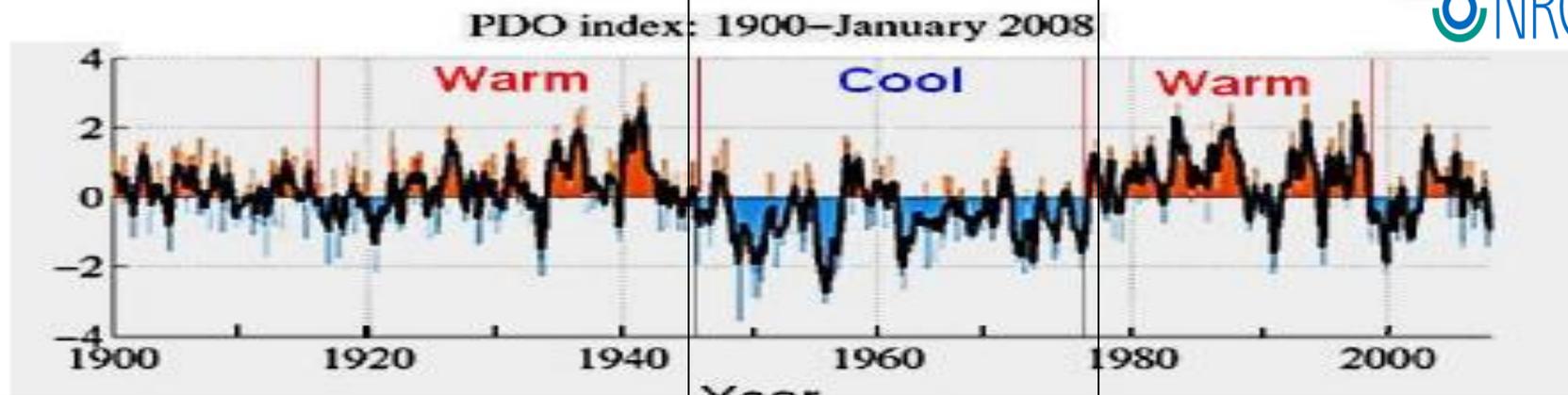
Don J. Easterbrook, Dept. of Geology, Western Washington University, Bellingham, WA

The announcement by NASA's Jet Propulsion Laboratory that the Pacific Decadal Oscillation (PDO) had shifted to its cool phase (Fig. 1) is right on schedule as predicted by past climate and PDO changes (Easterbrook, 2001, 2006, 2007). It is *not* an oddity superimposed upon and masking the predicted severe warming by the IPCC.



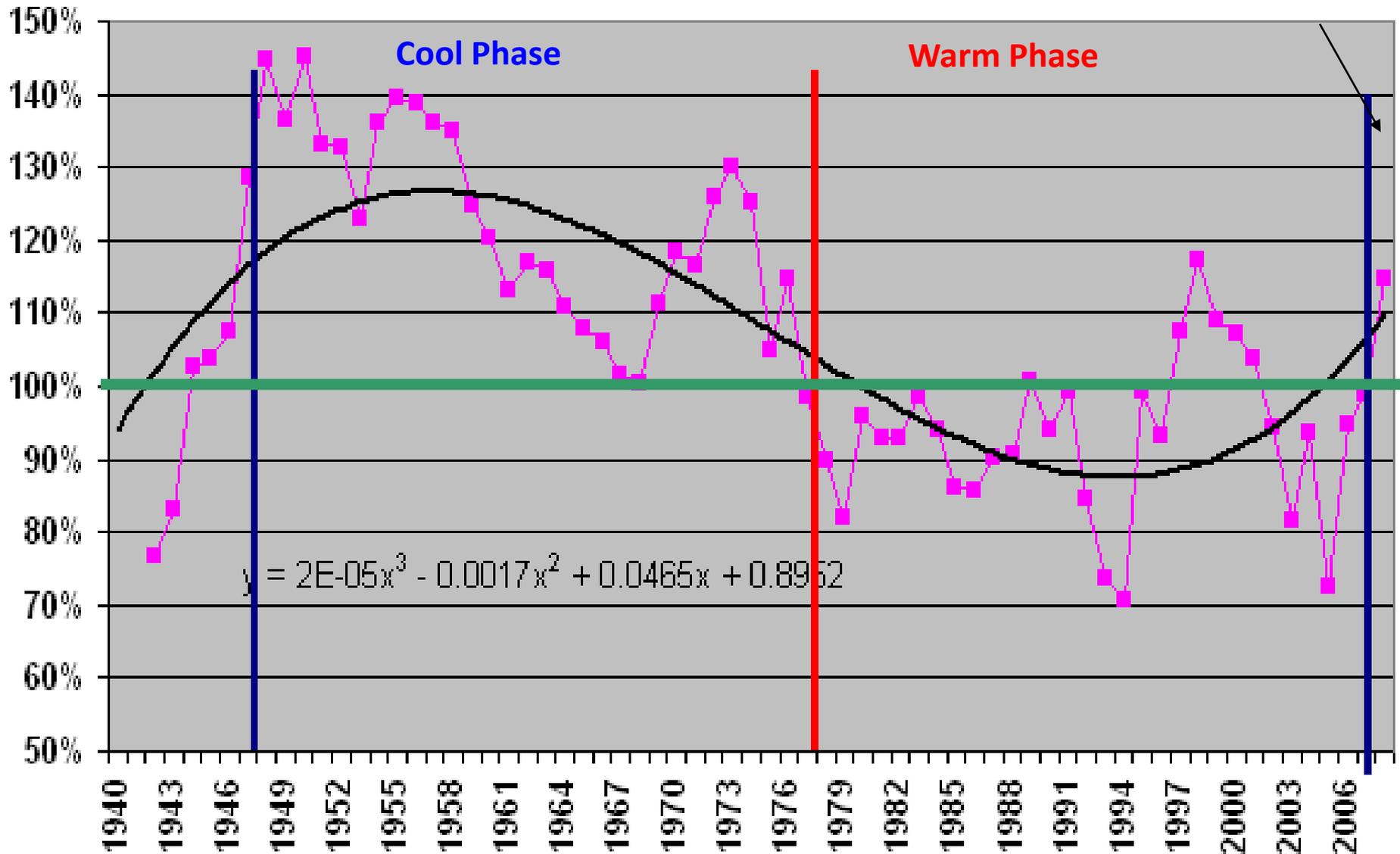
**Figure 1. Cooling of the Pacific Ocean and setting up of the PDO.** Sea surface temperature anomaly in the Pacific Ocean from April 14–21, 2008. The anomaly compares the recent temperatures measured by the Advanced Microwave Scanning Radiometer for EOS (AMSR-E) on NASA's Aqua satellite with

As shown by the historic pattern of PDOs over the past century (Fig. 2) and by corresponding global warming and cooling, the pattern is part of ongoing warm/cool cycles that last 25-30 years.

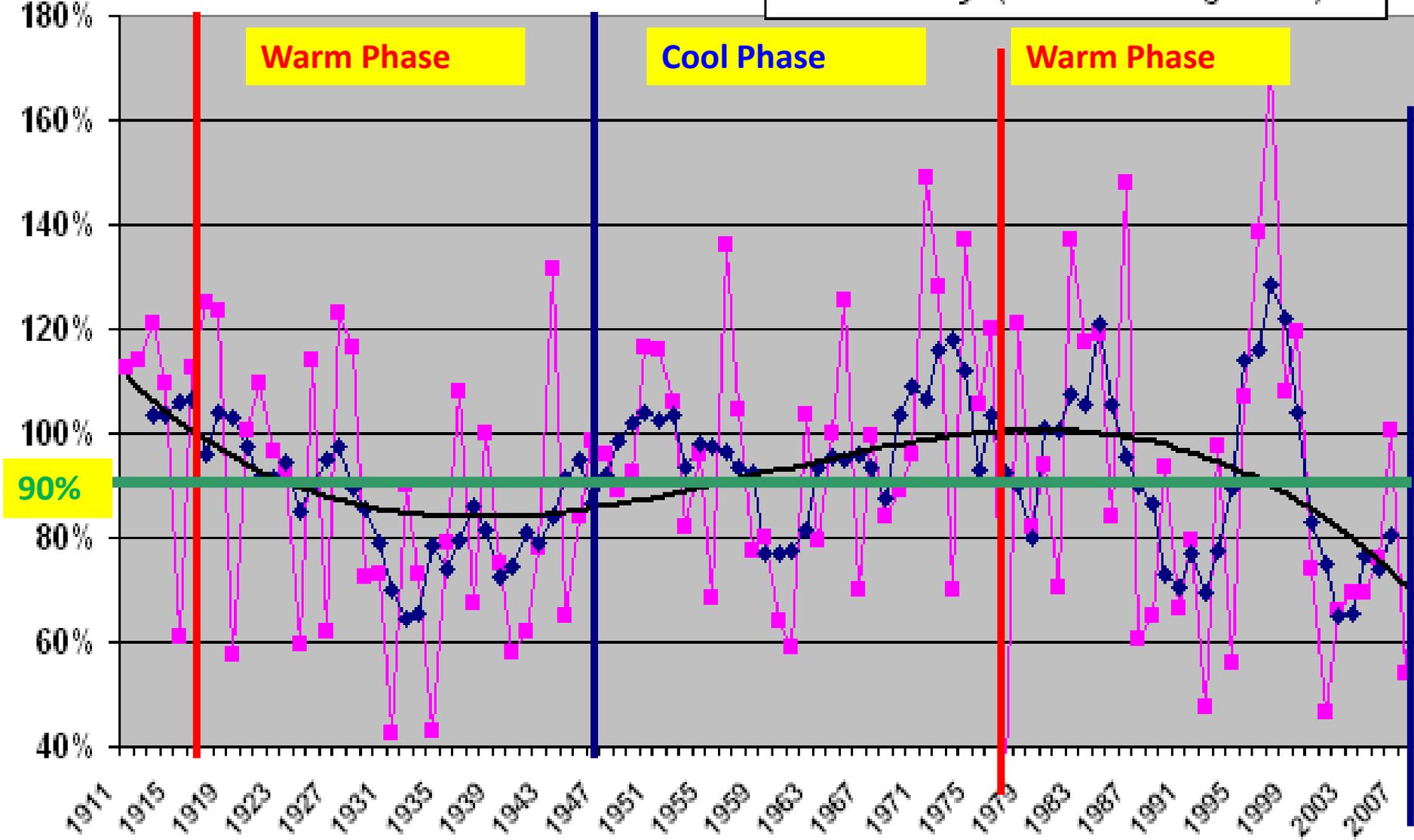
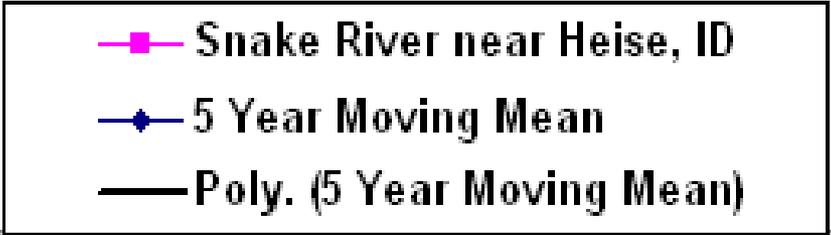


# NF Coeur d'Alene River 5 Year Moving Average

Cool Phase

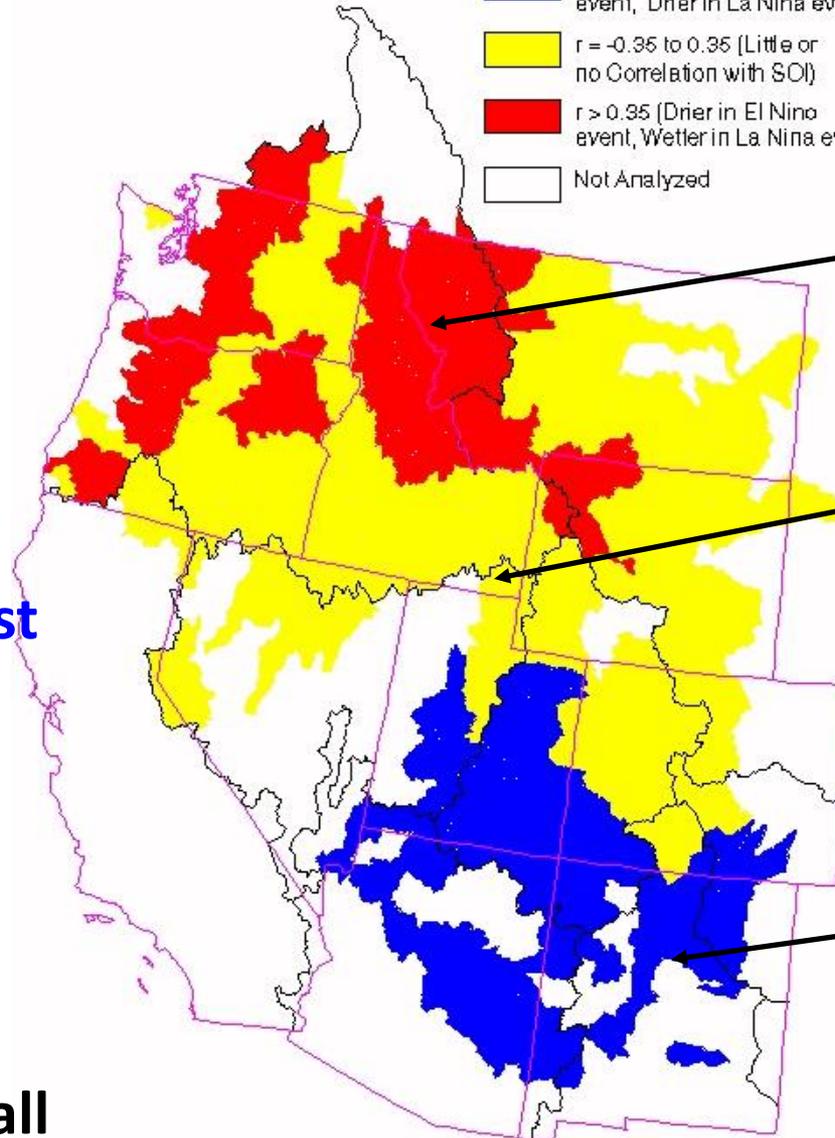


# Snake River nr Heise, ID



**Legend**

- $r < -0.35$  (Wetter in El Nino event, Drier in La Nina event)
- $r = -0.35$  to  $0.35$  (Little or no Correlation with SOI)
- $r > 0.35$  (Drier in El Nino event, Wetter in La Nina event)
- Not Analyzed



**Dry El Nino**

**Wet La Nina**

**No / Little Correlation**

**Wet El Nino**

**Dry La Nina**

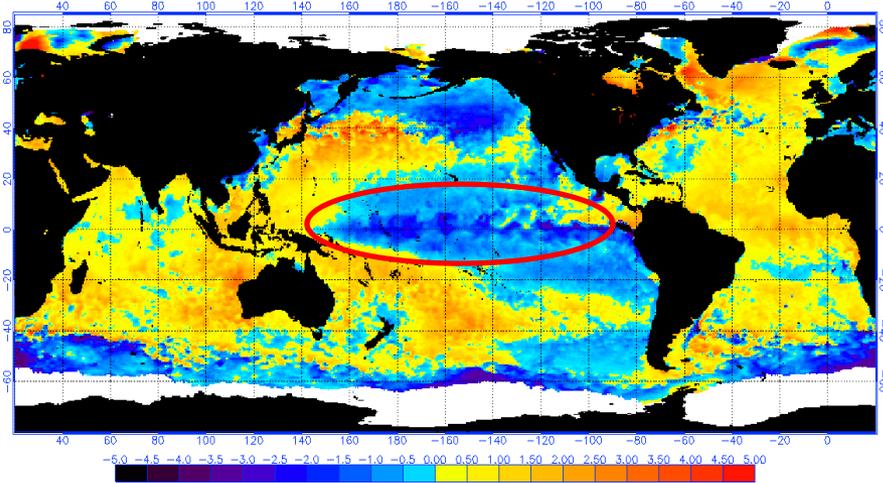
# Correlation Map of the Southern Oscillation Index (SOI) with spring and summer streamflow

## Winter 2013-2014

- ENSO Neutral Signal along with SOI
- Pacific Decadal Oscillation (PDO) is in cool phase since at least 2008 or 1997
- Key Time Period in Pacific Ocean is July to Nov – this period correlates the highest with our winter snowfall & water supplies

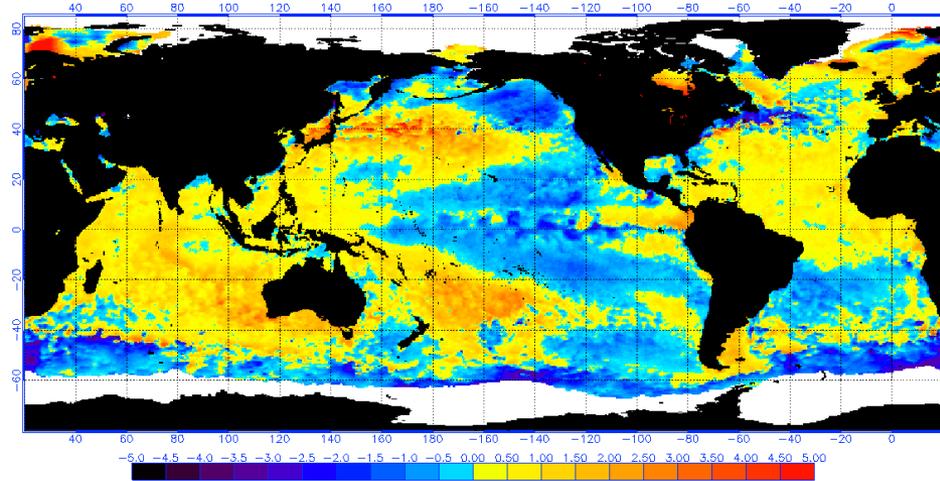
# Nov 2010 – Strong La Nina

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 11/8/2010  
(white regions indicate sea-ice)



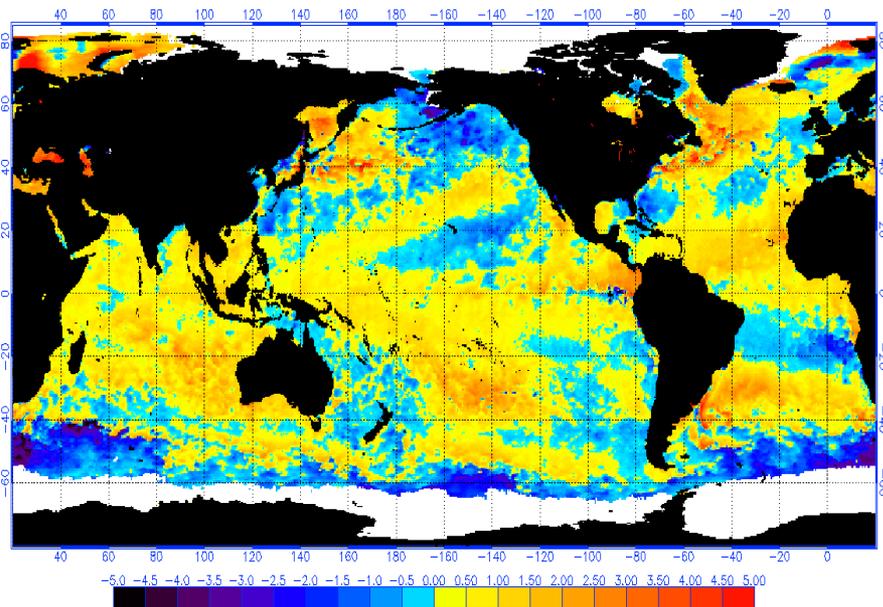
# Nov 2011 – Weak La Nina

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 11/7/2011  
(white regions indicate sea-ice)

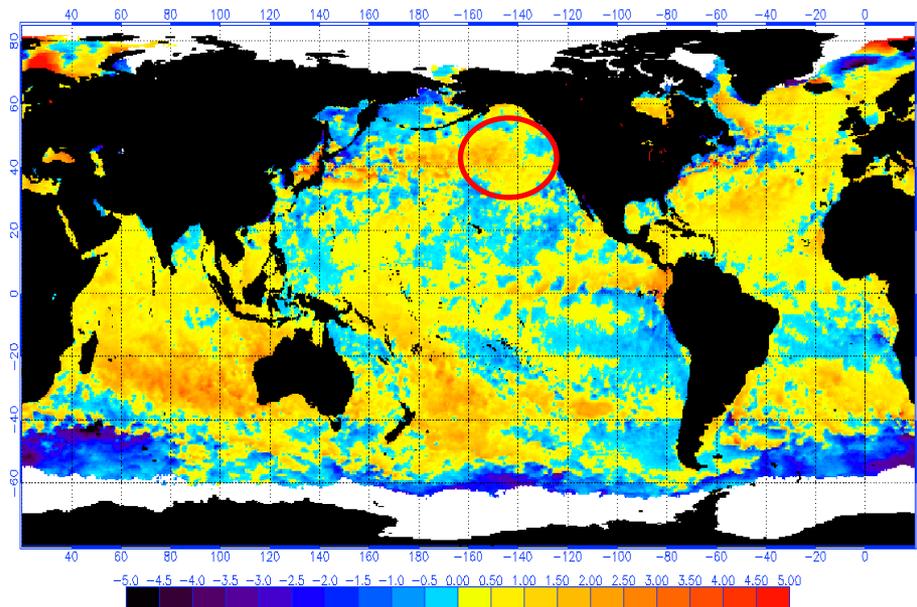


# November 2012 ----- Neutral Years ----- November 2013

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 11/12/2012  
(white regions indicate sea-ice)

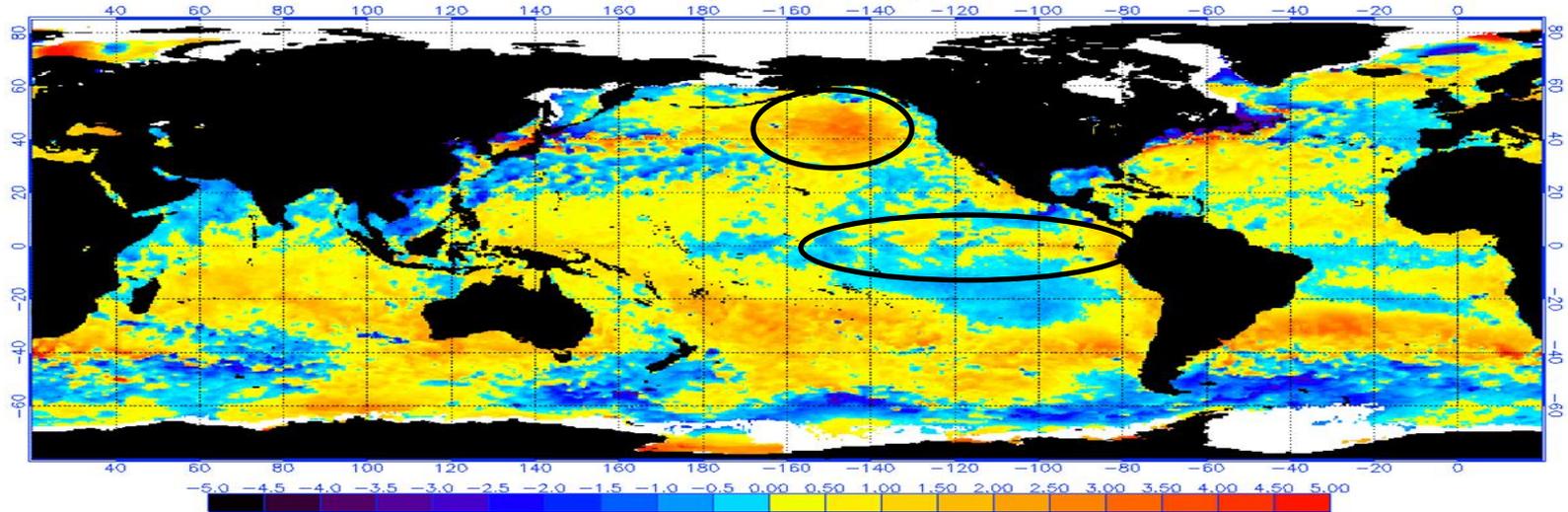


NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 11/14/2013  
(white regions indicate sea-ice)

