Lessons Learned About What Happened Last Winter

&

Why the 2014/2015 Winter is Setting up to be Similar to Last Year

Idaho-Eastern Oregon Seed Association Winter Convention
December 2, 2014 Nampa, Idaho
Pictures from Teton National Park Thanksgiving Nov 2013

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

USDA

United States Department of Agriculture

Topics:

- **Summary First – Weather Forecasts for Winter 2015 Outlook**
  - **Why 2014/2015 winter is setting up to be similar to last year**

- **Review of Major Teleconnections Climate Indices**
  - **Pacific Decadal Oscillation (PDO) - past cycles & trends**
  - **ENSO Correlations – El Nino – Neutral – La Nina**

- **Past Research & Examples of Climate Variability**
  - **Streamflow forecast accuracy & increasing spring precipitation variability**
  - **Recent examples of climate variability & current research**

- **Last Winter's Weather Forecasts**
  - **Which forecasts worked & why**

- **Winter 2013/2014-What Happened & When Did We Learn What We Now Know?**
  - **Lessons learned & precipitation patterns to watch in the future**

Saturday, October 11, 2014