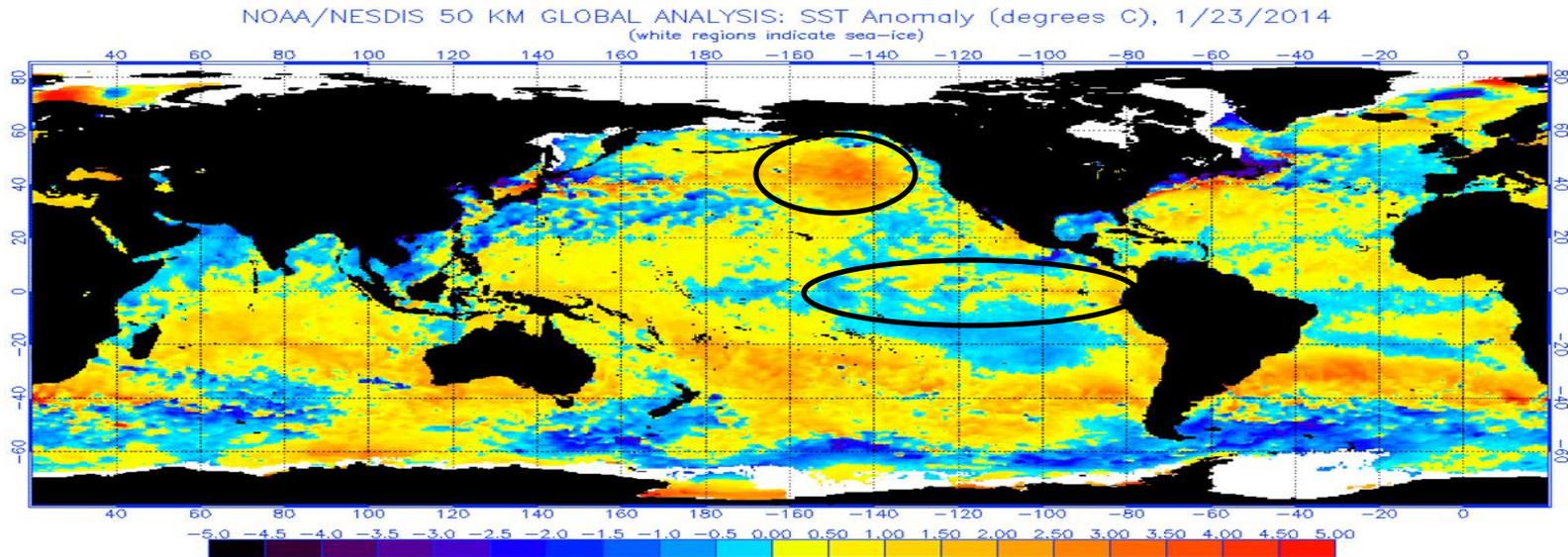


# January 23, 2014 – warm water in NE Pacific increasing

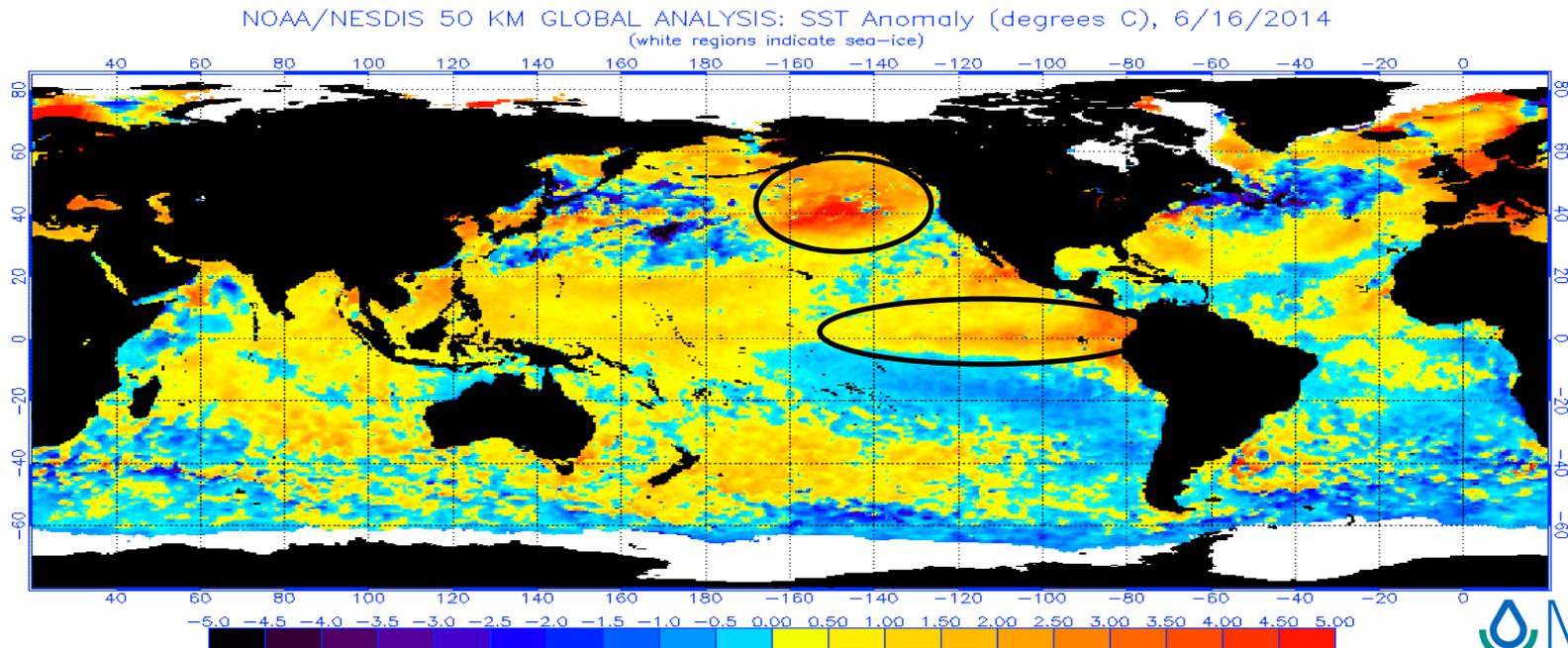
NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 1/23/2014  
(white regions indicate sea-ice)



# January 23, 2014 – warm water in NE Pacific increasing



# June 16, 2014 – El Nino Brewing



# Spring 2014: El Nino Watch for Summer 2014

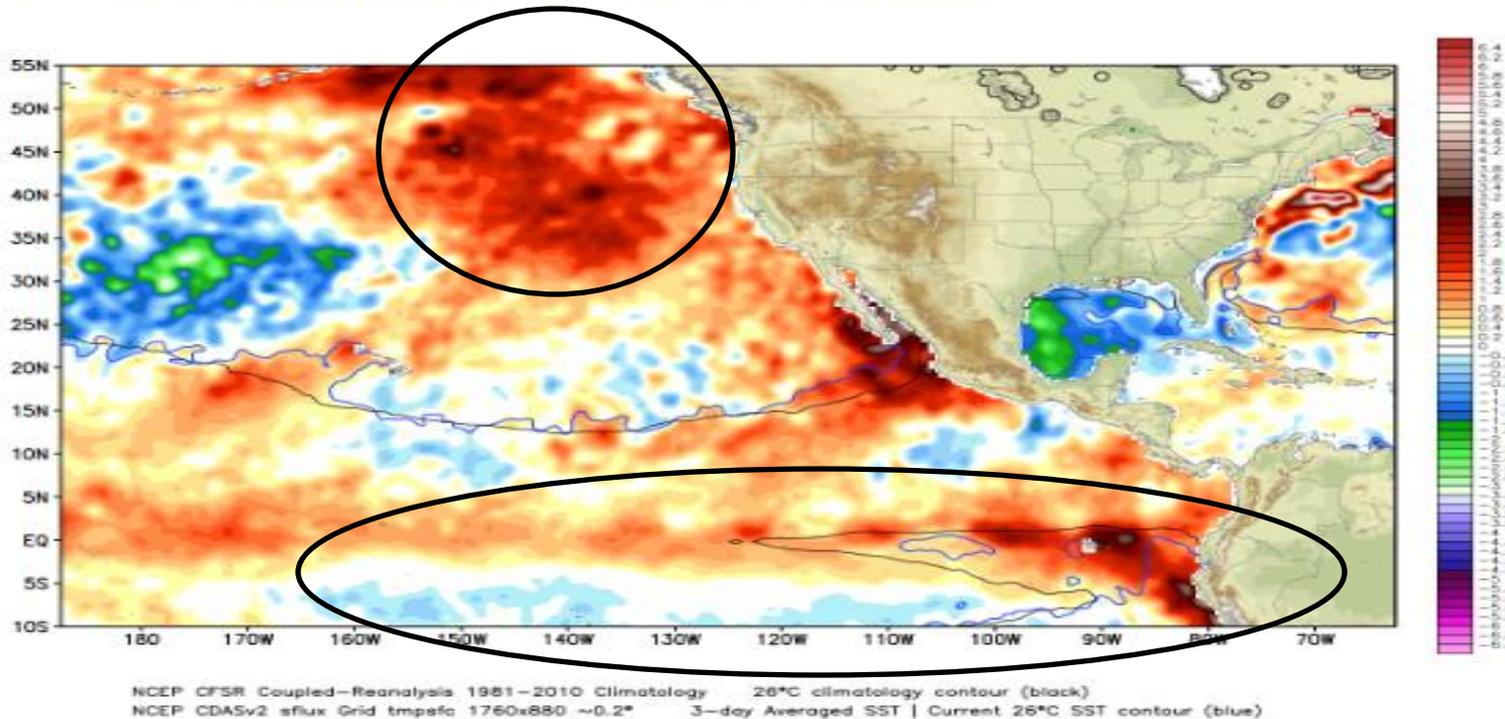
## June: 75% Chance El Nino will develop by Summer or Fall

May 25, 2014 Oregon

Chief Meteorologist Mark Nelsen

As mentioned, we've sure seen hotter weather in May, but most years that is then followed or preceded by cool/showery weather. By the way, there's a very good chance the much warmer than normal northeast Pacific waters are at least somewhat to "blame". That along with a lack of chilly westerly upper-level flow too. Check out the huge warm pool from the coastline all the way out into the central Pacific.

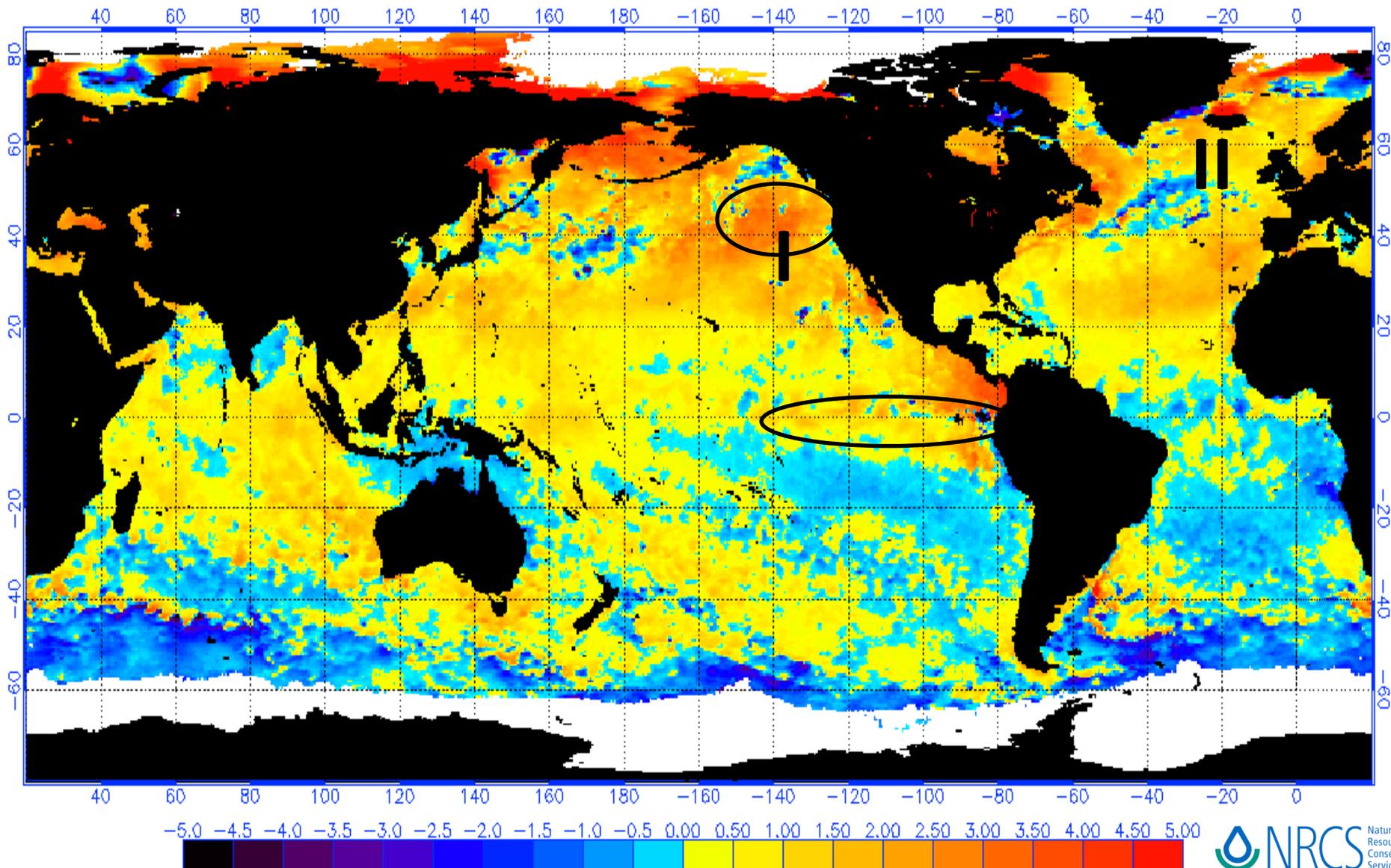
NCEP CDASv2 [CFS Reanalysis] SST Anomaly [°C] 18Z25MAY2014



It has been there for at least 6 months and probably isn't going anywhere with El Nino developing to the south. Another reason we will likely see warmer than average temps this summer, along with the data we're seeing elsewhere referenced in a posting last week.

# Sept 8, 2014 – Sea Surface Temperatures

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 9/8/2014  
(white regions indicate sea-ice)

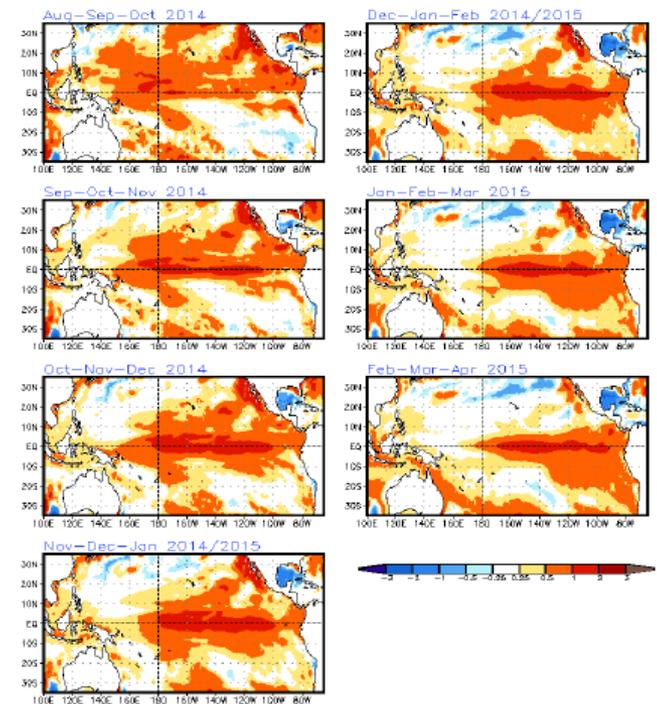
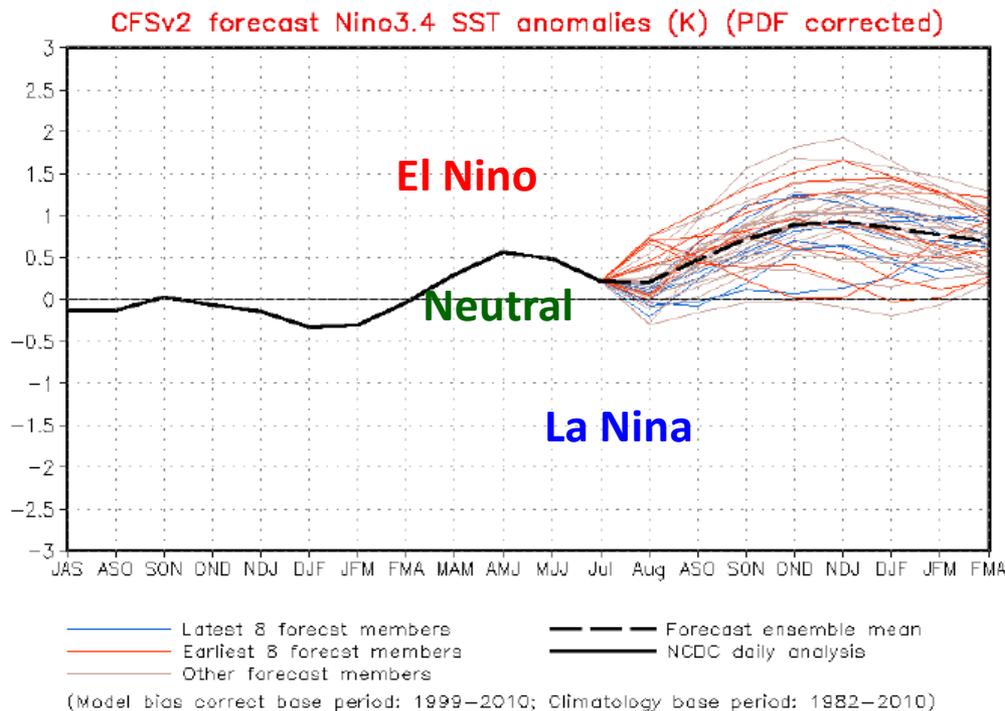


# NOAA Sea Surface Temperature Anomaly Forecast From August 11, 2014 Weekly ENSO Update

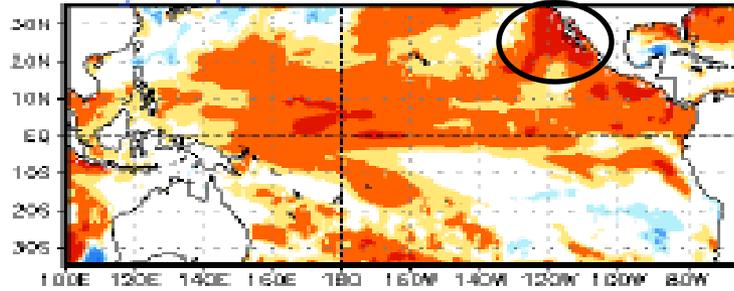
## SST Outlook: NCEP CFS.v2 Forecast (PDF corrected)

Issued: 4 August 2014

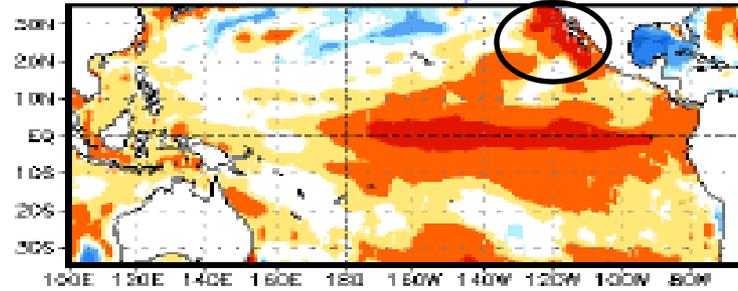
The CFS.v2 ensemble mean (black dashed line) predicts El Niño starting in the next couple of months and lasting through early 2015.



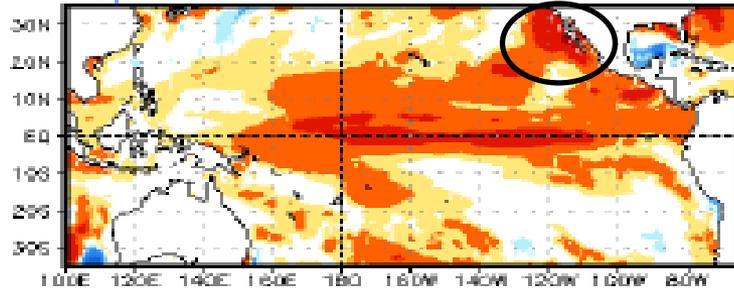
Aug-Sep-Oct 2014



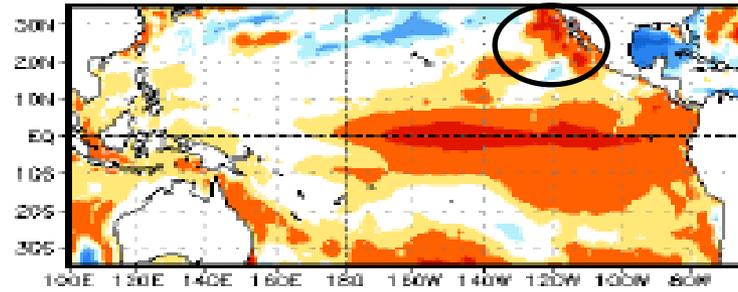
Dec-Jan-Feb 2014/2015



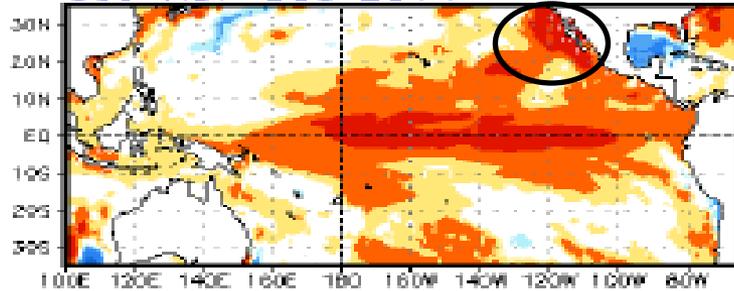
Sep-Oct-Nov 2014



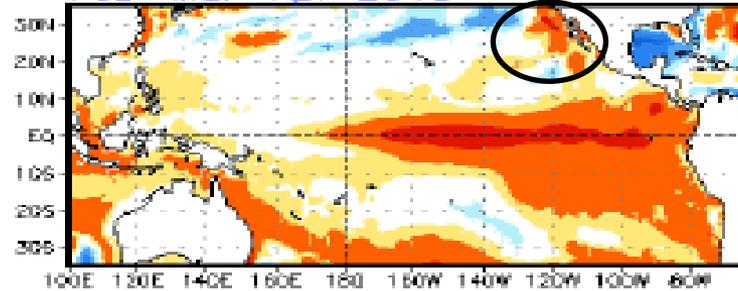
Jan-Feb-Mar 2015



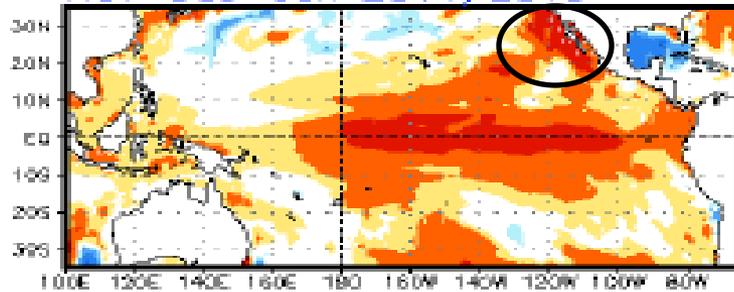
Oct-Nov-Dec 2014



Feb-Mar-Apr 2015

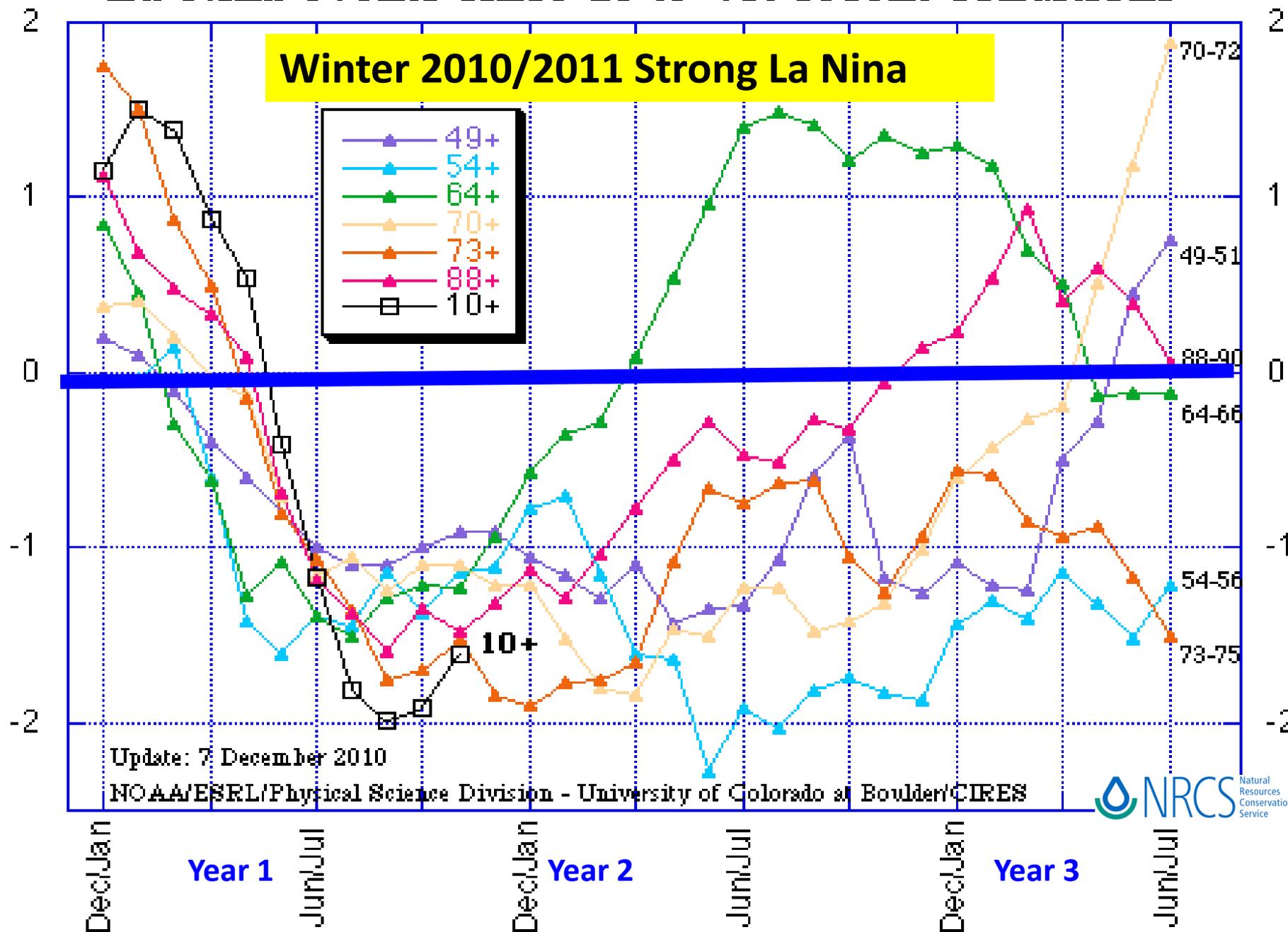


Nov-Dec-Jan 2014/2015



# Multivariate ENSO Index (MEI) for six strong La Niña events since 1949 vs. recent conditions

Standardized Departure



**Fall 2013 – hints at early fall,**

- **Cold temperatures were building over Artic, Sept 2013 snow & rain put forest fires out**
- **Fall 2014 - similar cold conditions exist**



**Our Crystal Ball isn't always round...**

# ***Fall Forecasts for Winter 2013-2014***

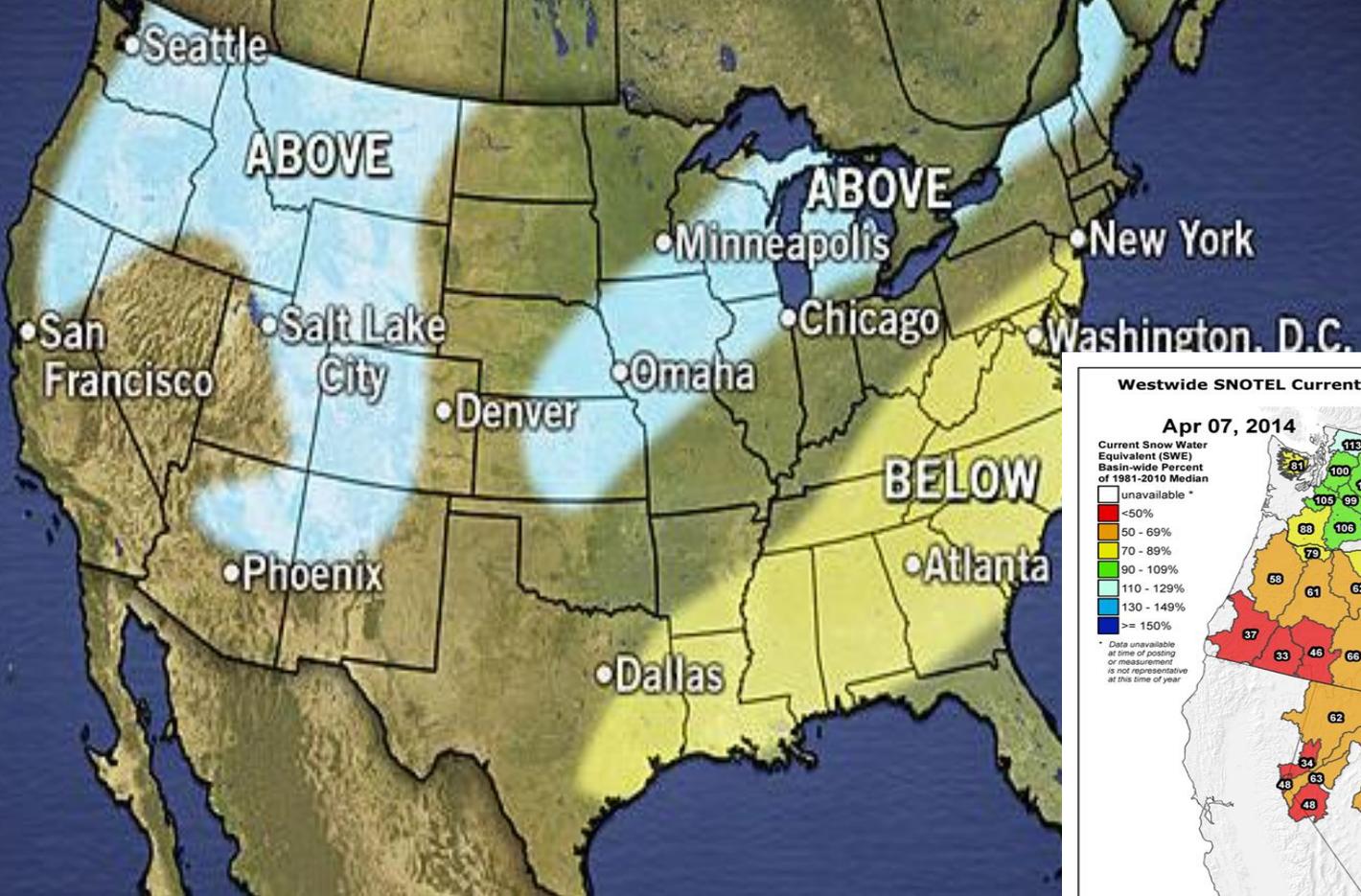
<b>Weather Forecasts</b>	<b>Streamflow Forecast</b>	<b>Combo Weather &amp; Stream</b>
<b>X X X X</b>	<b>X</b>	<b>X</b>

**6 Different Sources of Forecasts**

**Several Different Results**

# SNOWFALL 2013-2014

AccuWeather.com



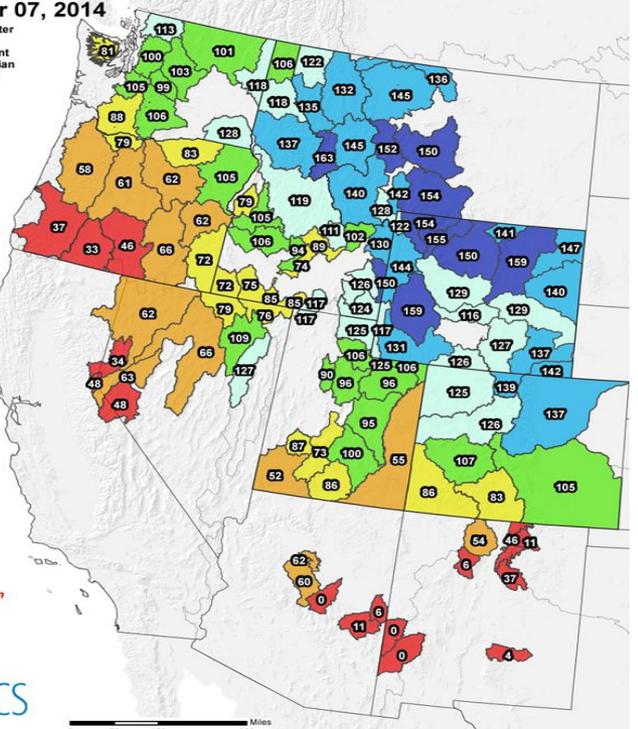
## Westwide SNOTEL Current Snow Water Equivalent (SWE) % of Normal

Apr 07, 2014

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).

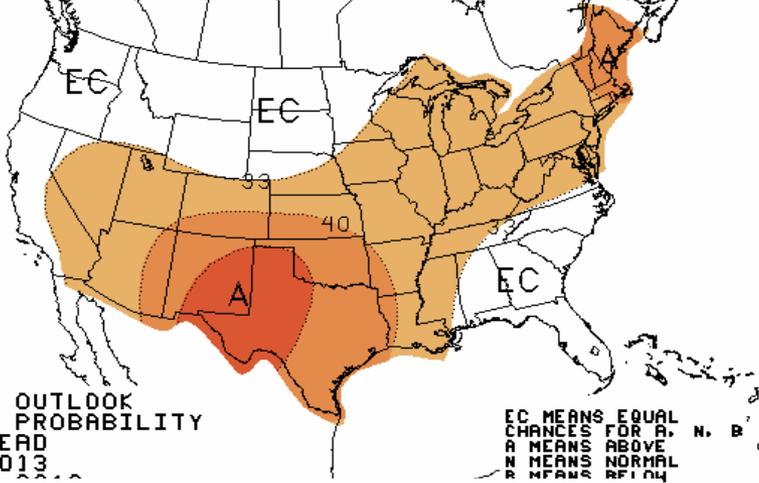
Prepared by the USDA/NRCS National Water and Climate Center Portland, Oregon <http://www.wcc.nrcs.usda.gov/gis/>  
Based on data from <http://www.wcc.nrcs.usda.gov/reports/>  
Science contact: Jim.Marron@por.usda.gov 503 414 3047

# Rule #1

- **Don't believe the 1<sup>st</sup> weather forecast you hear**
- **Wait until you hear the Same or Similar forecast from two or more unrelated sources**

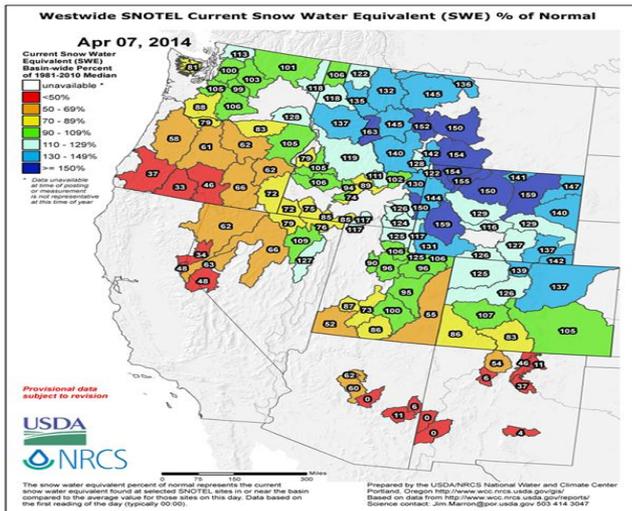
# NOAA Forecast from Oct 17, 2013 for Nov, Dec, Jan

## Nov, Dec, Jan Temperature



THREE-MONTH OUTLOOK  
TEMPERATURE PROBABILITY  
0.5 MONTH LEAD  
VALID NDJ 2013  
MADE 17 OCT

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



Apr 07, 2014

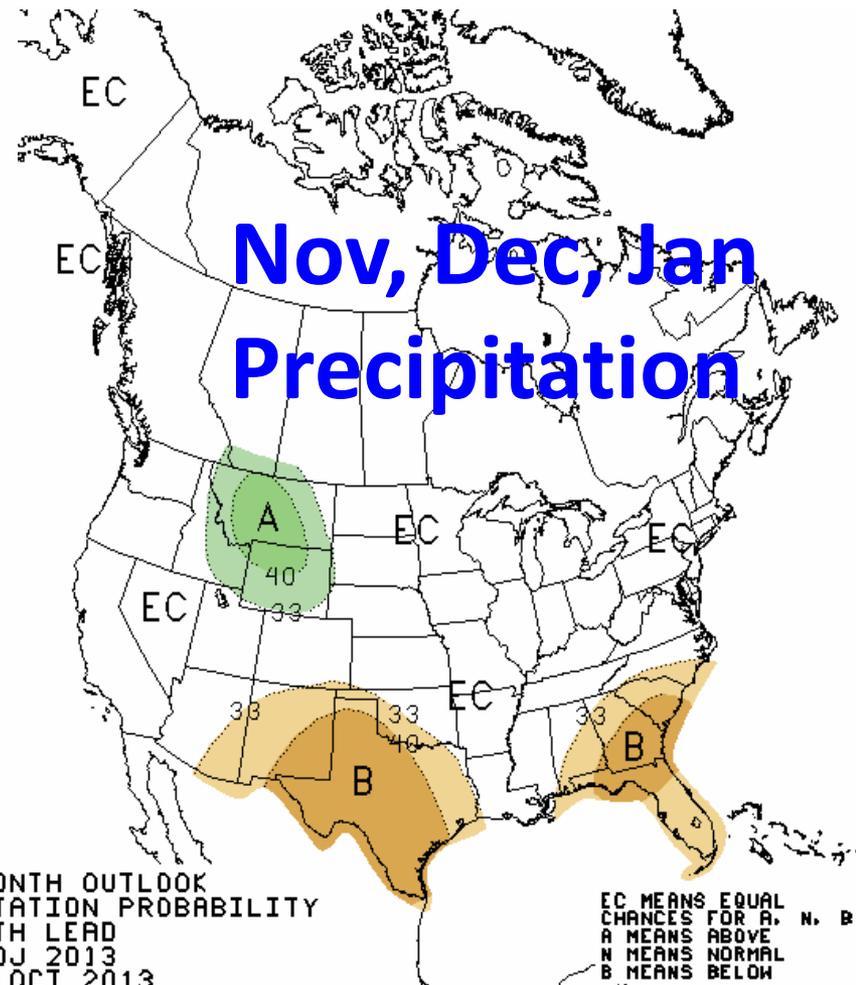
Current Snow Water  
Equivalent (SWE)  
Basinwide Percent  
of 1981-2010 Median

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

USDA  
NRCS

Prepared by the USDA/NRCS National Water and Climate Center  
Source: Oregon State University  
Based on data from <http://www.nws.noaa.gov>  
Source contact: Jim Manning@usda.gov 503-414-3047

## Nov, Dec, Jan Precipitation



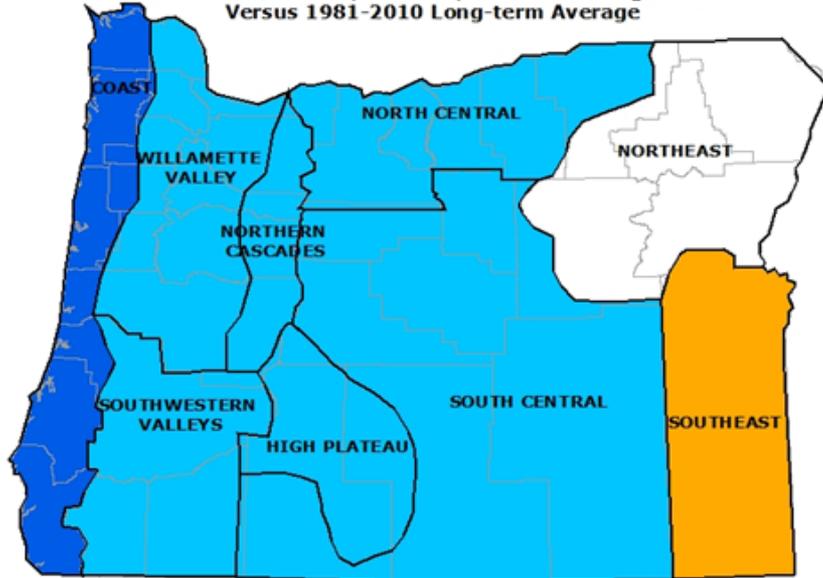
THREE-MONTH OUTLOOK  
PRECIPITATION PROBABILITY  
0.5 MONTH LEAD  
VALID NDJ 2013  
MADE 17 OCT 2013

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

# Pete Parsons Nov. 2013 – Jan. 2014 Forecasts

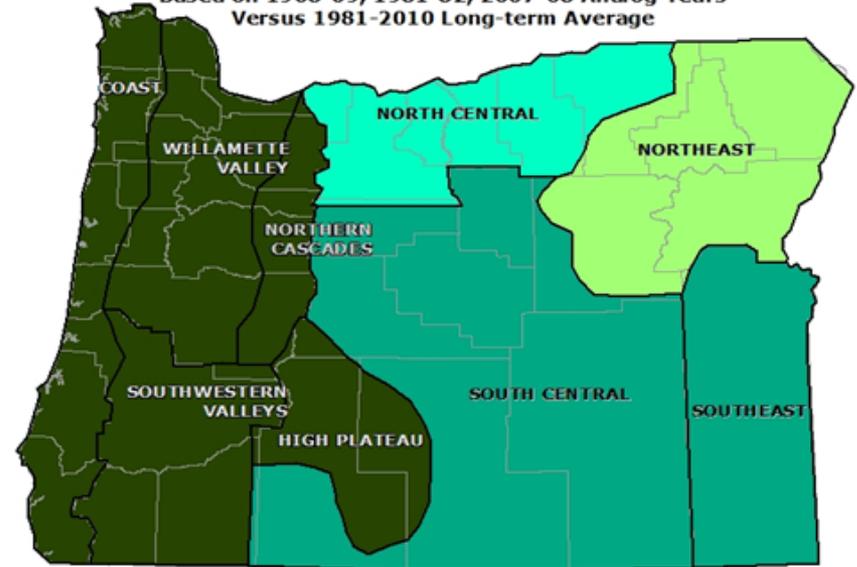
## Temperatures

November 2013 - January 2014 Forecast Temperature Anomalies (°F)  
Based on 1968-69, 1981-82, 2007-08 Analog Years  
Versus 1981-2010 Long-term Average



## Precipitation

November 2013 - January 2014 Forecast Precipitation Anomalies (Inches)  
Based on 1968-69, 1981-82, 2007-08 Analog Years  
Versus 1981-2010 Long-term Average



- A stormy but relatively mild Nov and early Dec should give way to much colder weather in late December and/or January.
- Precipitation should be well above average, with episodes of “extreme” weather likely (i.e. windstorms, floods, valley snow, Arctic air).

## **NRCS - Jan Curtis - Applied Climatologist retired after 41 years with several agencies**

**Had a wealth of info to share about current weather & future outlook that might affect snowfall, snow accumulation, snowmelt rates, peak flows, and even fall weather patterns hinting at first frost.**

**Position is vacant - not sure when this NRCS Meteorologist / Applied Climatologist will be filled.**

**Jan also looks at a number of climate indices including solar activity:**

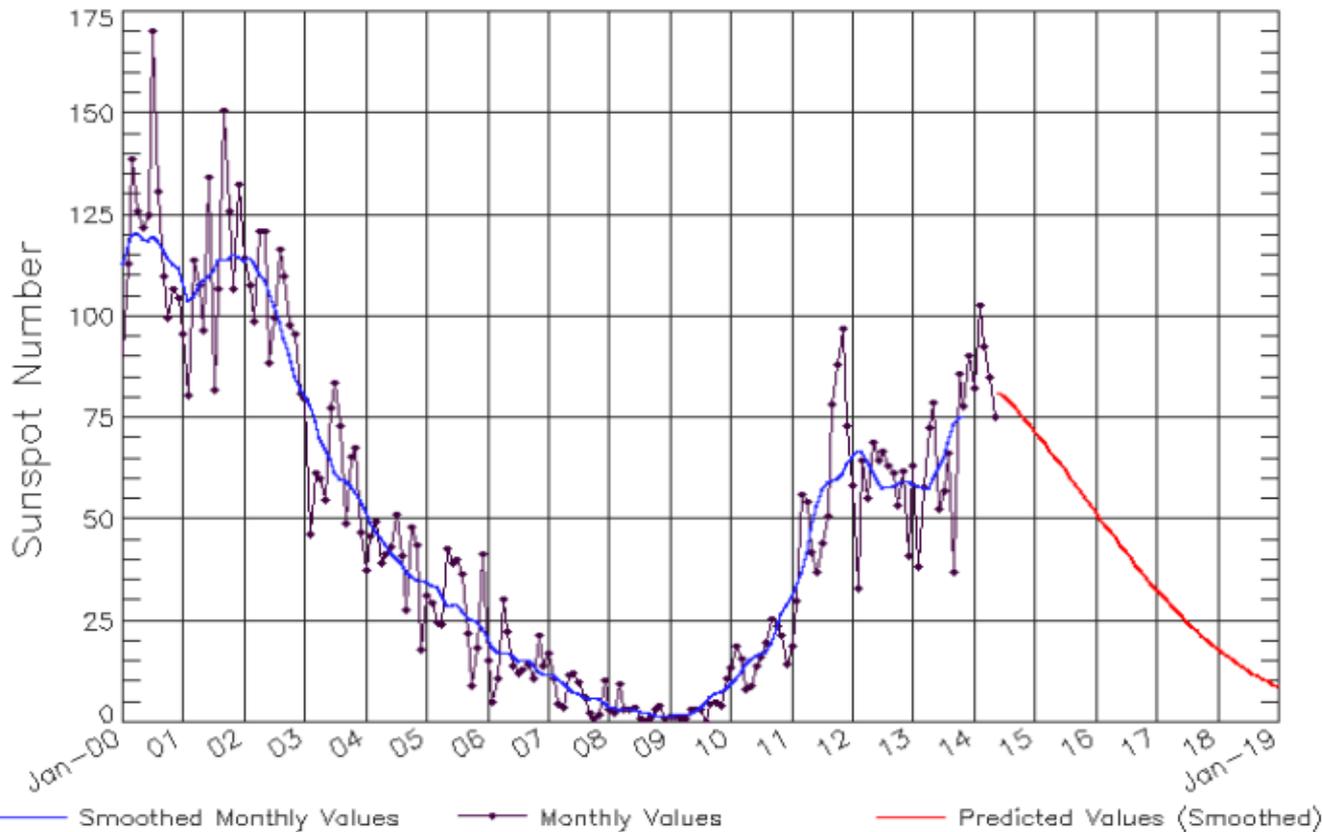
**General Forecast - with neutral ENSO conditions, precip to be near normal for West but bumpy road to reach normal levels by April 2014.**



The abnormally low sunspot numbers will likely have some sort of effect on the Earth ... take home message: is that we are more prone to a chilly winter with sunspots projected to drop than a warm one Andrew 6-14-14



ISES Solar Cycle Sunspot Number Progression  
Observed data through May 2014



Sept 9, 2013 - the sun, which should be at SOLAR MAX, only has a measly 24 sunspots number (150 is



# Streamflow Forecast & Current Research



Department of  
**Geosciences**  
in the College of Arts & Sciences

Home » People » Graduate Students »

Home

Degree Programs ▶

General Information ▶

Outreach

People ▶

Prospective Students ▶

Research ▶

**BOISE STATE**  
UNIVERSITY



 **NRCS** Natural Resources  
Conservation Service

**Melvin (Mel) L. Kunkel**

## WY 2012 STREAMFLOW FORECAST

The Upper Boise River Basin 2012 water year looks to be an interesting one from the water management point of view. Last year was a wet year with the natural flow into Lucky Peak being ~24% higher than the 50 year average flow, **this year will follow suit with flows being ~17% higher than normal.**

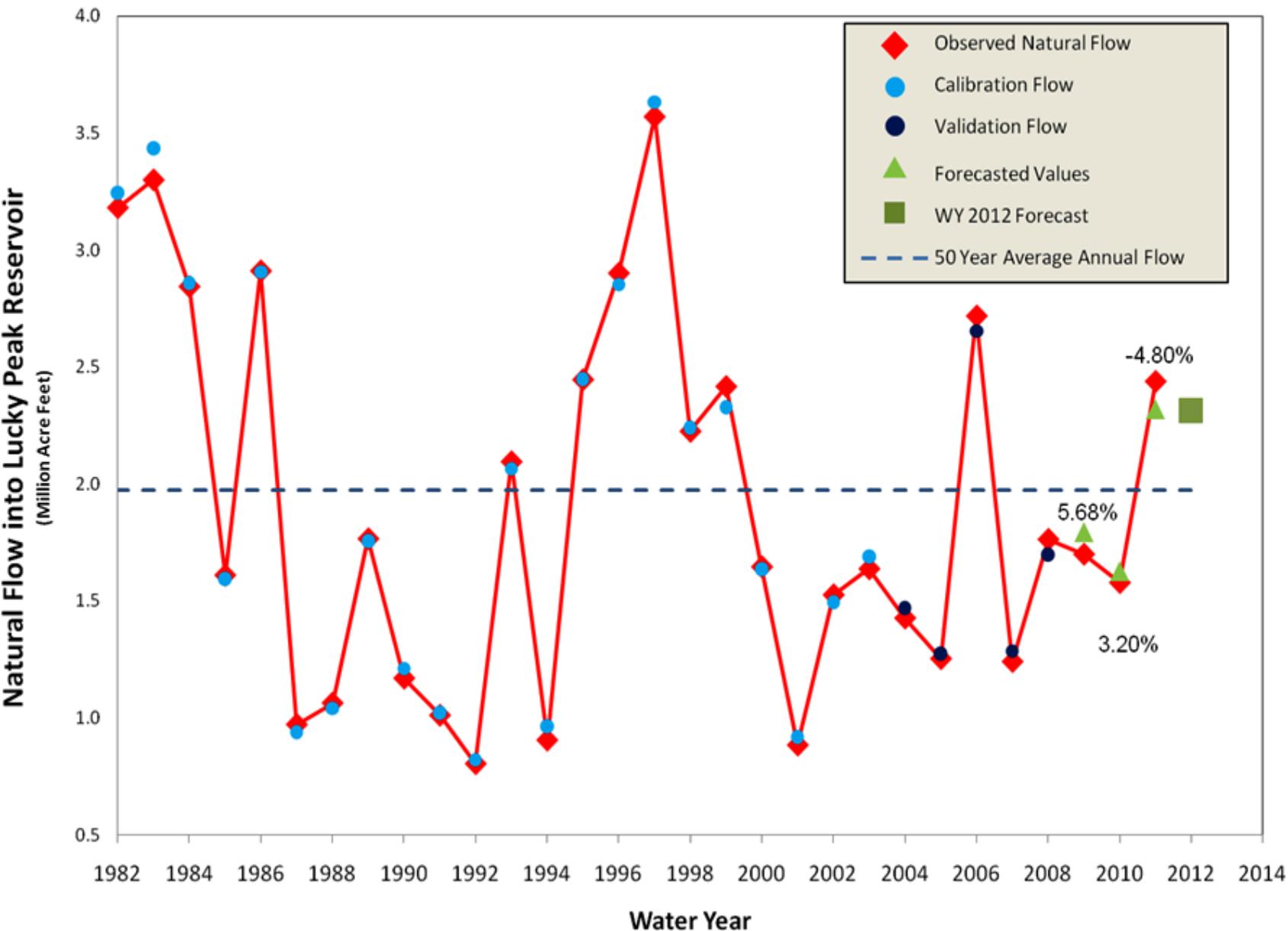
The model results indicate that we will have a slightly wetter first quarter than last year followed by a second quarter that is **significantly** wetter than last year's above average flow. After two quarters of strong flows, the third and fourth quarters drop slightly compared to last year's flows. The predicted annual flow from the summed Quarters predictions and the Annual prediction falls short of the WY 2011 flows, but not by much.

The **Forecasted flows are (posted 16 Oct 2011):**

<b>1st Qtr</b>	<b>2nd Qtr</b>	<b>3rd Qtr</b>	<b>4th Qtr</b>	<b>Summed Qtrs</b>	<b>Annual Fcst</b>
186,000 AF	396,000 AF	1.27 MAF	373,000 AF	<b>2.22 MAF</b>	<b>2.31 MAF</b>

\*\* One note: This years modeling included the September PDO values. Normally I use the PDO values from the University of Washington; however this year, the September values were not available in time to do the forecast. In place of the UW data I used the September PDO value presented by the Climate Prediction Center, NCEP/NOAA, in its October 11, 2011 briefing titled "Global Ocean Monitoring: Recent Evolution, Current Status, and Predictions" available at <http://www.cpc.ncep.noaa.gov/products/GODAS/>. The forecast may be revised as the University of Washington PDO index is available.

## Lucky Peak Annual Natural Flow / Observed Vs Predicted

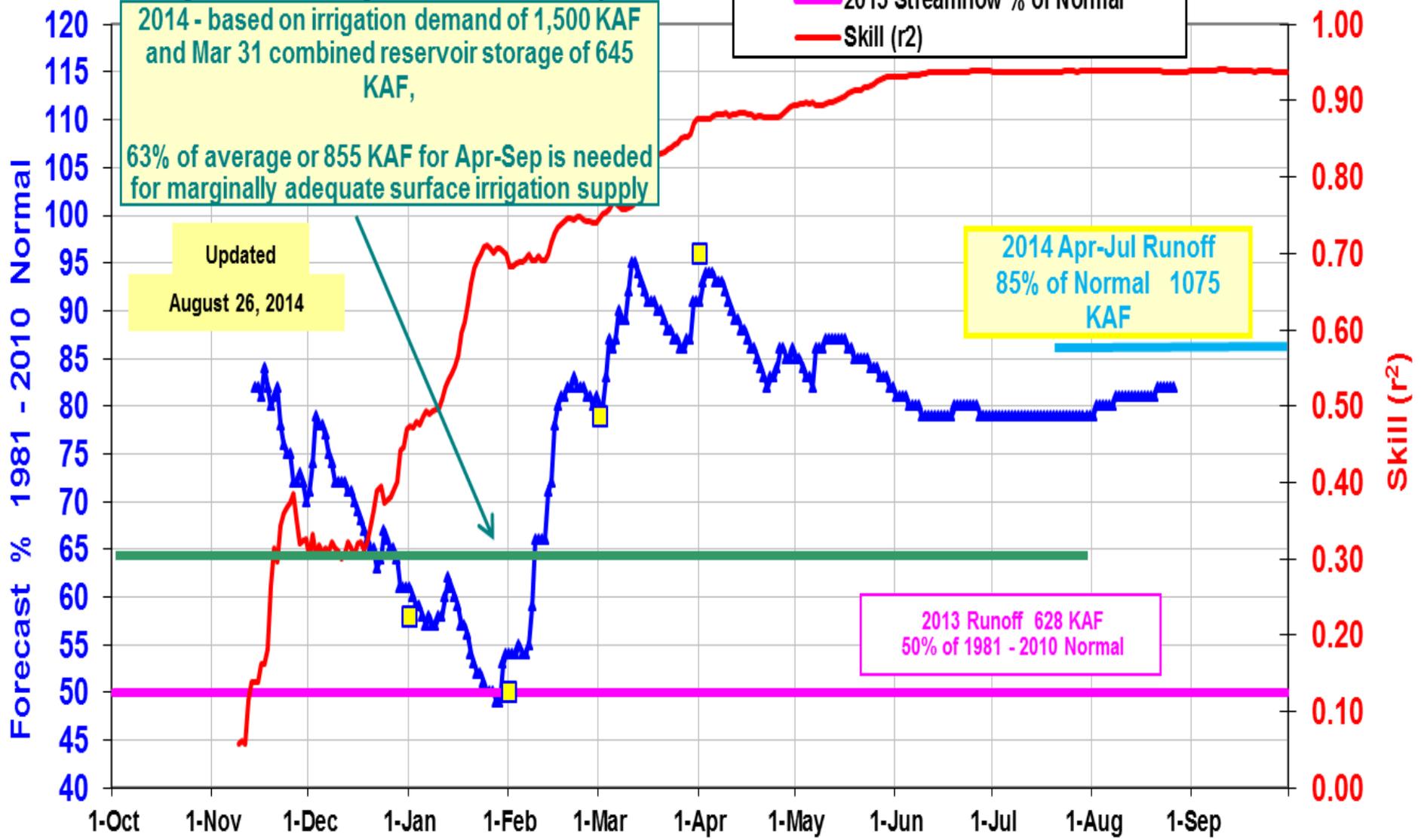


# 2014 Boise River near Boise: Apr - Jul Volume



NRCS Monthly / mid-Monthly Forecasts are Squares

- Daily Guidance Forecast
- Monthly Forecasts
- 2013 Streamflow % of Normal
- Skill ( $r^2$ )



SNOTEL Sites used: Atlanta Summit, Trinity Mountain, Dollarhide Summit, Vienna Mine, Galena and Galena Summit



# The Weather Centre

**EXPECT THE UNEXPECTED**

[Home](#)   [Weather Models](#)   [Current Weather](#)   [Winter Weather Wall](#)   [Snow Day Formula](#)   [2013-2014 Winter Forecast Directory](#)

[2013-2014 Official Winter Forecast](#)   [\\*\\*Final 2013-2014 Winter Forecast\\*\\*](#)

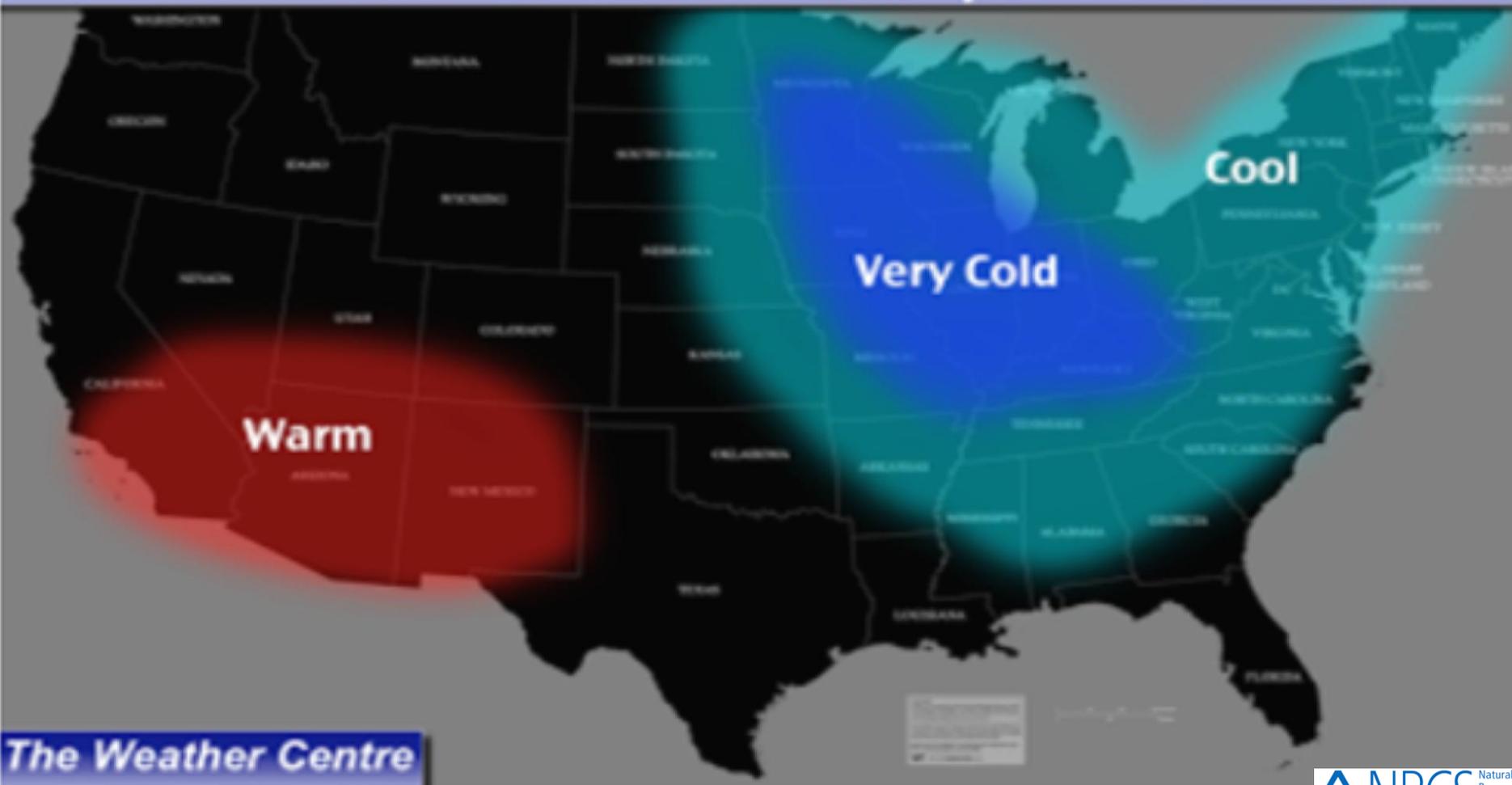
Saturday, August 31, 2013

*"Much of the nation can expect some frigid weather this winter."*

## Official 2013-2014 Winter Forecast

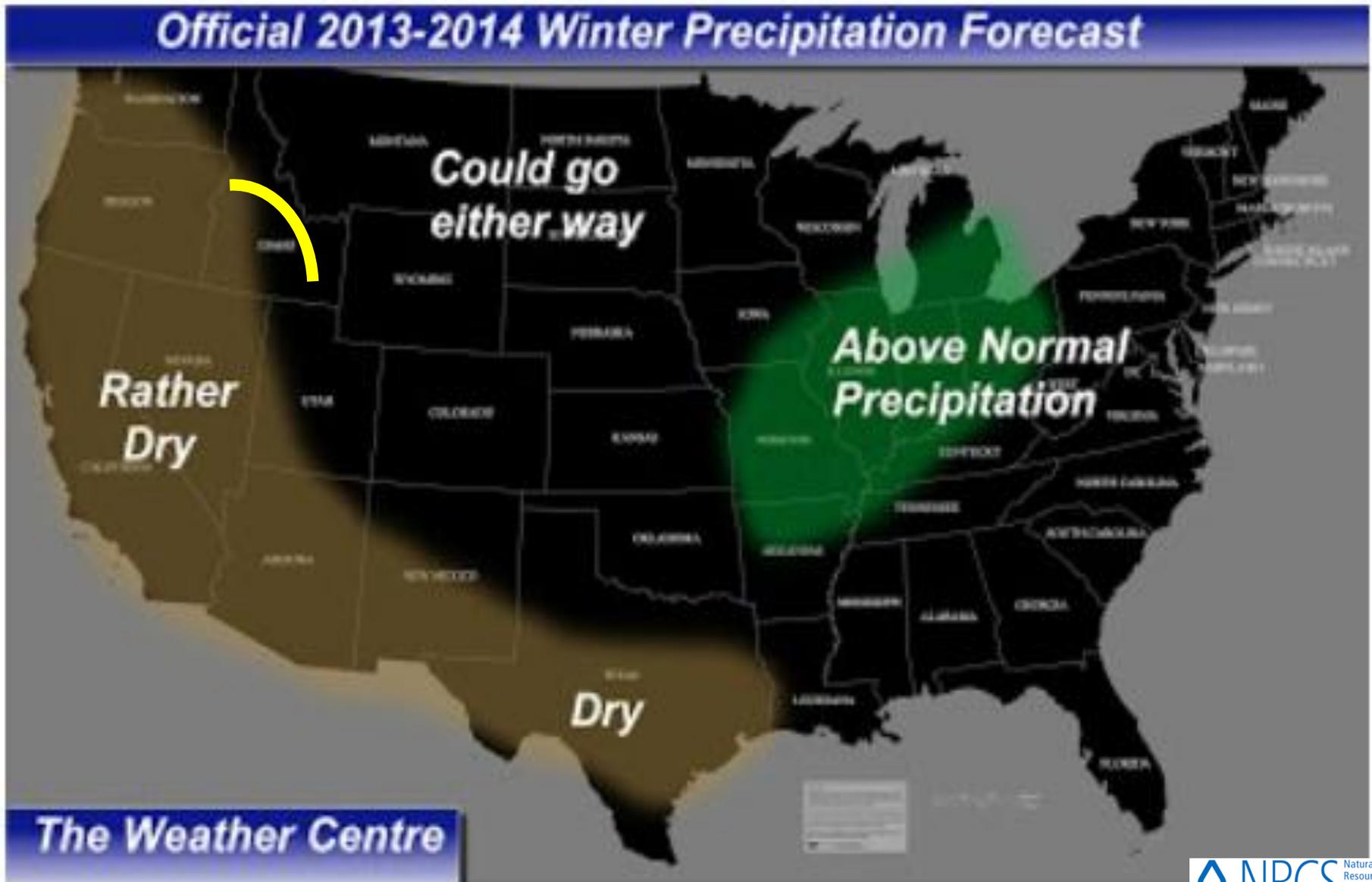
By **Andreat** 12:00 PM

### Official 2013-2014 Winter Temperature Forecast



The Weather Centre

Precipitation is a wild card this year. With a ridging pattern expected along the western coast of North America, drier than normal conditions are expected. I'm not completely confident in the entire Western US receiving dry weather, which is why it is labeled 'Rather Dry' over just dry.



Thursday, October 24, 2013

## Final 2013-2014 Winter Forecast

By [Andre](#) at 5:00 PM



*"Slow start to winter should deliver harsh January, February for Central US..."*

Hello everyone, this is the Final 2013-2014 Winter Forecast from The Weather Centre. This post will finalize my projections for this winter, with 3 month-averaged temperature, precipitation and snowfall graphics. Month by month descriptions will be written below each graphic. If you do not wish to see the discussion, you may scroll down to the graphics to see the forecast itself.

### Final 2013-2014 Winter Forecast Graphic



Thursday, October 24, 2013

Final 2013-2014 Winter Forecast

By [Andreat](#) 5:00 PM

*"Slow start to winter should deliver harsh January, February for Central US..."*

## Snowfall

### Final 2013-2014 Winter Forecast - Snowfall Forecast



Confidence: Medium to Medium-High

# Past Research & Examples of Recent Climate Variability

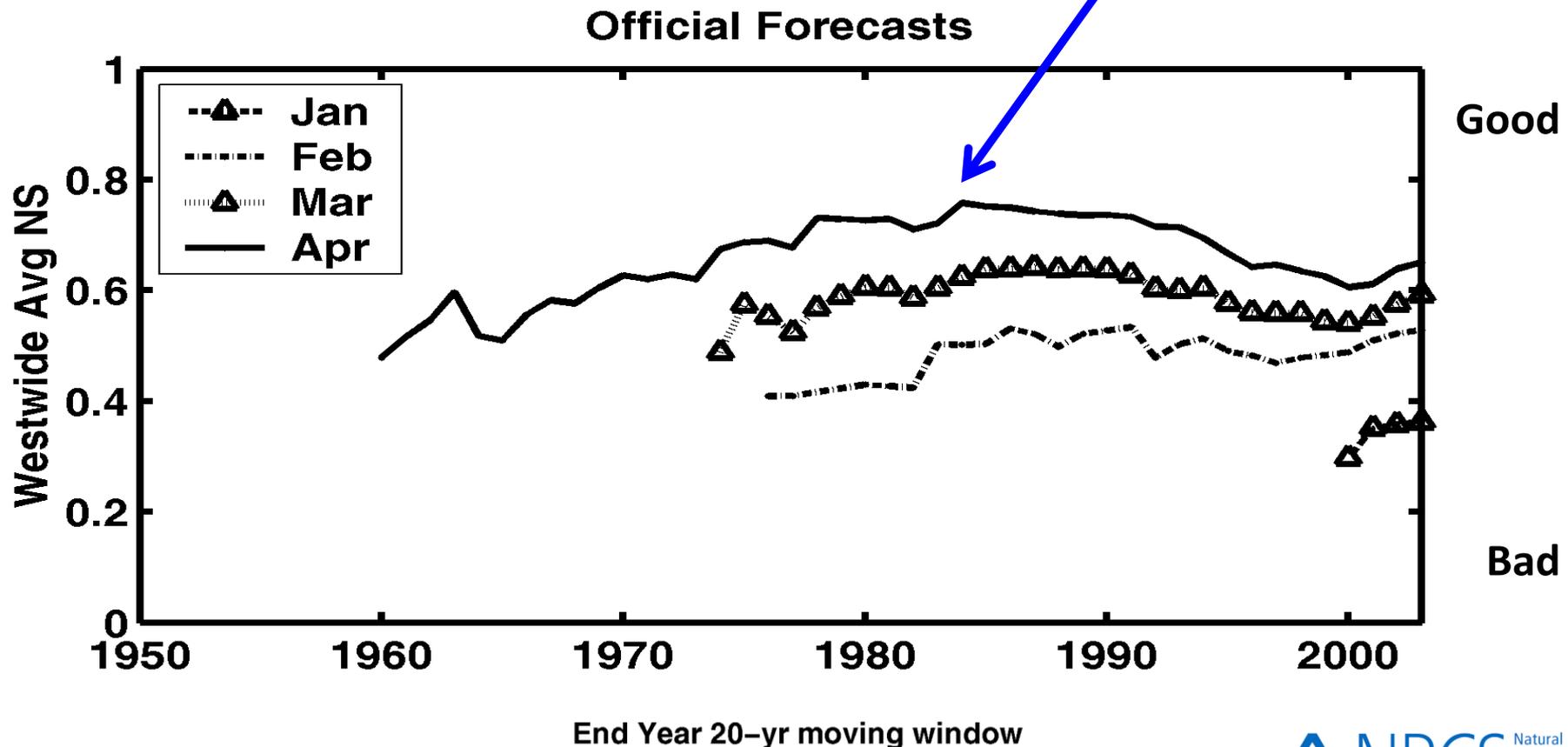
*By Tom Pagano who was at  
USDA NRCS NWCC in PDX*

## *Long-term Trends in Water Supply Forecast Skill*

**Are there any long-term trends  
in April 1<sup>st</sup> water supply forecast skill?**

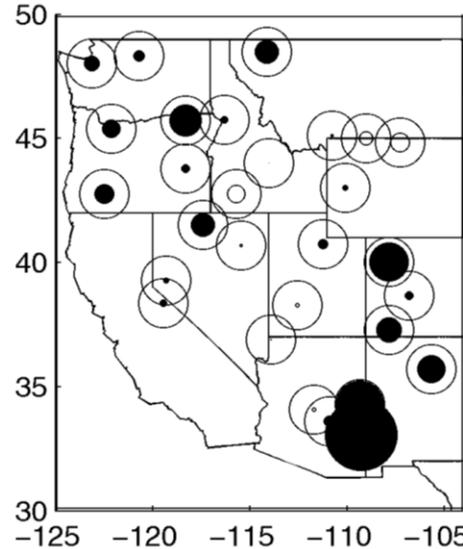
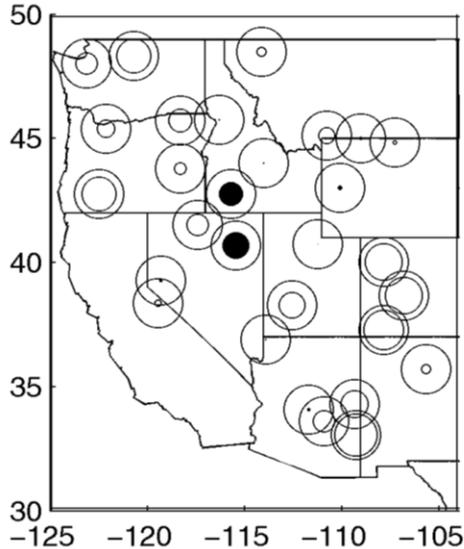
**If so, where, when and why?**

**Average skill for all forecasts over 20-yr moving window for the West, as a whole:  
April 1 forecast skill peaked around 1985 then slumped afterwards**



**1961-80**

**1981-00**



**Calm**



**Typical**



**Extreme**

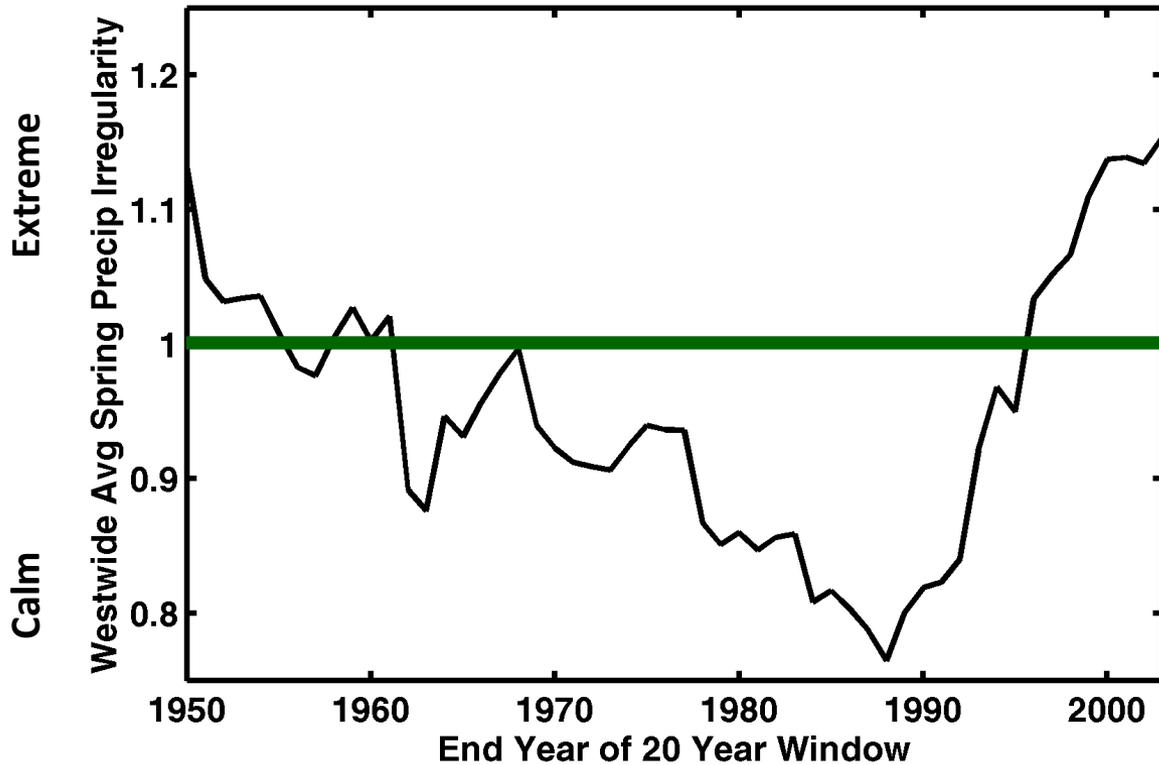
**Where is spring precipitation more irregular?**

**Now, especially in PNW & Southwest, whereas before it was very calm**

**This matches decline in forecast skill**

**20-year moving window  
Spring precipitation  
“irregularity”**

Westwide average of 29 basins

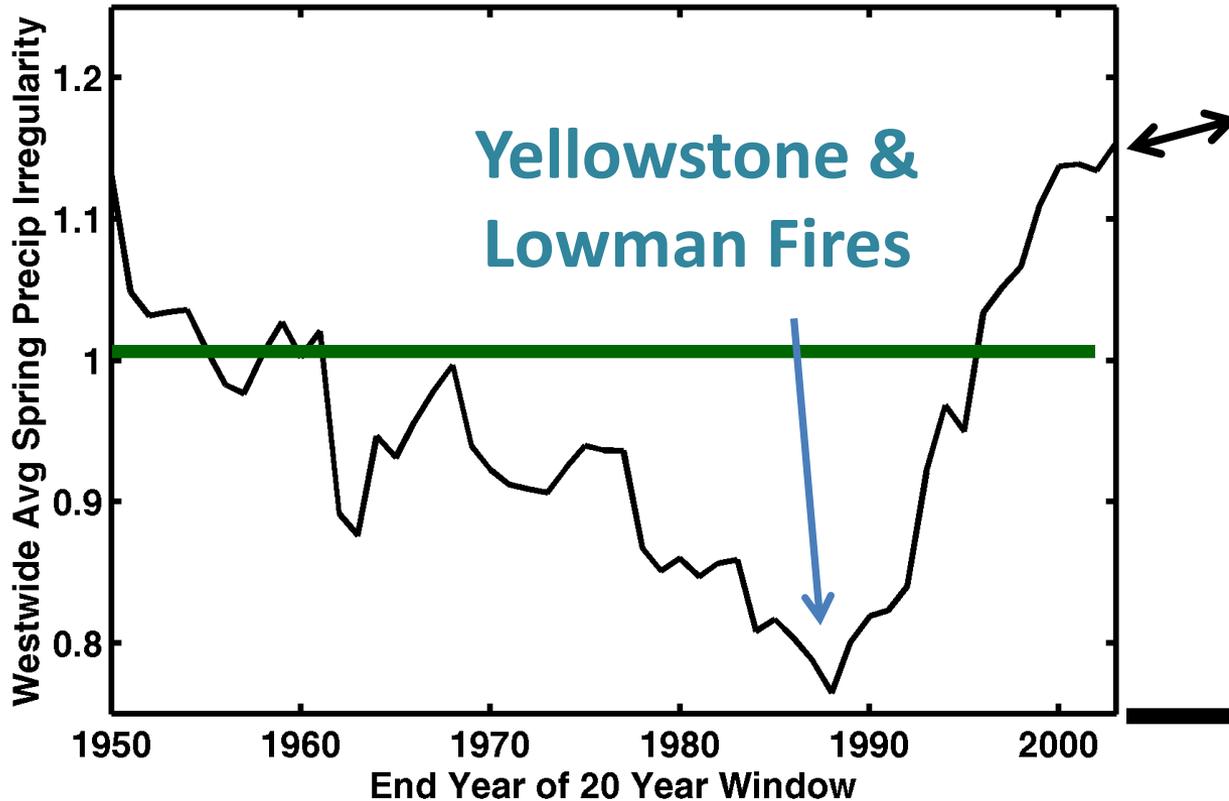


**> 1  
more extreme  
than usual**

**< 1  
calm, reliably  
near-normal**

# The question is:

Will trend continue?



or

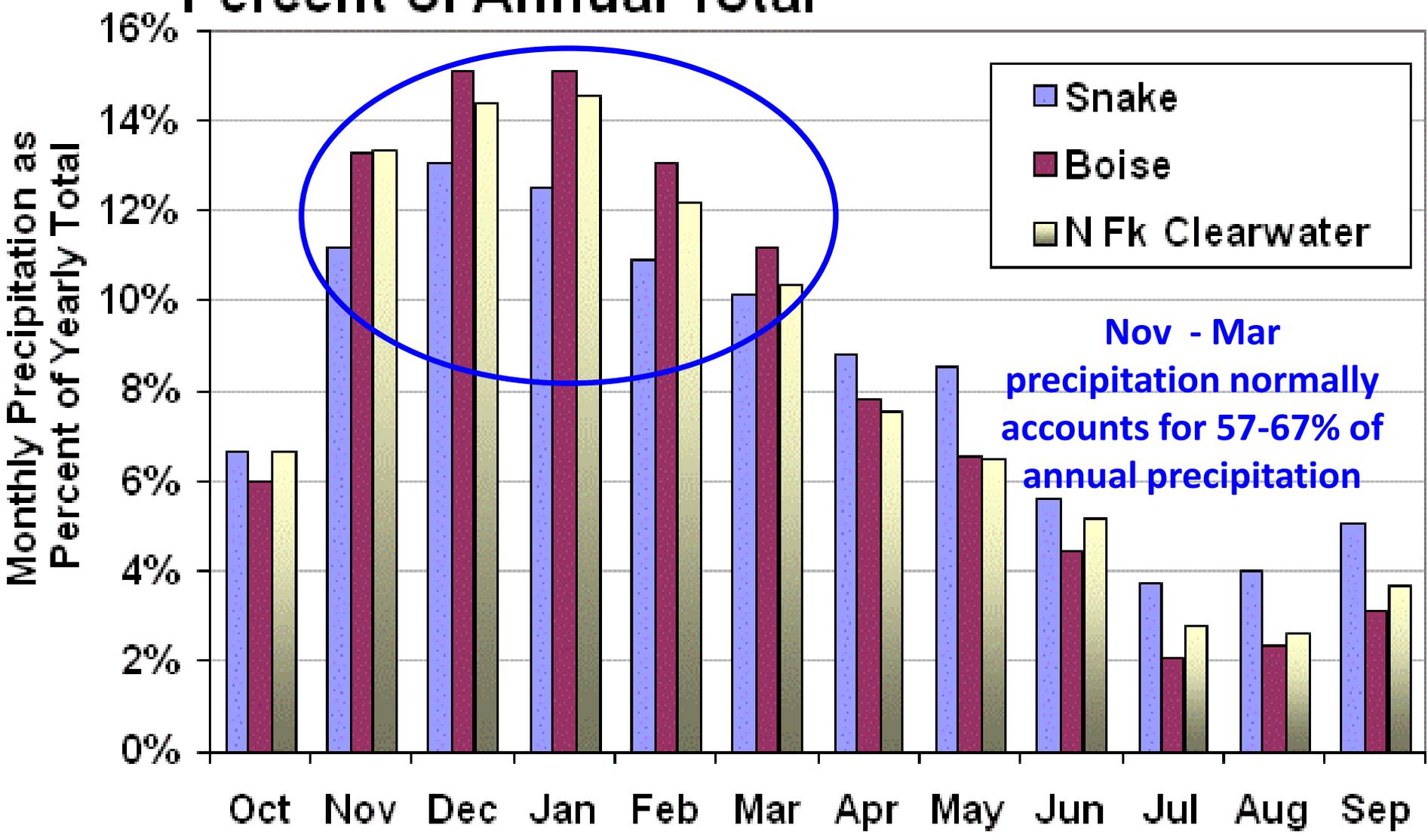
return to normal?

Based on data since mid 2000s, seems like trend is continuing.....

# Recent Climate Variability

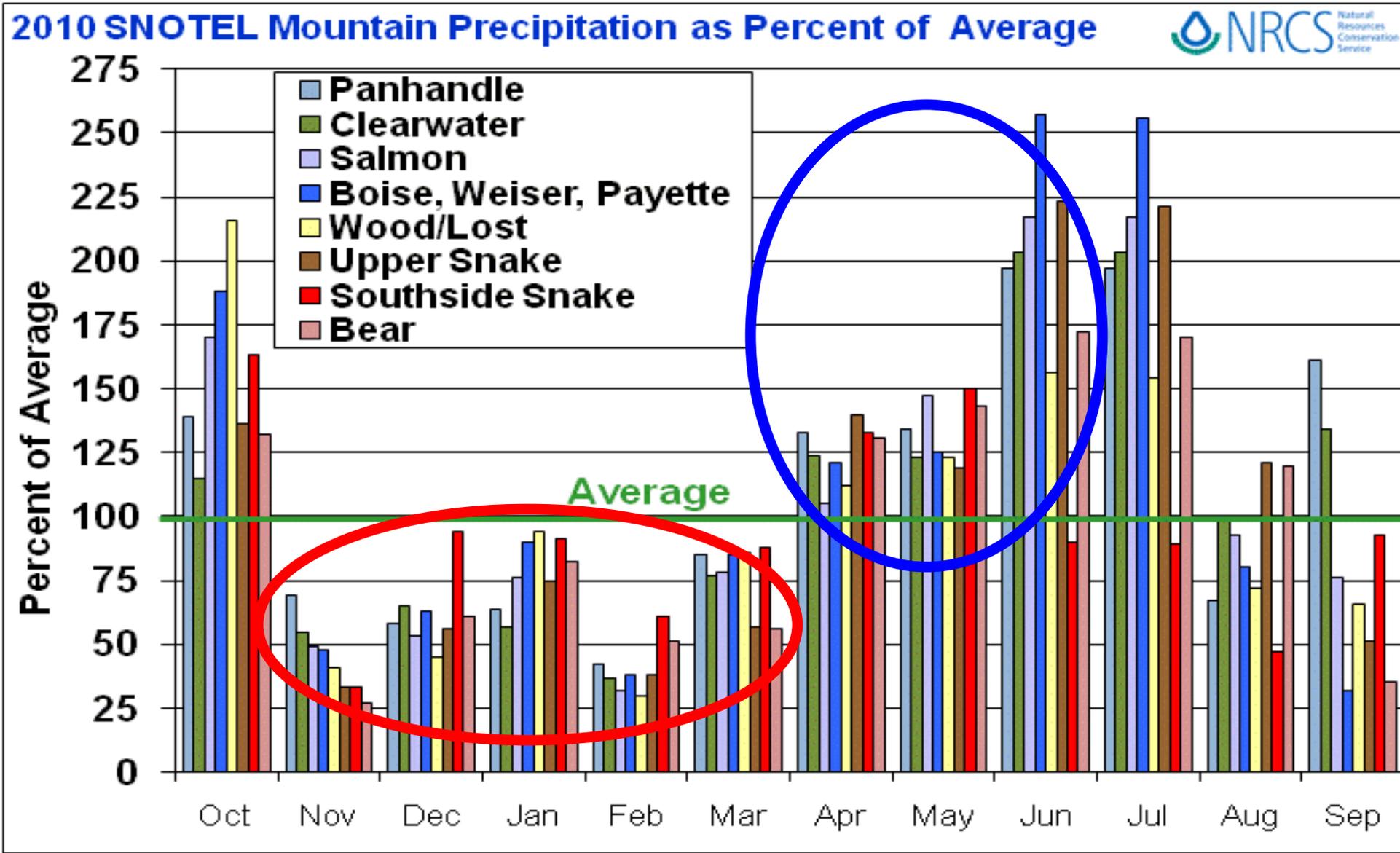


## Monthly Precipitation Basin Totals as Percent of Annual Total



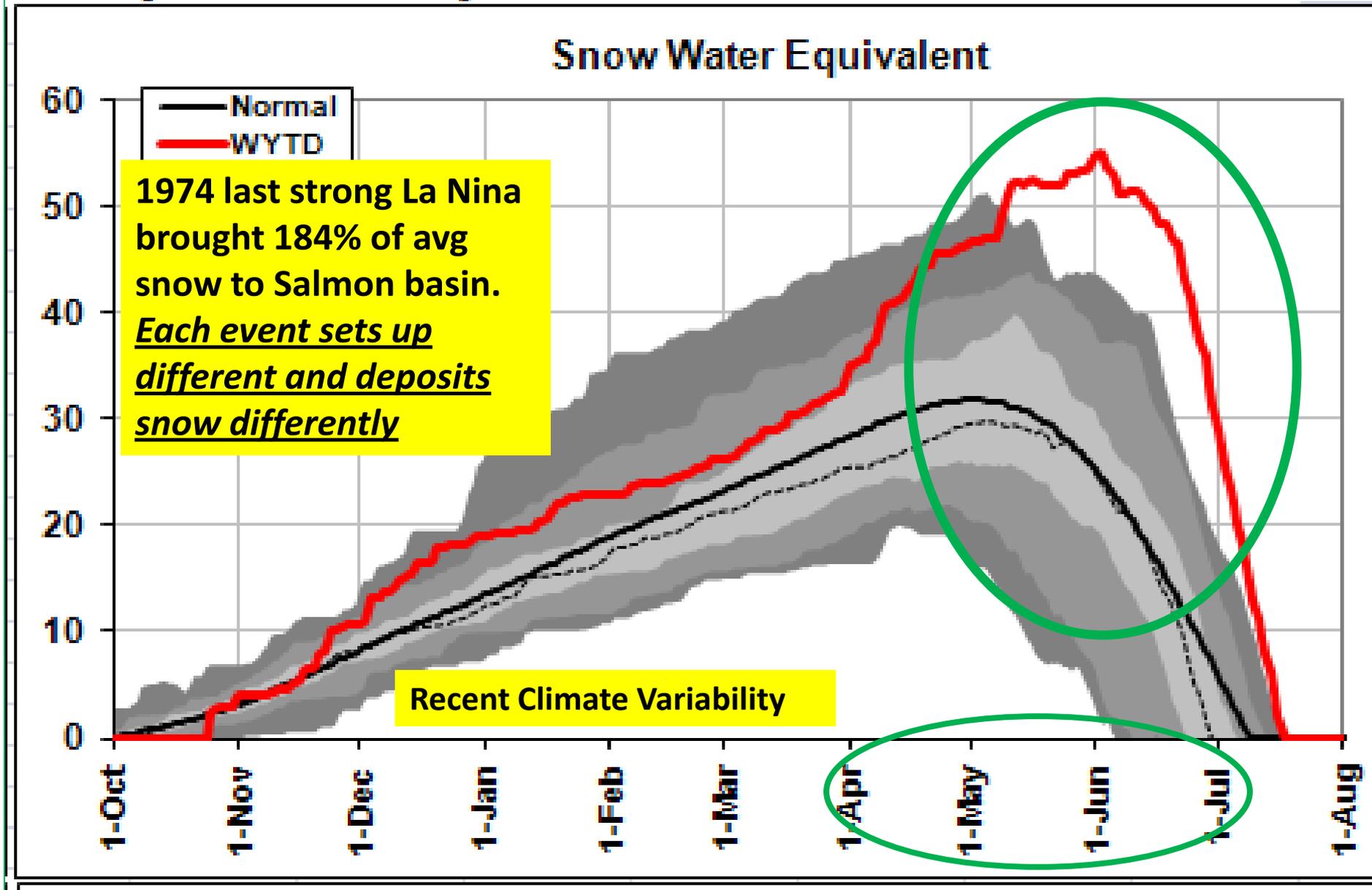
Recent Climate Variability

2010 Apr-Jun Precipitation ~ 20 stations received record high amounts



Nov-Mar Precipitation ~90 of 115 sites were 1<sup>st</sup>-5<sup>th</sup> driest

# 2011: Snow Water Equivalent Two Ocean Plateau SNOTEL in Yellowstone NP, Elevation 9,240 feet



# NRCS Snow School Lake Tahoe Jan 13, 2012

A week later major storms came  
into the West...



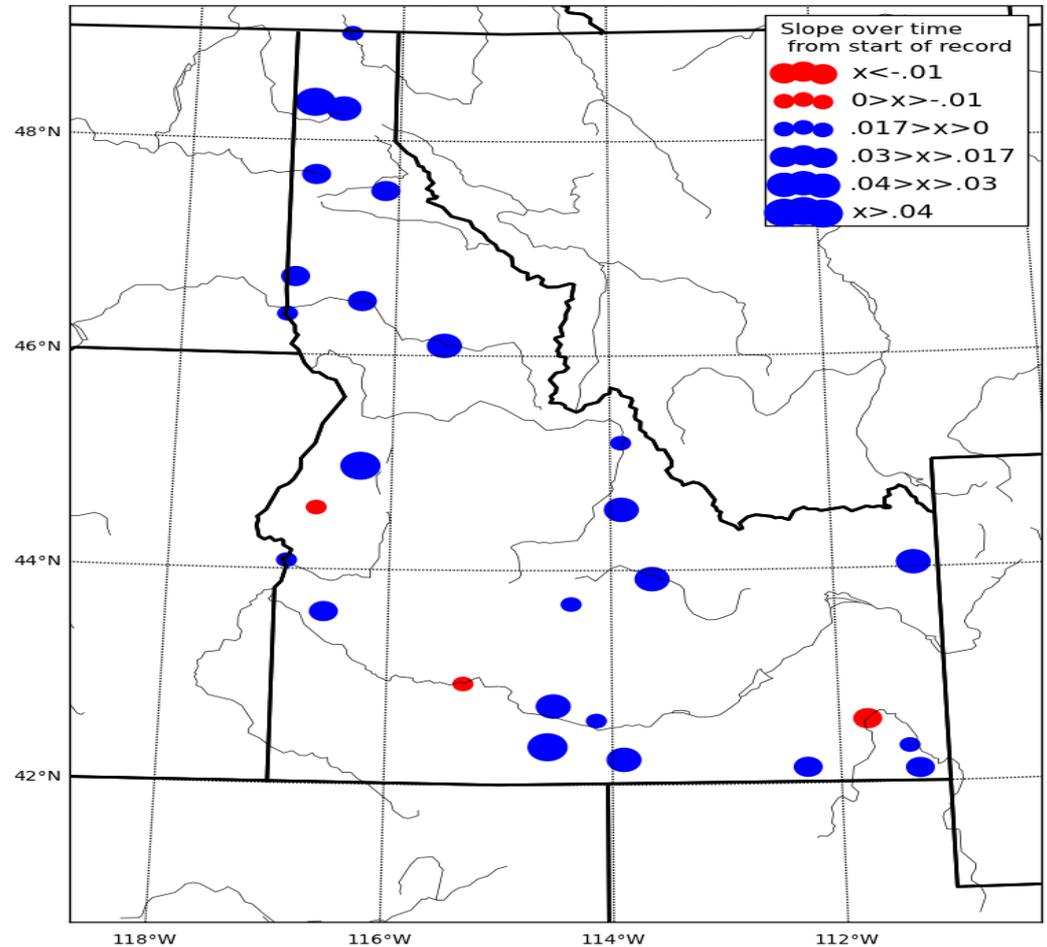
**Recent Climate Variability**



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

- **Observed warming has led to an intensification of the largest precipitation events, primarily in spring/summer<sub>2</sub>**

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



Recent Research on Climate Variability

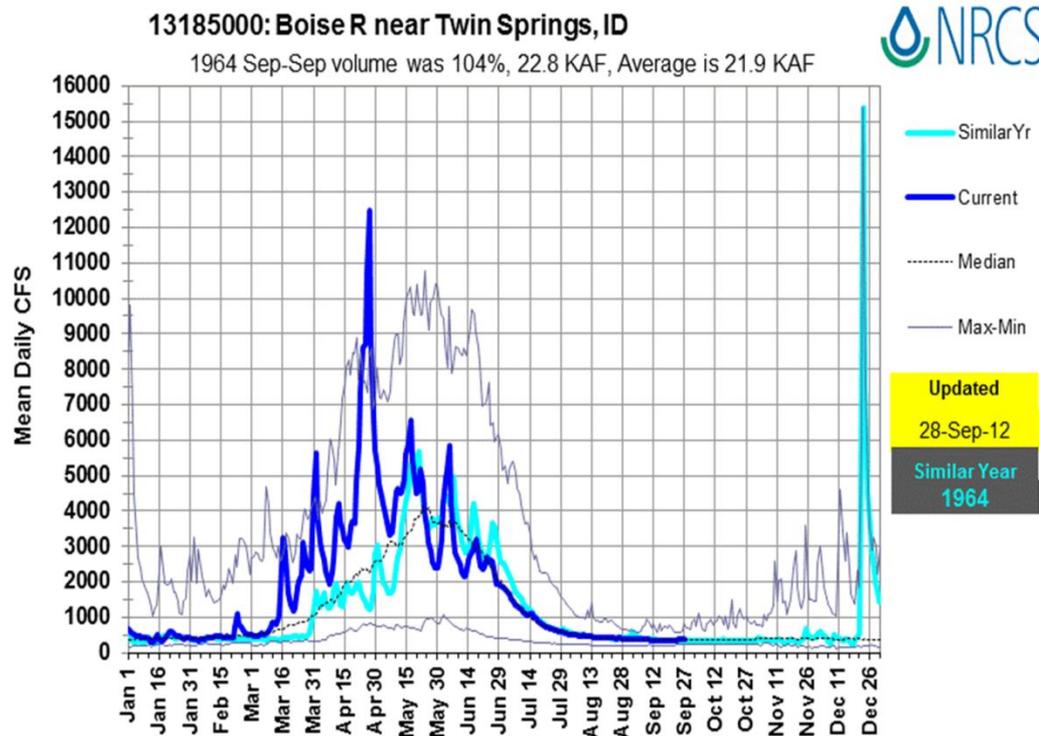
## March 2012

Snowmelt started melting two weeks earlier than normal this March at some SNOTEL sites. .... warm storms producing **new March precipitation records at 25 SNOTEL sites**. Rain produced snowmelt at mid-elevation stations across the state.

## April 2012

**Record April temperatures reaching 90 F in the valleys and 70 F in the mountains...** 1-2 inches of rain on April 26 increased streams to record high levels for this time of year. Using long term valley weather station data as a gauge, this heat wave was likely the hottest in April since 1875.

# Water Year 2012 Streamflow Boise River near Twin Springs



# 2013 WOOD and LOST RIVER BASINS

Oct-Dec precipitation - 2<sup>nd</sup> wettest in 30 years at 3 SNOTEL sites making it one of the best starts on record.

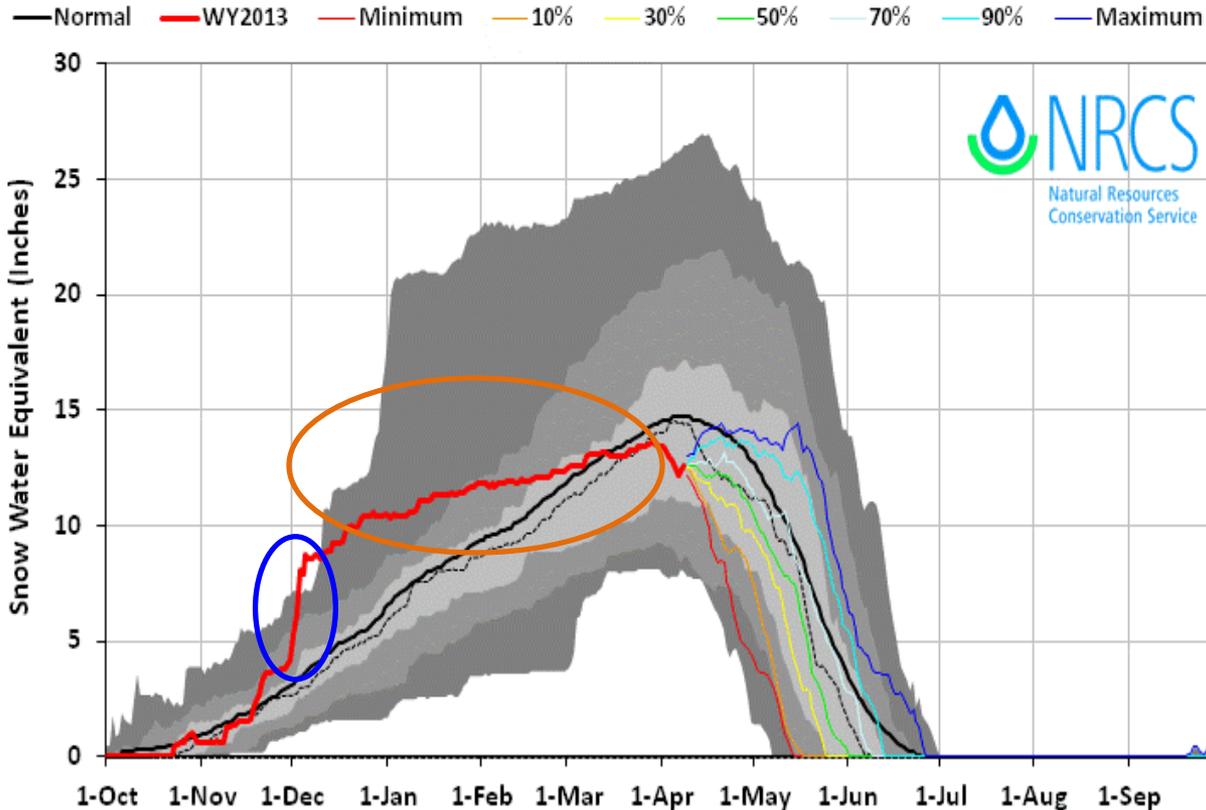
January 1 snowpacks were 130-160%.

**BUT** gave way to record low Jan-Apr SWE increases



Big Lost Basin 2013 Snow Water with Non-Exceedence Projections (5 sites)

*Based on Provisional SNOTEL data as of Apr 08, 2013*



Thanksgiving at Galena Summit



# The Missing Mountain Water: Slower Westerlies Decrease Orographic Enhancement in the Pacific Northwest USA

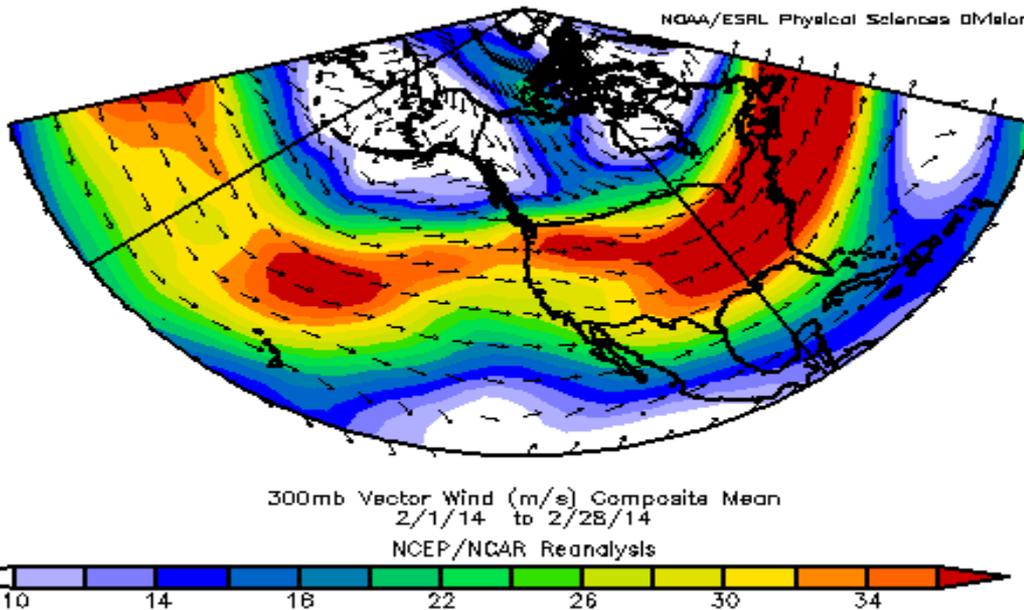
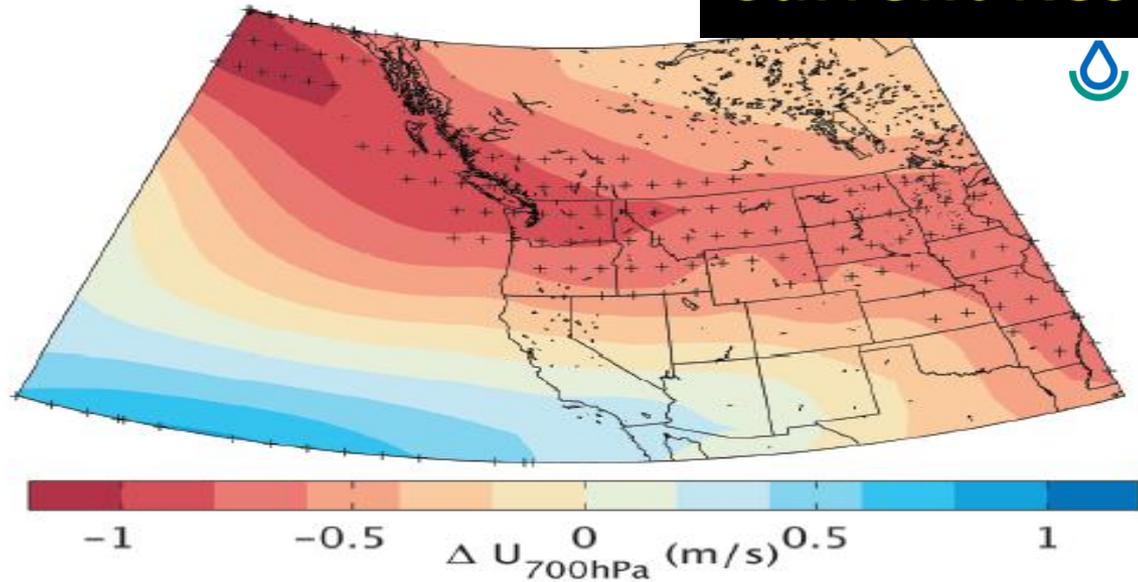
C. H. Luce,<sup>1\*</sup> J. T. Abatzoglou,<sup>2</sup> Z. A. Holden<sup>3</sup>

**Current Research**



Trends in streamflow timing and volume in the Pacific Northwest United States have been attributed to increased temperatures, because trends in precipitation at lower-elevation stations were negligible. We demonstrate that observed streamflow declines are probably associated with declines in mountain precipitation, revealing previously unexplored differential trends. Lower-troposphere winter (November to March) westerlies are strongly correlated with high-elevation precipitation but weakly correlated with low-elevation precipitation. Decreases in lower-tropospheric winter westerlies across the region from 1950 to 2012 are hypothesized to have reduced orographic precipitation enhancement, yielding differential trends in precipitation across elevations and contributing to the decline in annual streamflow. Climate projections show weakened lower-troposphere zonal flow across the region under enhanced greenhouse forcing, highlighting an additional stressor that is relevant for climate change impacts on hydrology.

**Fig. 4. Projected changes in November to March u700 zonal wind averaged across 24 CMIP5 models, 2071–2100 versus 1971–2000 RCP8.5. Plus signs denote areas where >80% of the models agree on the sign of the change. 20 of the 24 models predict a decrease in the PNW.**



**Feb 2014 wind pattern is in contrast to the January blocking ridge. A very strong jet stream allowed a 'parade' of weather systems to impact the PNW in Feb & Mar**

# Setting the Stage for Winter 2013-2014

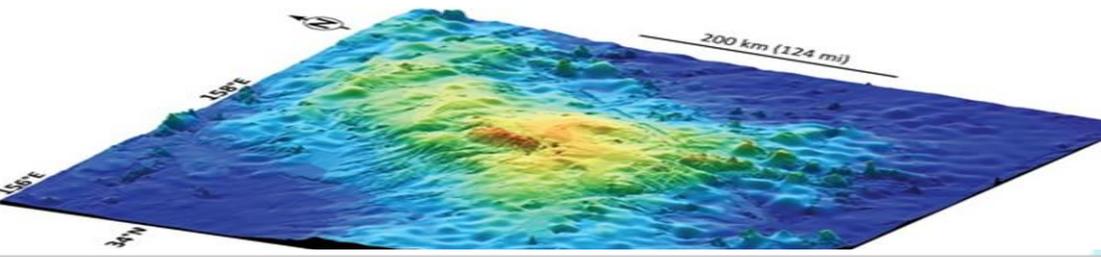
Natural Cycles – rate of change might be key to better understand...

SCIENCE -- SEPTEMBER 11, 2013 AT 9:36 AM ET

## The largest volcano on earth discovered beneath the Pacific Ocean

BY: NEWS DESK

Like 140 Share



Home | U.K. Home | News | Sport | U.S. Showbiz | Femail | Health | Science

News Home | Arts | Headlines | Pictures | Most read | News Board

## Iceland's latest volcano eruption worsens

Sept 2014

06/09 12:53 CET



euronews

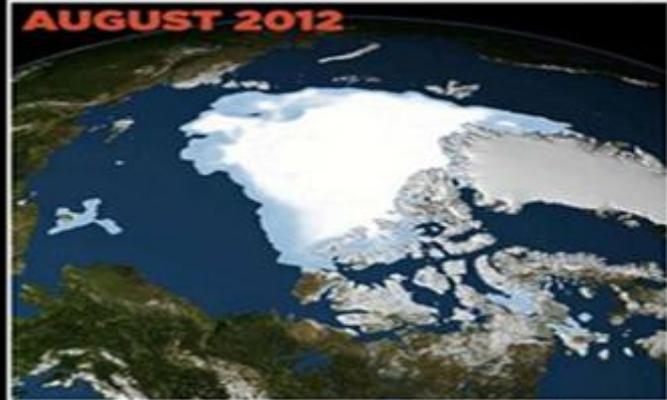
## And now it's global COOLING! Return of Arctic ice cap as it grows by 29% in a year

- 533,000 more square miles of ocean covered with ice than in 2012
- BBC reported in 2007 global warming would leave Arctic ice-free in summer by 2013
- Publication of UN climate change report suggesting global warming caused by humans pushed back to later this month

## New Volcanic Island near Japan Nov 2013

### HOW ICE SHEET GREW 533,000 SQUARE MILES IN A YEAR

**AUGUST 2012**



**CONTRACTION:** This Nasa satellite image shows the ice at the smallest extent on record, with much of the Arctic Ocean uncovered

**AUGUST 2013**



**RECOVERY:** Contrary to predictions that the ice would have vanished by this summer, it has actually increased by 29 per cent from last year



clouds

ash plume

detail

2,000 m

download large image (2 MB, JPEG, 2208x3360)

download CoreTiff file (18 MB, TIFF)

download Google Earth file (KML)

acquired March 20, 2013

acquired March 20, 2013

acquired March 20, 2013

in November 2013, a seafloor volcano in the western Pacific Ocean erupted and expanded to the water line. The new island, or 'Mujina' in Japanese, is a volcanic island that had last erupted and expanded one island, and the volcanic eruption shows no sign

**NRCS** Natural Resources Conservation Service

# Arctic Sea Ice News & Analysis

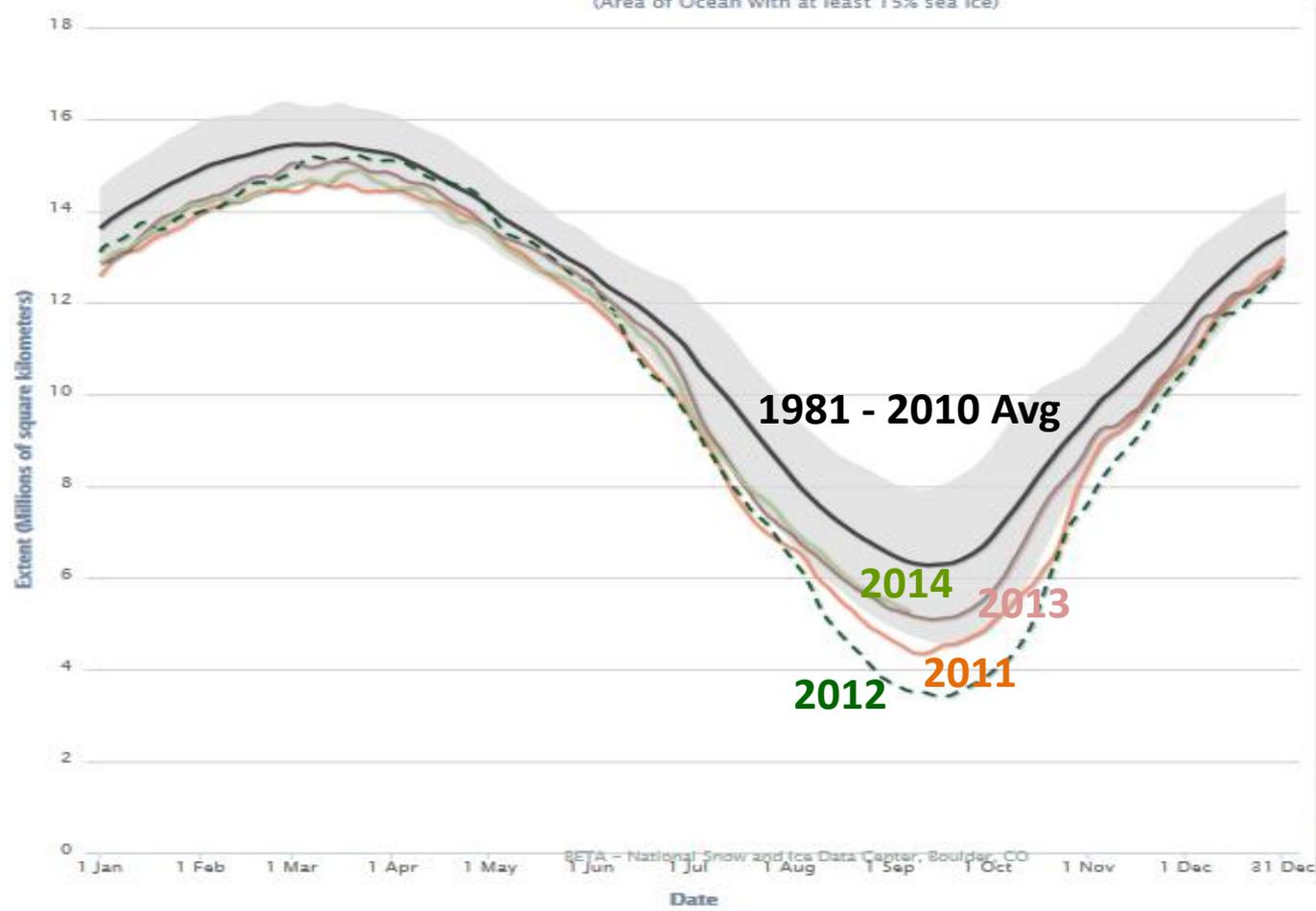
[Arctic Sea Ice News & Analysis home](#)

## Charctic Interactive Sea Ice Graph

Arctic

Antarctic

Arctic Sea Ice Extent  
(Area of Ocean with at least 15% sea ice)



- 1981-2010 Average
- ±2 Standard Deviations
- 1979
- 1980
- 1981
- 1982
- 1983
- 1984
- 1985
- 1986
- 1987
- 1988
- 1989
- 1990
- 1991
- 1992
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- - 2012
- - 2012
- - 2014
- Show all
- Hide all

BETA - National Snow and Ice Data Center, Boulder, CO

# Arctic Circle Observations Indicate Immense Cold Air Available

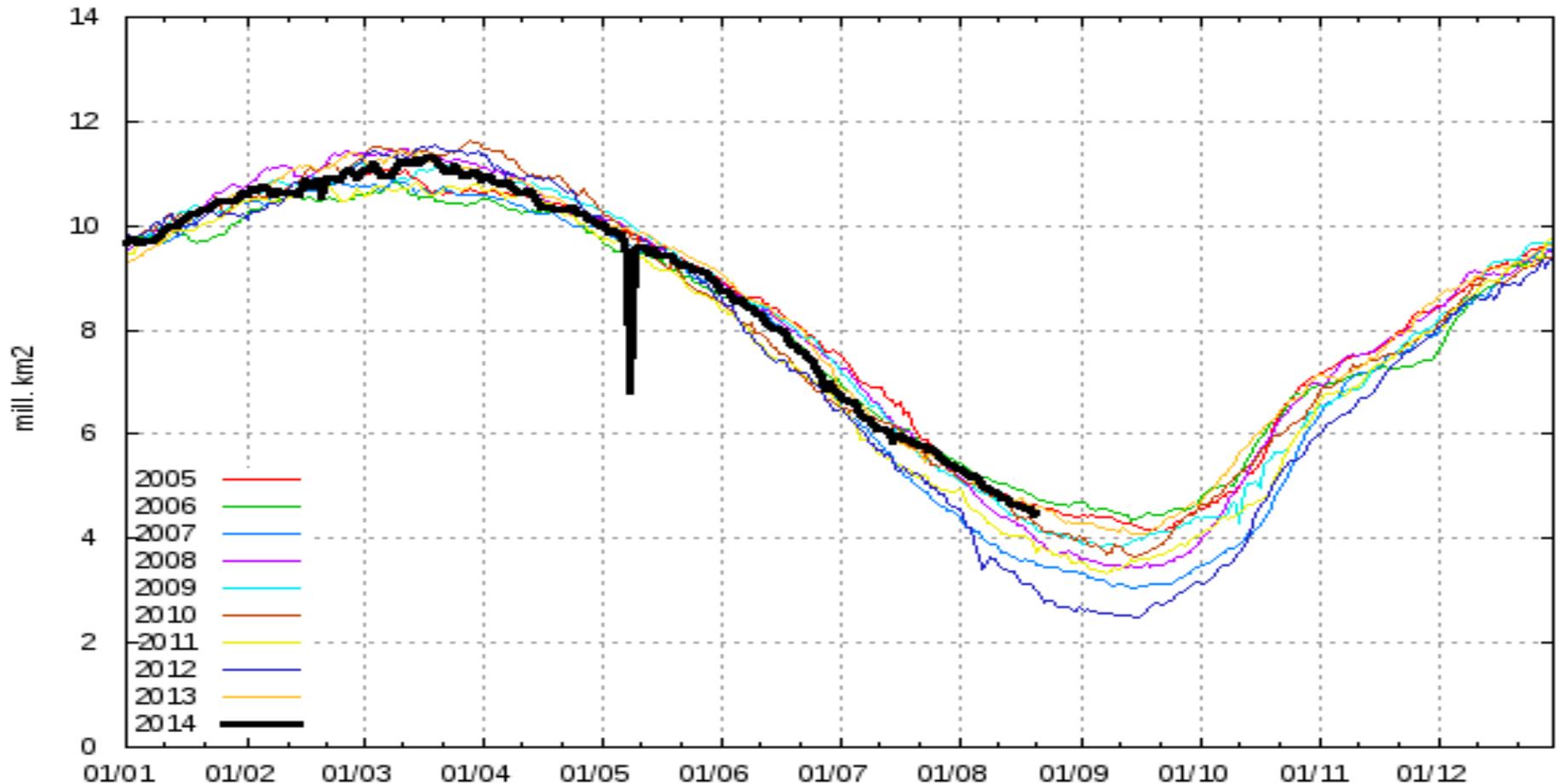
Posted: 23 Aug 2014 03:27 PM PDT

Similar to last year, Arctic sea ice is running above normal, temperatures are below normal.

What we can gather is:

- there is a vast reservoir of cold air available up north;
- a positive sign for those wishing for a repeat of this past winter.

Andrew



# Winter 2013-2014 What Happened?

Boulder Mountains near Sun Valley , looking SE from Hwy 93 South of Galena Lodge after Major Snow, Rain & Wind Event January 11-14, 2014



# Surf's Up

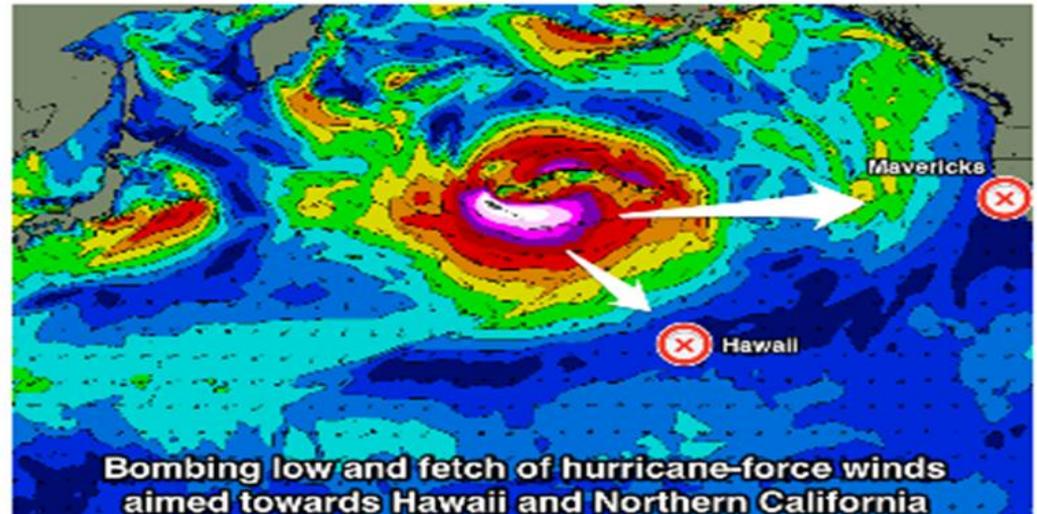
Jan 22, 2014

30-40 (60-80) foot waves & erratic winds cancel Hawaii Surfing Event



## All eyes on Hawaii as huge storm approaches

A fortnight ago the eyes of the surfing world were on Europe and the 'Hercules' storm that burst out of the North Atlantic Ocean. At the time Hawaii was almost unsurfably small. Since then a series of storms in the North Pacific have wrested attention back to the Hawaiian Islands. The great run of swell will be capped by a beast of a system; a storm that has longtime forecasters cooing with excitement.

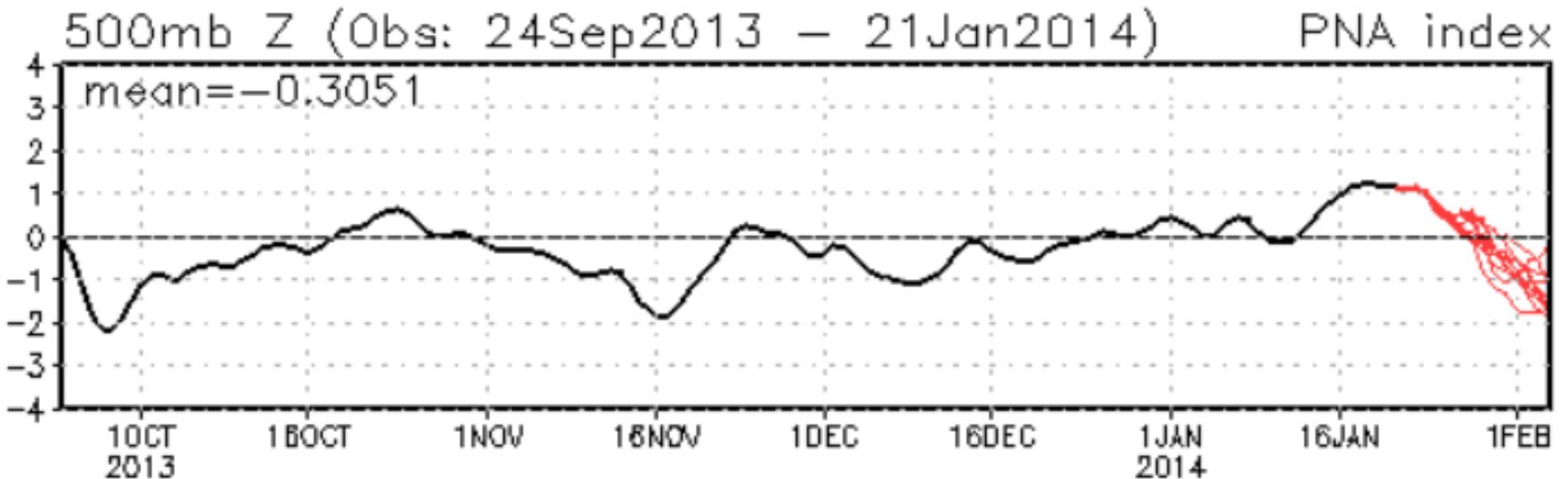


Bombing low and fetch of hurricane-force winds aimed towards Hawaii and Northern California

# The PNA is getting interestingly negative:

Pacific North American Index one parameter (index) that helps bring moisture to Pacific NW but there are others needed too

## PNA: Observed & ENSM forecasts



# Another Signal of What Might be Expected Soon:

Jan 14 2014 daily SOI (Southern Oscillation Index) value was above 50 & pressure at Darwin was at 998mb for 2<sup>nd</sup> consecutive day.

*An SOI value of 50 does not occur often, based on 23 years of record.*

Here are FEW times the daily SOI value has been in the mid 40's or above and following events:

- Jan 14/15 2014: (44.17, 50.71)... ??? Abundant Moisture Feb/Mar 2014
- Dec 25 2011: (49.20) ..... Snowstorm/Arctic Blast Jan 14, 2012
- Jan 17/18 2011: (50.87, 55.43)..... Snow/Arctic Blast Feb 24, 2011
- Dec 22/23 2003: (44.34, 44.34).... Snow/Arctic Blast Jan 2, 2004
- Dec 4/5 2000: (49.61, 47.14)..... Modified Arctic air Dec 10-15, 2000
- Dec 11/12 1998: (51.02, 49.60)..... Major Arctic Blast Dec 19, 1998

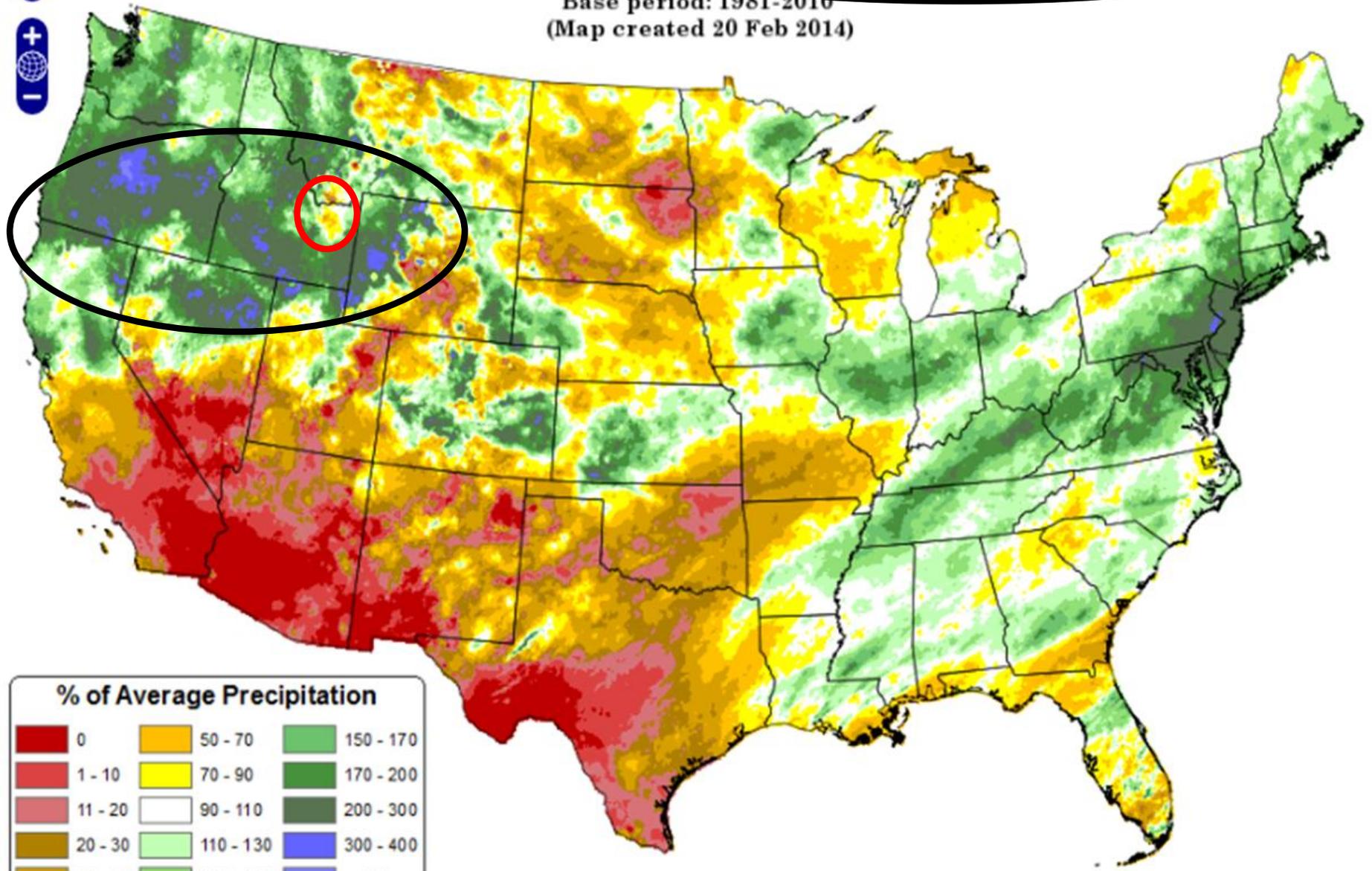
**It's no fool proof method, but  
is now showing agreement with weather models.**

# Total Precipitation Anomaly: 01 February 2014 - 19 February 2014

Period ending 7 AM EST 19 Feb 2014

Base period: 1981-2010

(Map created 20 Feb 2014)



## % 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

# Total Precipitation Anomaly: February 2014

Period ending 28 Feb 2014

Base period: 1981-2010

(Map created 13 Aug 2014)

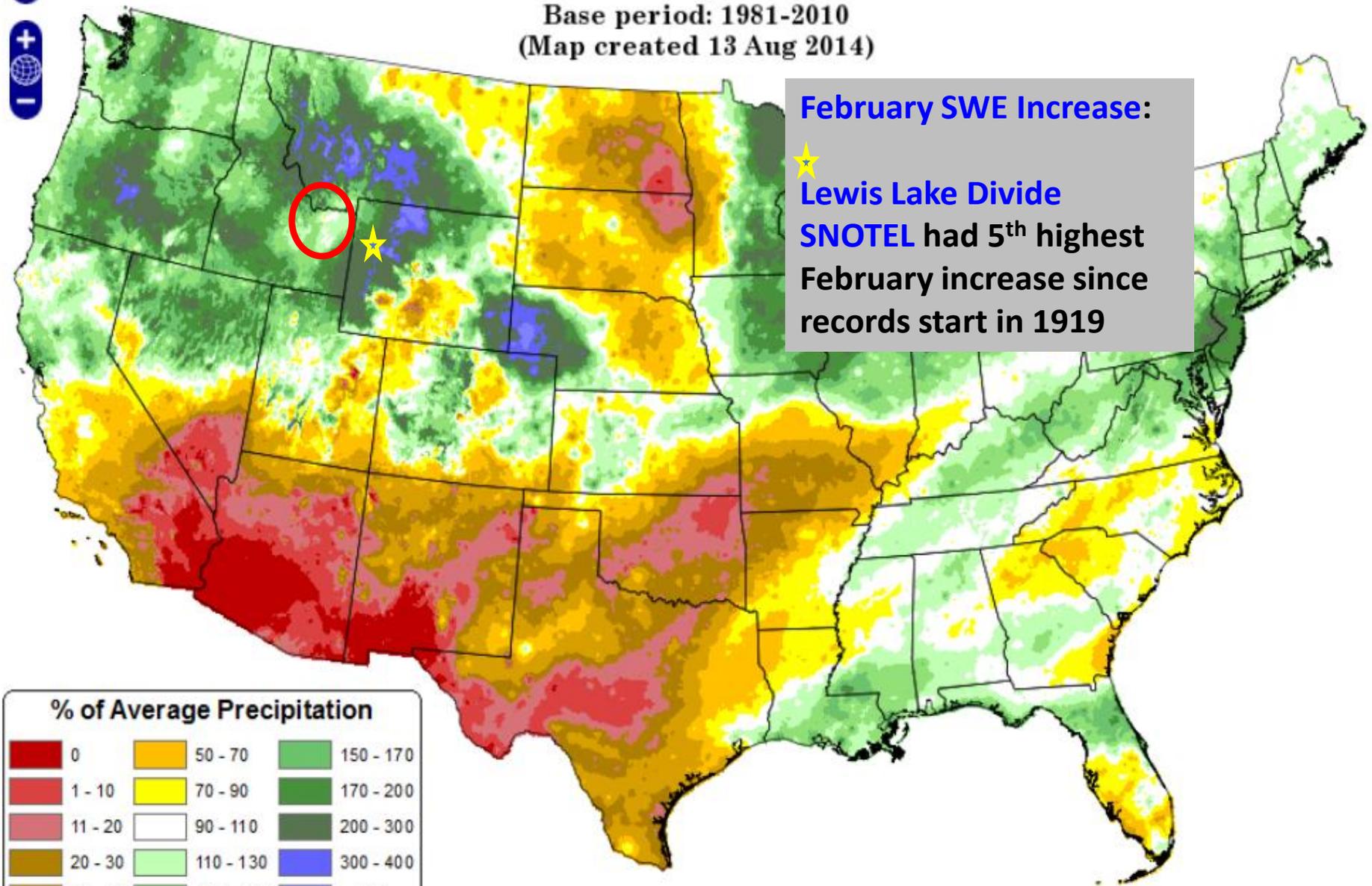


**February SWE Increase:**



**Lewis Lake Divide**

**SNOTEL had 5<sup>th</sup> highest February increase since records start in 1919**

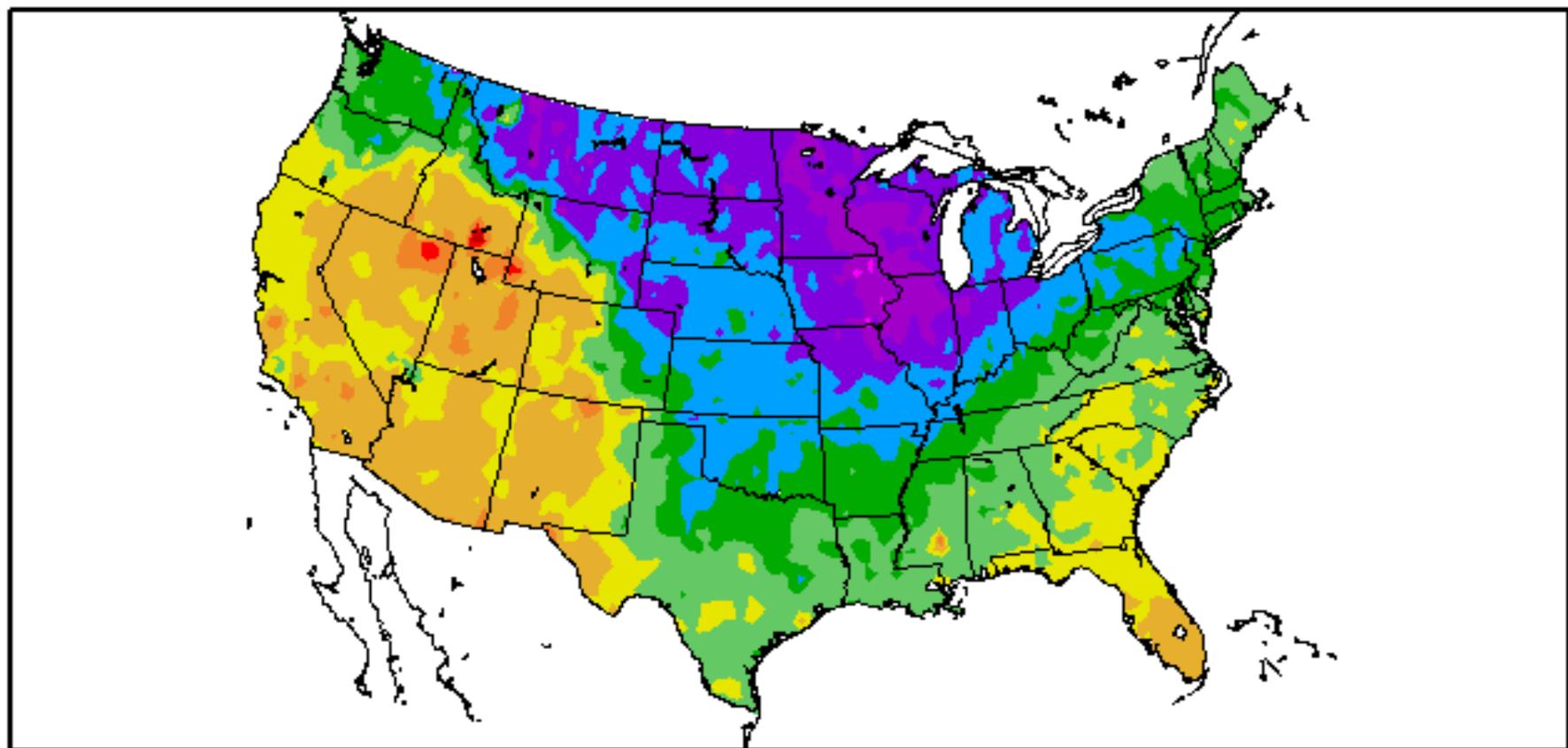


## % of Average Precipitation

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

# Departure from Normal Temperature (F)

## 2/1/2014 - 2/28/2014



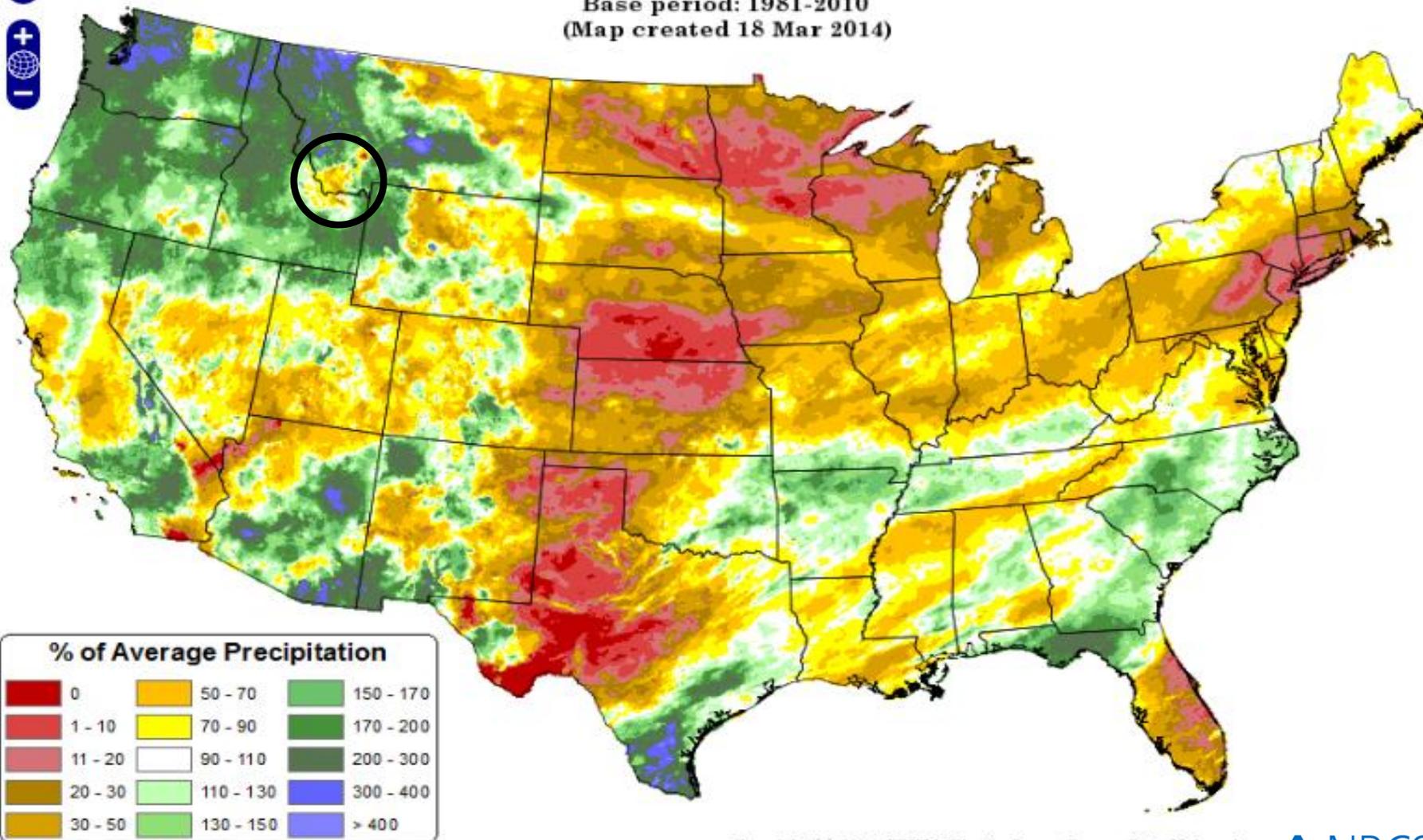
# Precipitation in 1<sup>st</sup> half of March was still above average – people were asking how long can this last....

## Total Precipitation Anomaly: 01 March 2014 - 17 March 2014

Period ending 7 AM EST 17 Mar 2014

Base period: 1981-2010

(Map created 18 Mar 2014)



## *From March 19, 2014 talk*

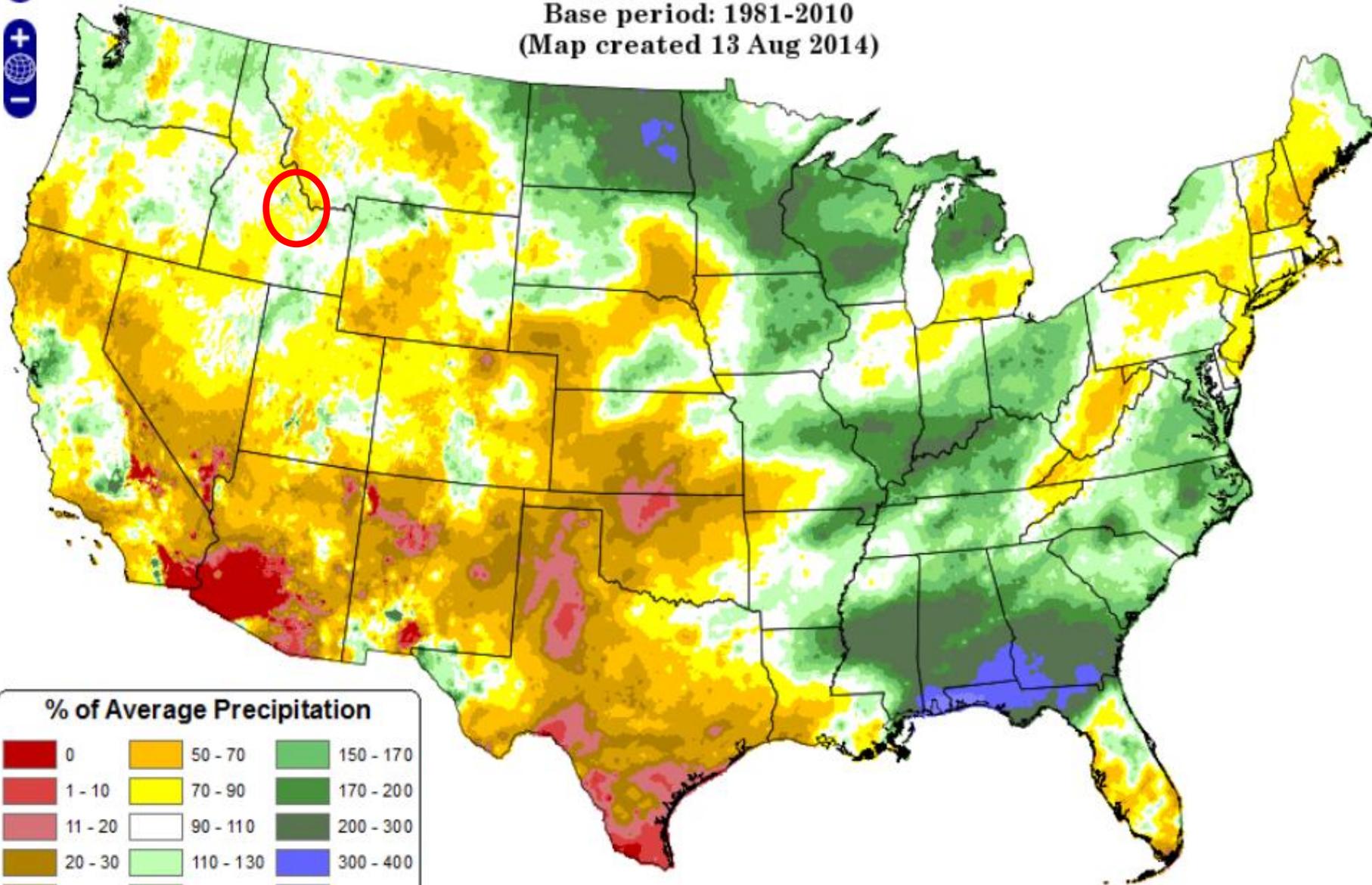
- Long range and short range forecasts are not showing strong agreement signals, confidence is low in forecasts beyond ~5 days or so....
- Persistence is still best forecast and wins in these types of weather patterns – what you see in your area is what you will continue to have until a different weather pattern sets in

# Total Precipitation Anomaly: April 2014

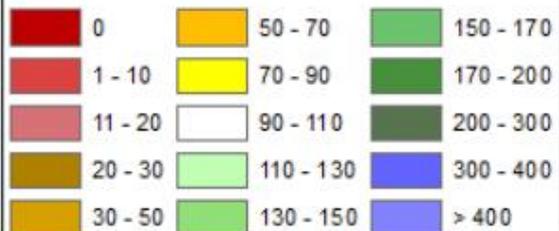
Period ending 30 Apr 2014

Base period: 1981-2010

(Map created 13 Aug 2014)



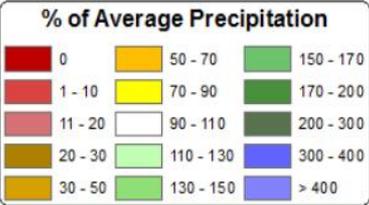
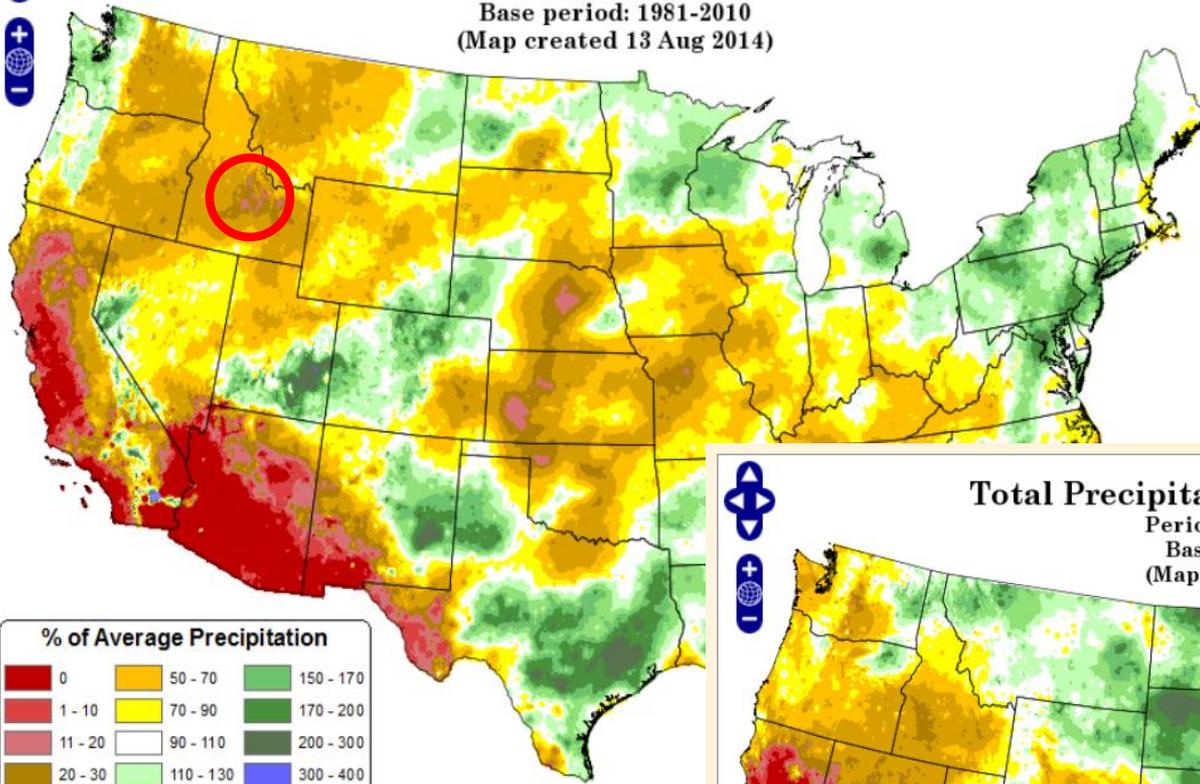
## % of Average Precipitation



Copyright (c) 2014, PRISM Climate Group, Oregon State University

### Total Precipitation Anomaly: May 2014

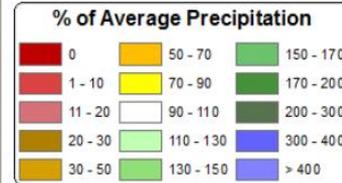
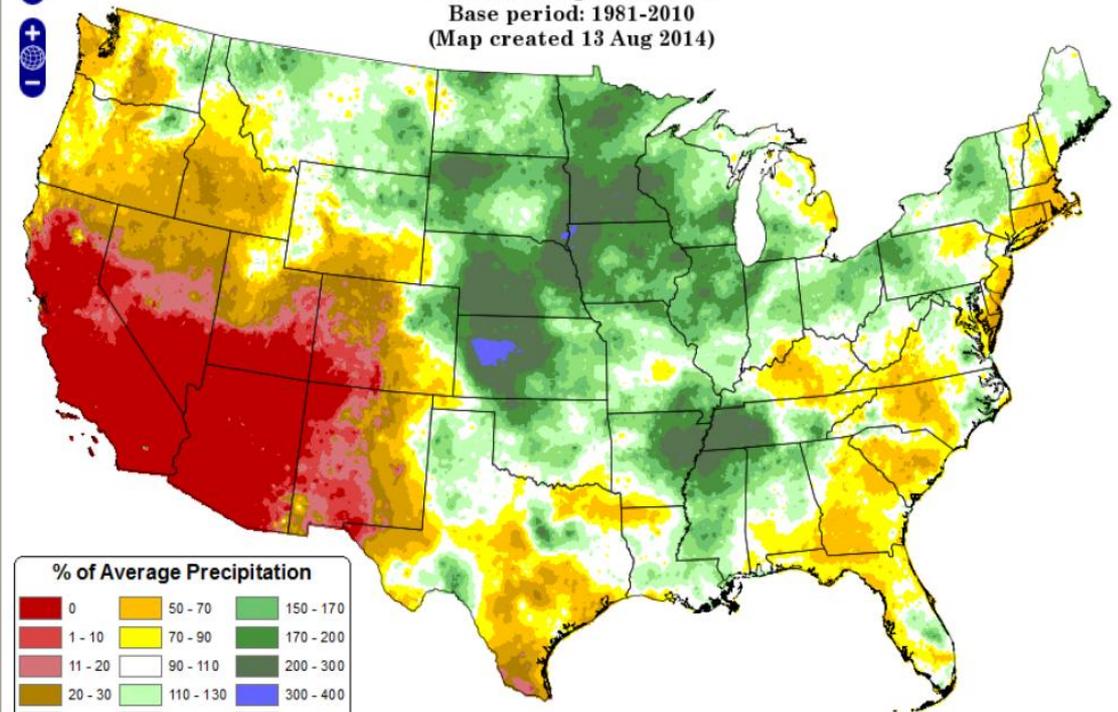
Period ending 31 May 2014  
 Base period: 1981-2010  
 (Map created 13 Aug 2014)



Copyright (c) 2014, PR

### Total Precipitation Anomaly: June 2014

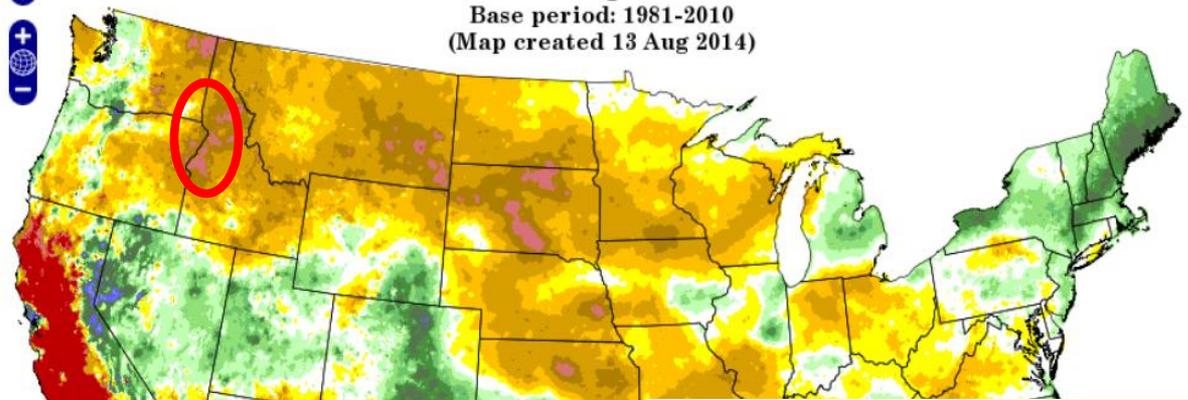
Period ending 30 Jun 2014  
 Base period: 1981-2010  
 (Map created 13 Aug 2014)



Copyright (c) 2014, PRISM Climate Group, Oregon State University

# Total Precipitation Anomaly: July 2014

Period ending 31 Jul 2014  
Base period: 1981-2010  
(Map created 13 Aug 2014)



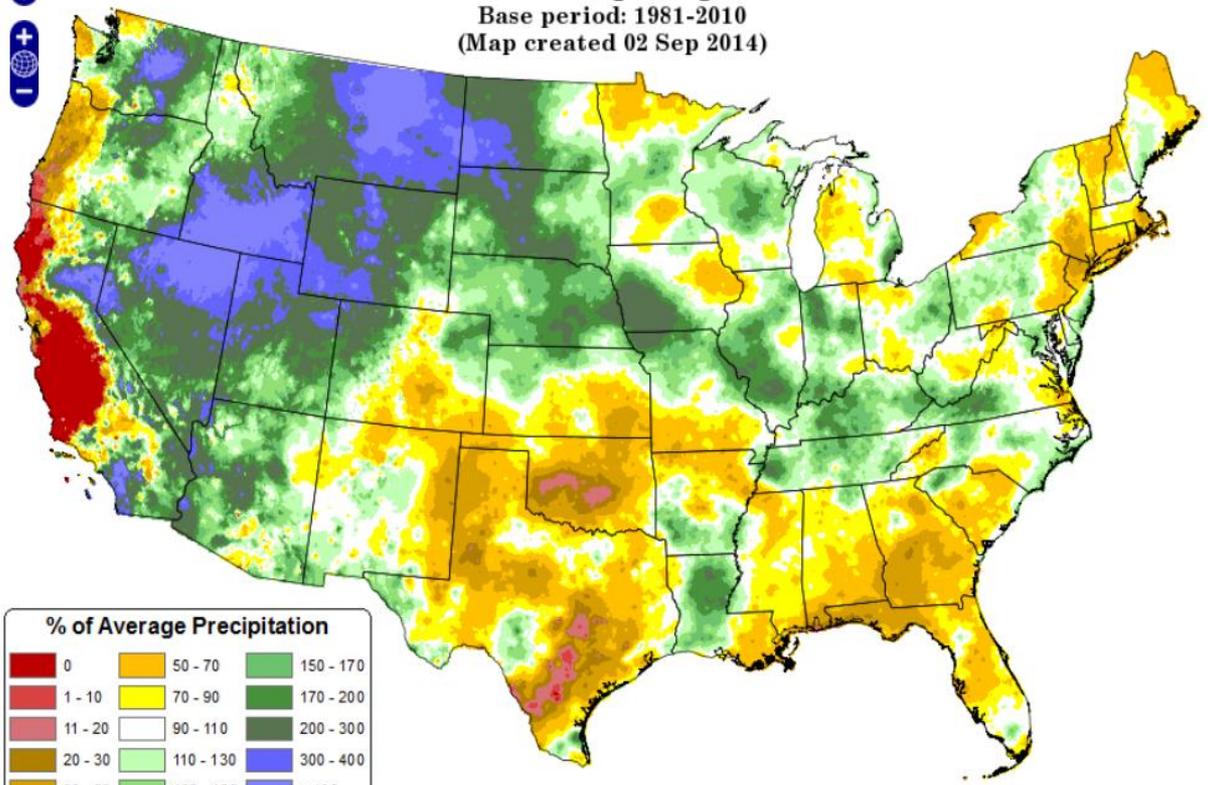
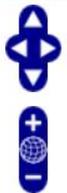
**% of Average Precipitation**

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

Copyright (c) 201

# Total Precipitation Anomaly: August 2014

Period ending 31 Aug 2014  
Base period: 1981-2010  
(Map created 02 Sep 2014)



**% 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

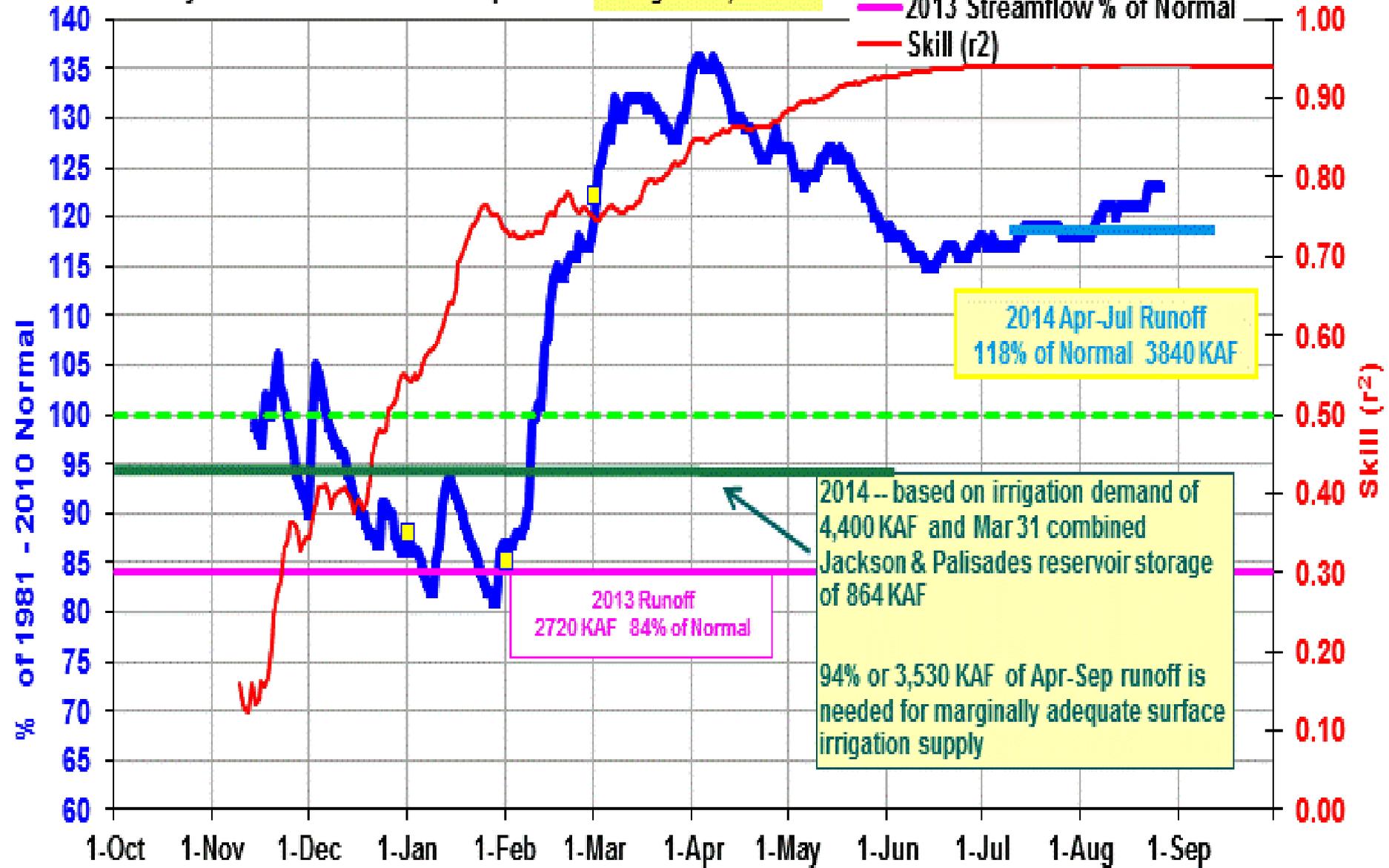
Copyright (c) 2014, PRISM Climate Group, Oregon State University

2014 Snake River near Heise: Apr - Jul Volume  
 NRCS Monthly Forecasts are Yellow Squares

Updated  
 August 26, 2014



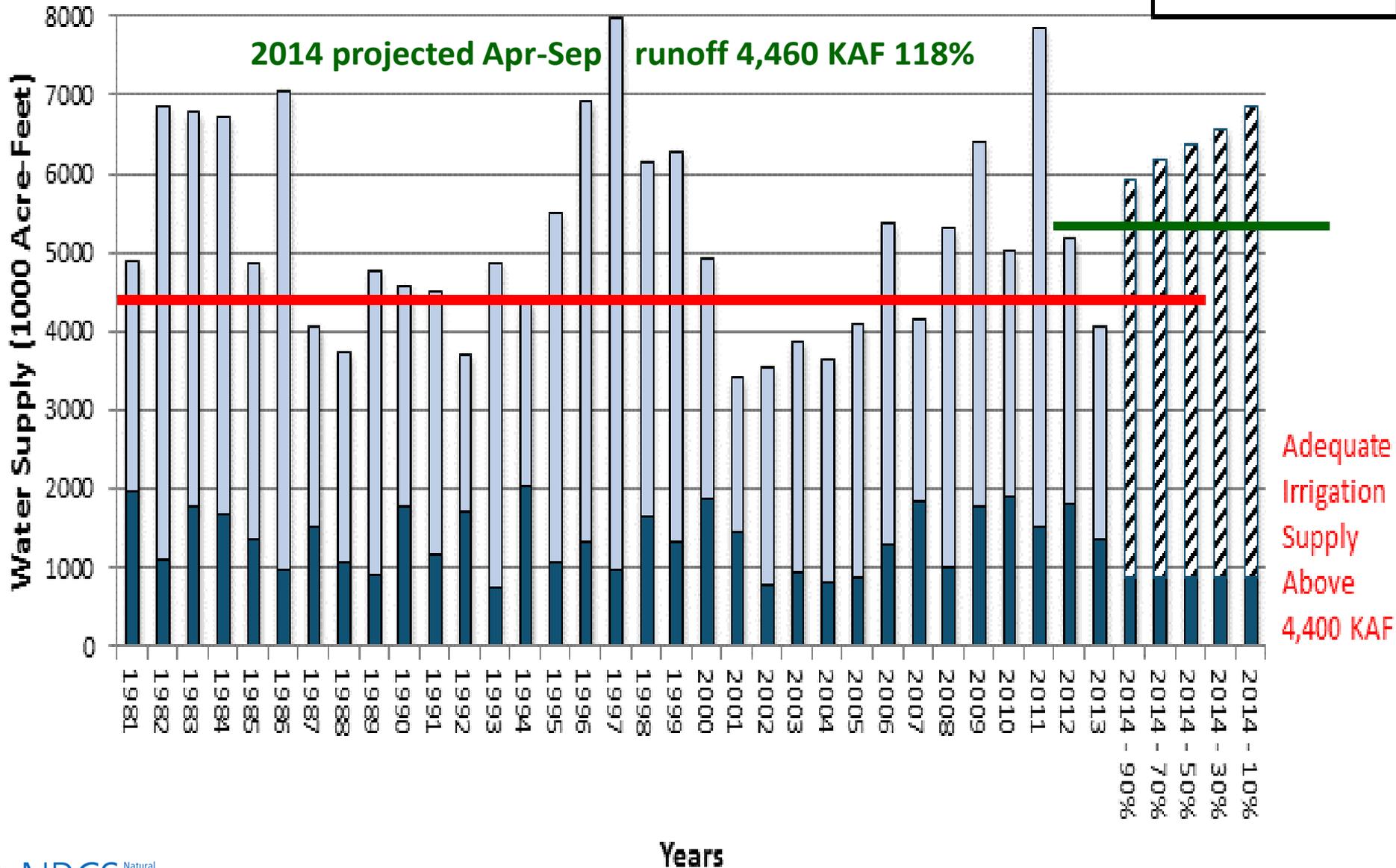
- Daily Guidance Forecast
- Monthly Forecasts
- 2013 Streamflow % of Normal
- Skill (r<sup>2</sup>)



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

# Apr 1 Historic and Forecasted Surface Water Supply Snake River Near Heise

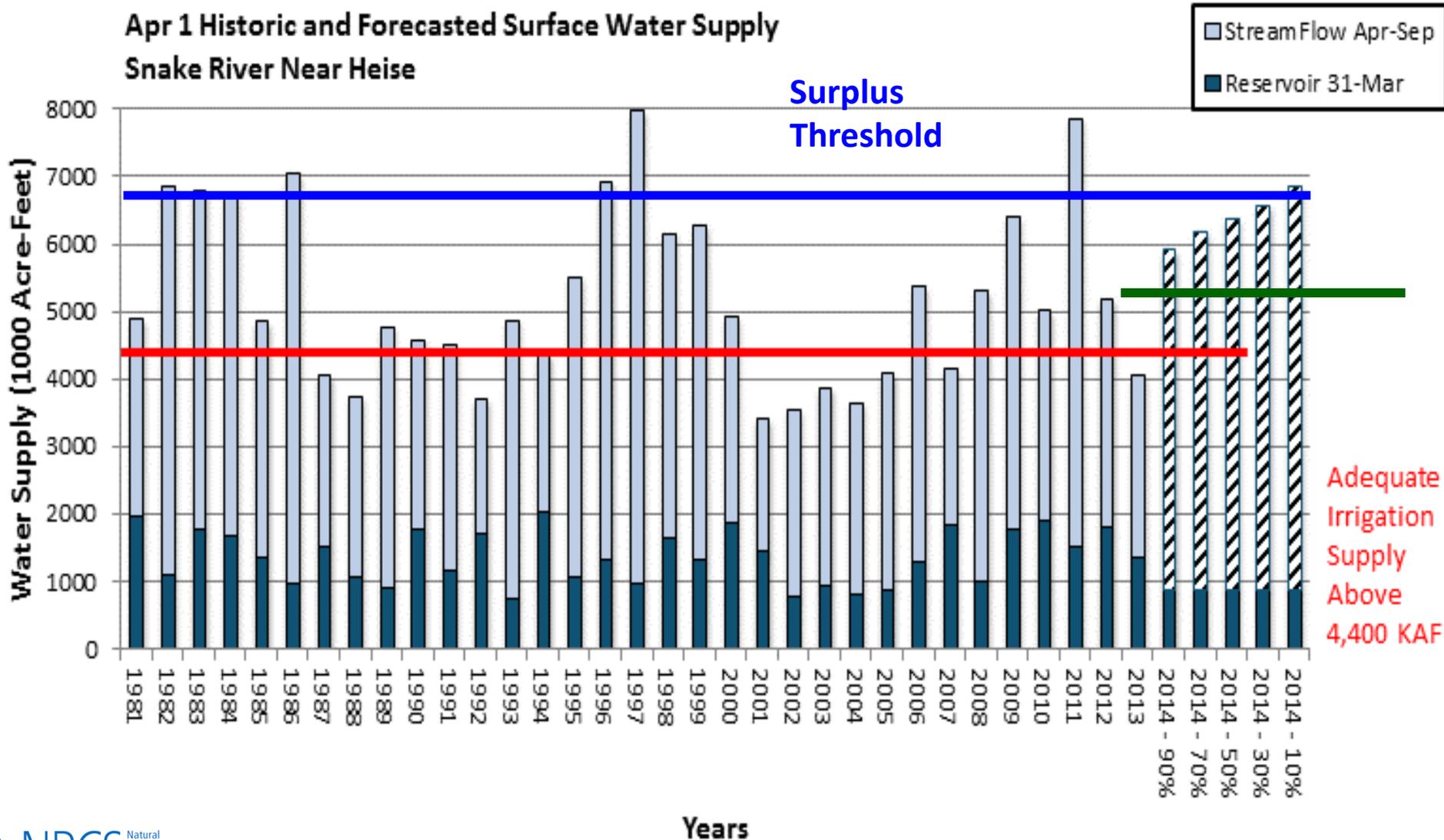
StreamFlow Apr-Sep  
 Reservoir 31-Mar



Analysis started for Cloud Seeding Suspension in Upper Snake based on flow > 21,000 @ Blackfoot, which is a volume of ~6800 KAF or + 2.9 SWSI

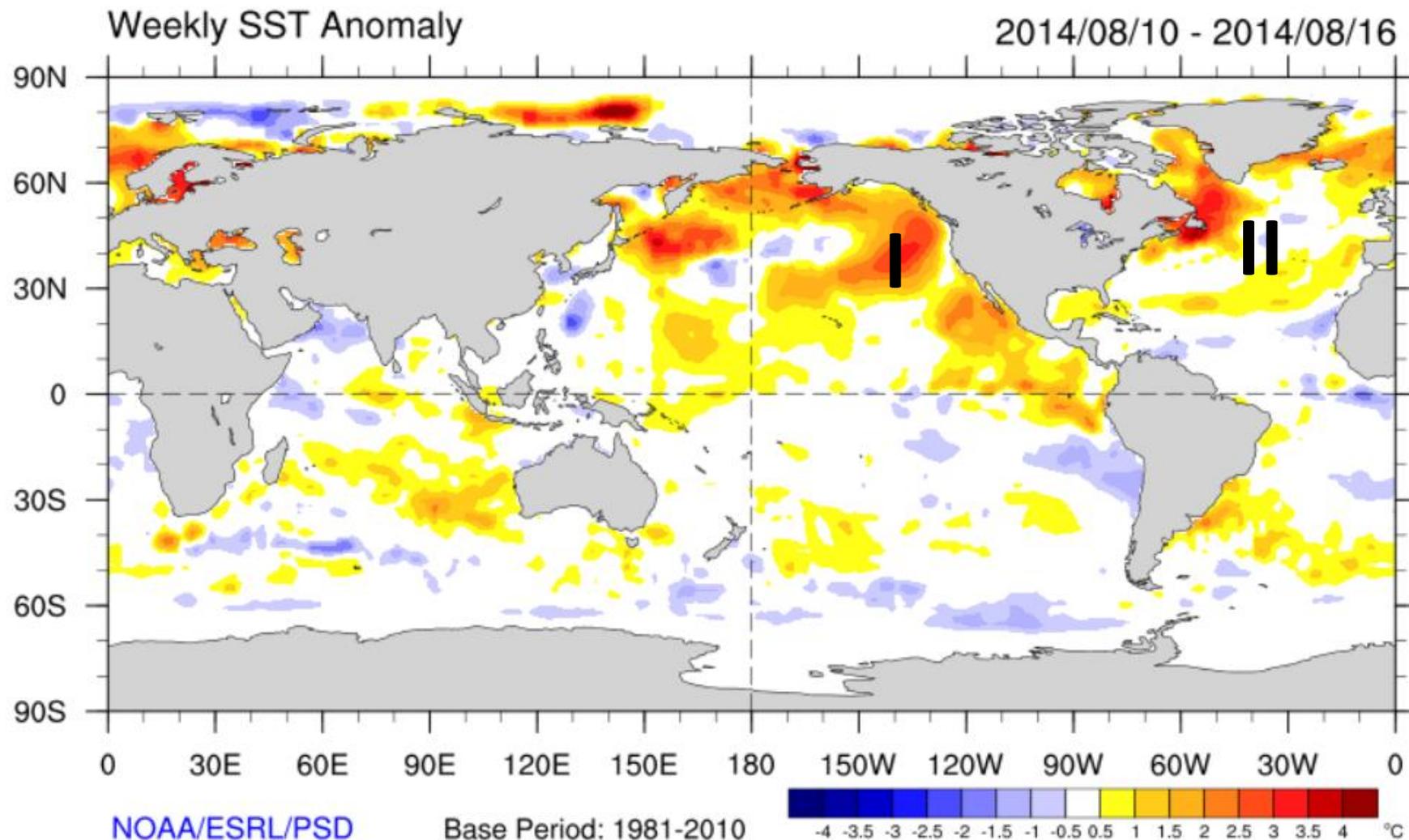
2014 estimated Apr-Sep runoff 4,460 KAF 118%

Apr 1 Historic and Forecasted Surface Water Supply  
Snake River Near Heise



# 2014-2015 Winter Forecast Update: First Maps & Outlooks Released

Posted: 25 Aug 2014 02:29 PM PDT



# *I. Temperature Outlook: Cold Winter Now Expected*

## *I. Persistent Warm Pool in Northeast Pacific*

We've discussed this a lot this summer, and the enormity of its influence is still a concern for this winter. The large pool of warmer than normal waters is still present in the Northeast Pacific and into the Gulf of Alaska. Last winter, this body of warm waters allowed a very strong ridge of high pressure to form along the West Coast of North America, which then enabled the infamous polar vortex to slide south into Canada, making the winter of 2013-2014 as cold as it ended up being. This winter, it looks like that same warm pool will be back again, which could set up yet another dicey situation for the risk of a cold winter.

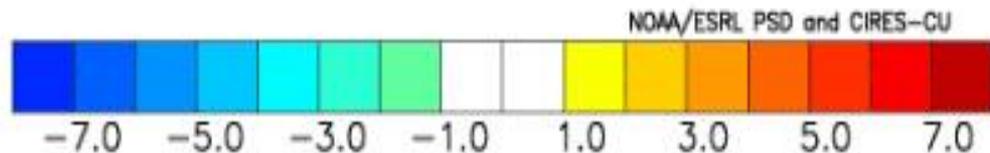
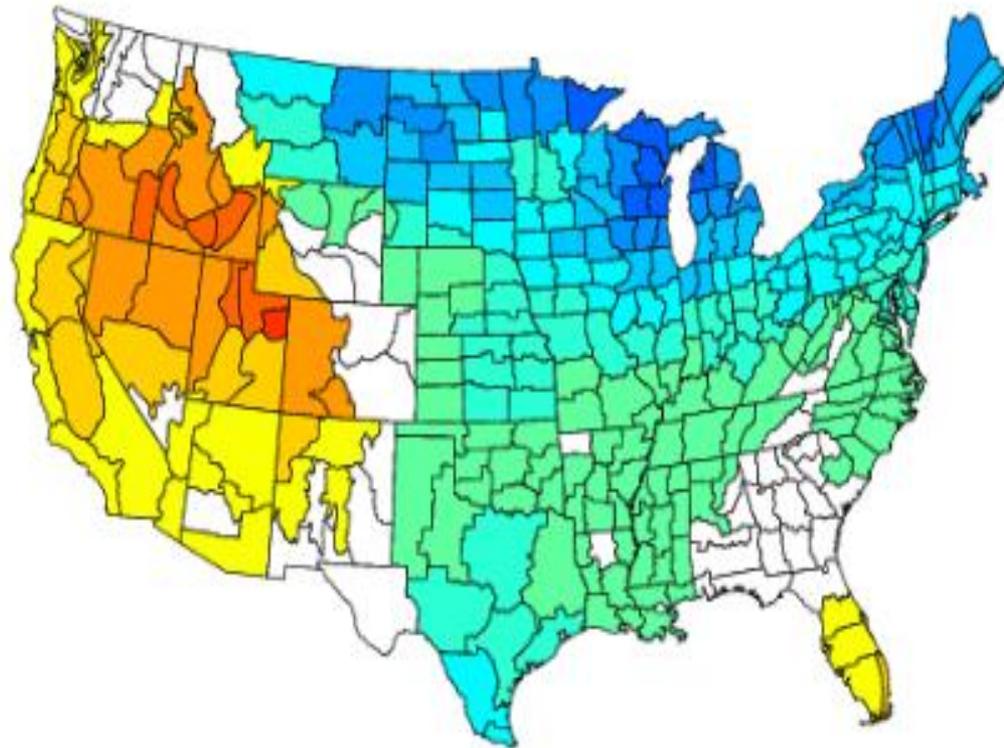
## *II. Warm Waters Offshore Greenland, Canada*

Something we didn't see last year, but is now present, is a swath of above normal water temperatures from the area west of Greenland to the waters in northeast Canada. Typically, the presence of these warm waters in this part of the world can enable strong high pressure to form over Greenland, forcing the jet stream in the United States to buckle south and bring cold air flooding into the Central and East US. While this wasn't present last year, it is certainly available this year, and is something we'll need to watch often for an increased risk of a cold winter.

Something else we're using to watch for this winter is the perfect-scoring analog winter of 1958-1959, [which we](#)

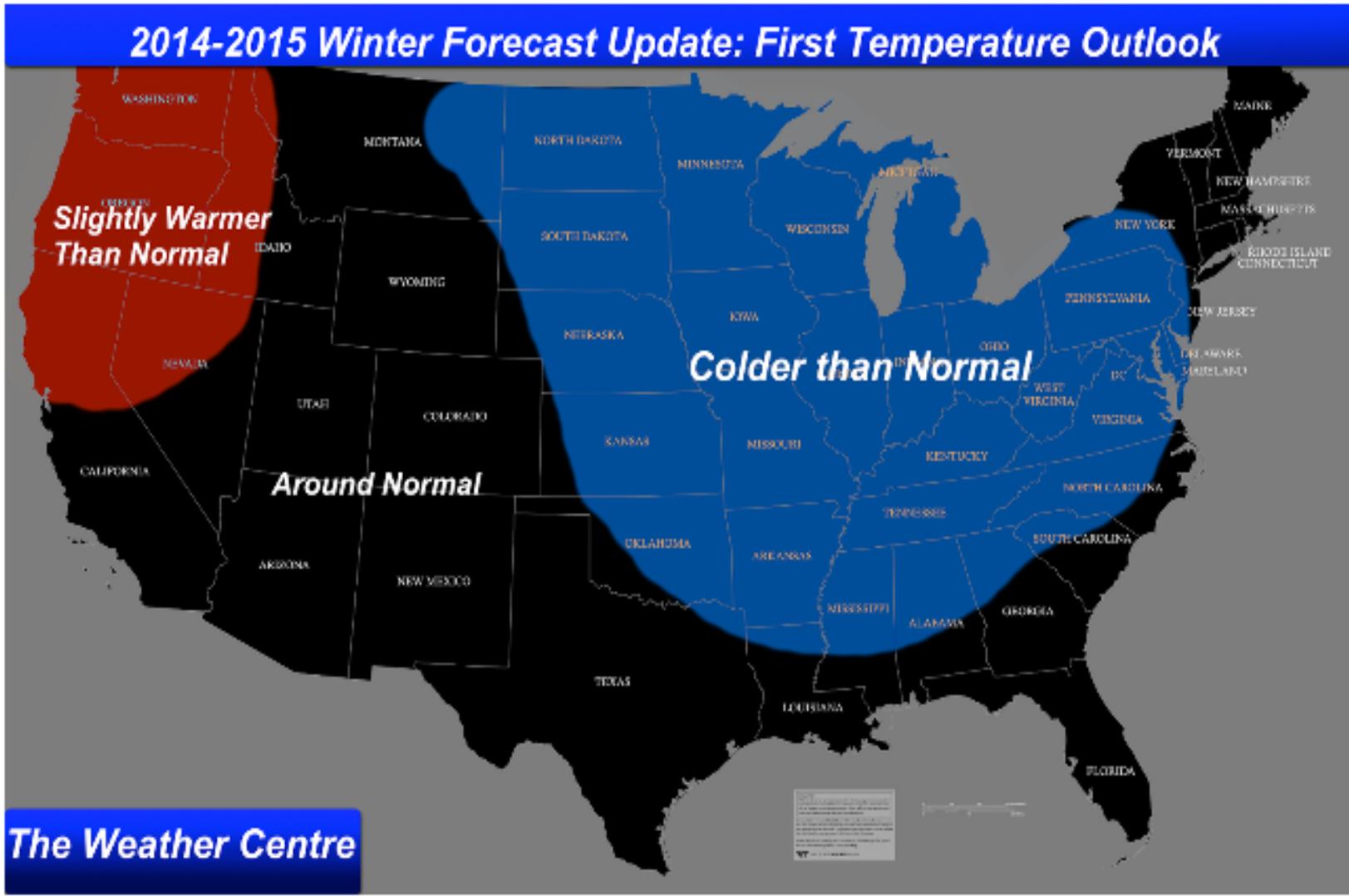
From Andrew at The Weather Centre Aug 25, 2014

NOAA/NCDC Climate Division Temperature Anomalies (F)  
Dec to Feb 1958-59  
Versus 1950-1995 Longterm Average



ESRL

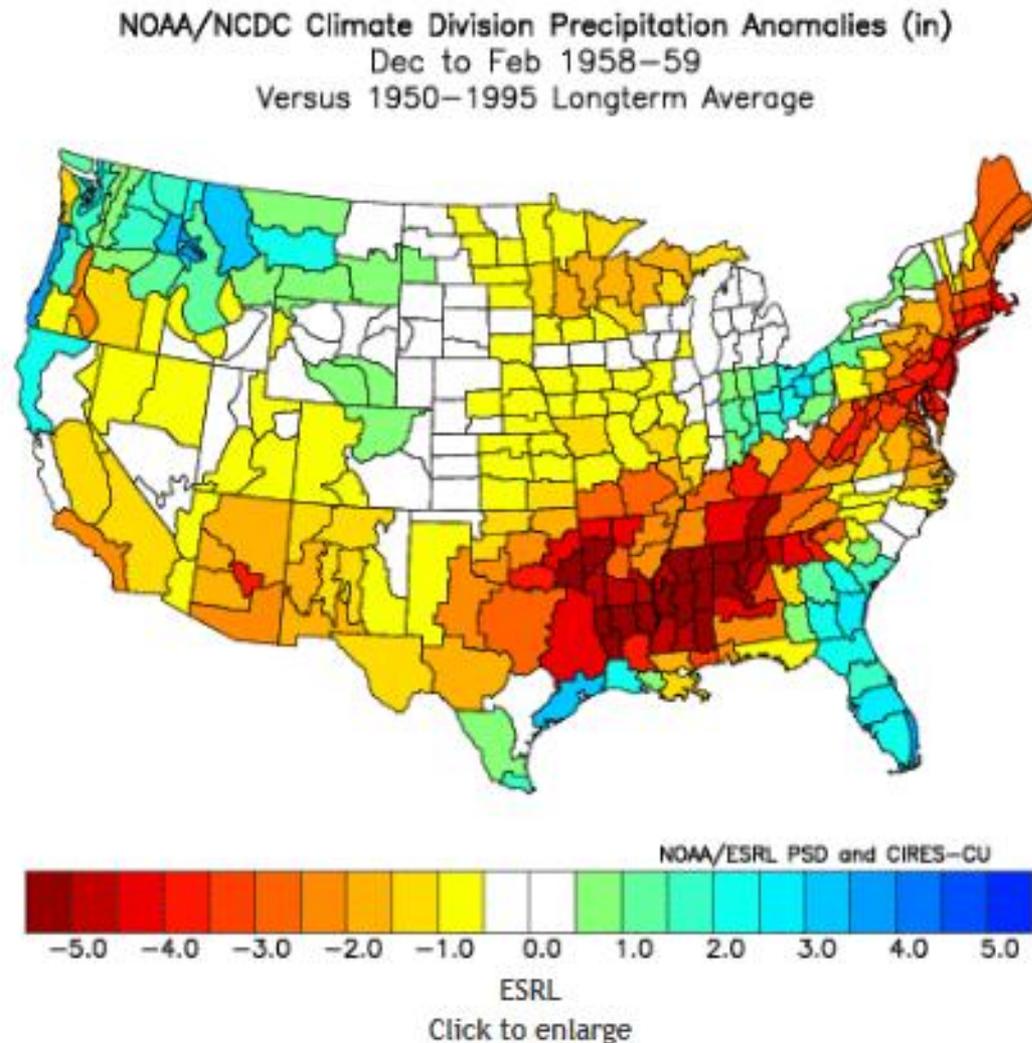
[Click to enlarge](#)



My first outlook places the Pacific Northwest in slightly warmer than normal conditions due to the aforementioned warm pool in the Pacific Northeast and Gulf of Alaska, where a sustained ridge may form. The majority of the Rockies

## II. Precipitation Outlook Still Cloudy

We're going to start out this section by going back to our analog year of 1958-1959 and seeing what it says.

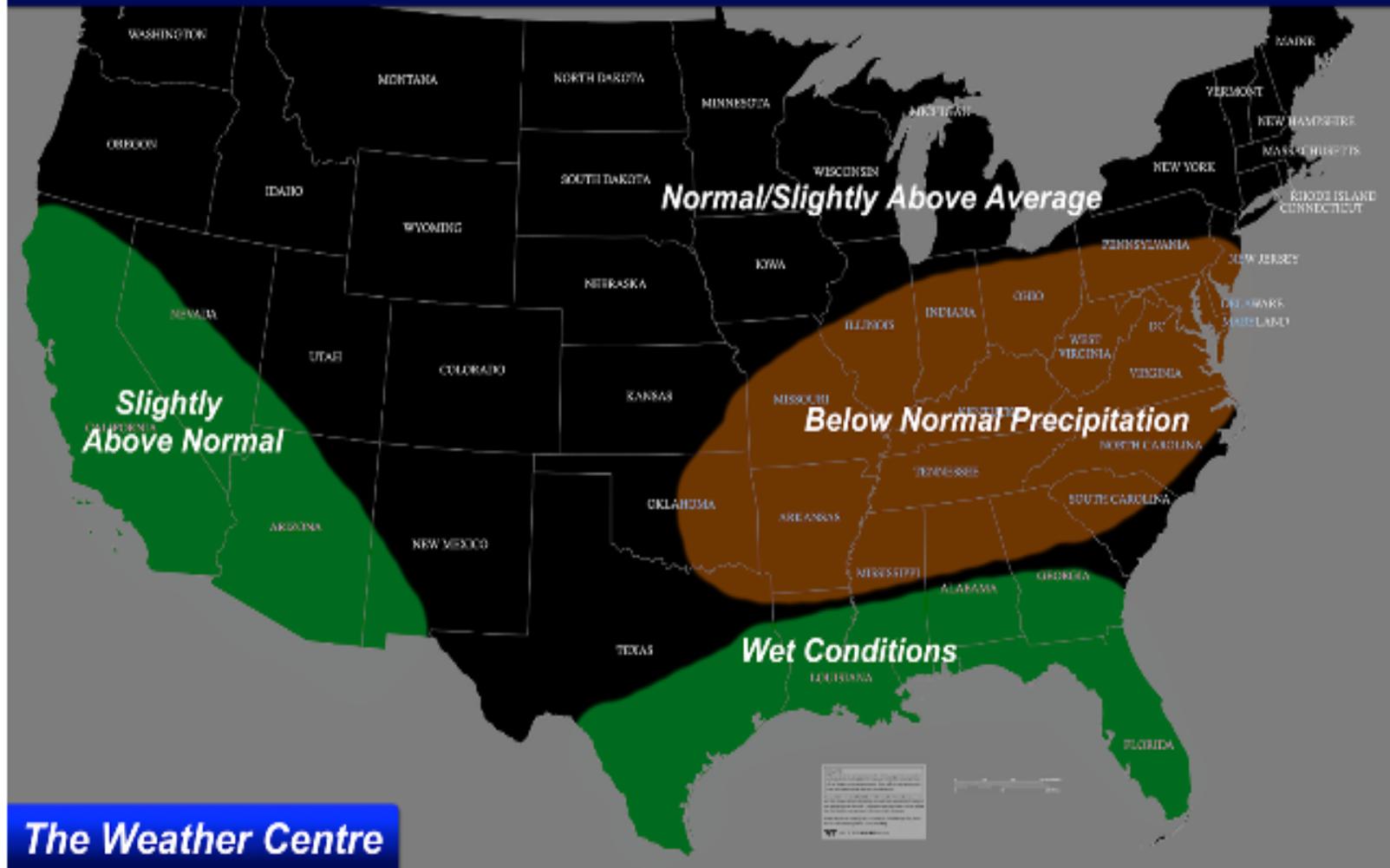


During the winter of 1958-1959, the majority of the nation saw quite a dry season. T

Because some of the other variables are still too uncertain to definitively forecast on, I made this outlook based predominantly off of the analog year of 1958-1959, typical precipitation patterns with ridging in the northeast Pacific, as well as a couple other factors that are expected to play into this winter.

From Andrew at The Weather Centre Aug 25, 2014

## 2014-2015 Winter Forecast Update: First Precipitation Outlook



Subject to potentially drastic change.  NRCS Natural Resources Conservation Service

## April – July Streamflow Runoff Volumes as Percent of 1981-2010 Normals From North to South

<b>Forecast Point</b>	<b>1959</b>	<b>2014</b>
-----------------------	-------------	-------------

### Northern Idaho

Boundary Ck NR Porthill	109%	104%
Moyie River	142%	115%
Priest R NR Priest River	121%	
Spokane River at Post Falls	140%	115%
St. Joe River at Calder	137%	
Dworshak Reservoir Inflow	---	122%
Locsha River	134%	
Selway River	129%	
Clearwater River nr Spalding	127%	

### Salmon & West-Central Idaho

Lemhi R NR Lemhi	92%	
Salmon River at White Bird	106%	114%

Weiser River nr Weiser	74%	
SF Payette at Lowman	91%	
Payette nr Horseshoe Bend	95%	

SF Boise River nr Featherville	~77%	
Boise River nr Twin Springs	92%	
Boise River nr Boise	86%	85%

## April – July Streamflow Runoff Volumes as Percent of 1981-2010 Normals

<u>Forecast Point</u>	<u>1959</u>	<u>2014</u>
-----------------------	-------------	-------------

### Central Idaho

Camas Creek nr Blaine	49%	
Big Wood at Hailey	57%	59%
Little Wood River nr Carey	49%	31%
Big Lost R abv Howell	59%	
Big Lost blw Mackay Reservoir	---	40%
Little Lost R NR Howe	71%	68%

### Eastern Idaho

Teton River nr Driggs	---	102%
Snake River nr Heise	88%	118%
Snake R at Neely (American Falls)	66%	97%

### Southern Idaho

Bear River blw Stewart Dam	29%	51%
Oakley Reservoir Inflow	42%	57%
Salmon Falls Creek, NV	39%	46%
Bruneau River nr Hot Springs	46%	37%
Owyhee River nr Rome	17%	14%



Questions / Comments / Corrections



**Our weather is  
always changing to  
form our climate.**

**Key is figuring the  
weather out to better  
understand the  
driving forces &  
relationships to  
make wise decisions  
to mitigate impacts.**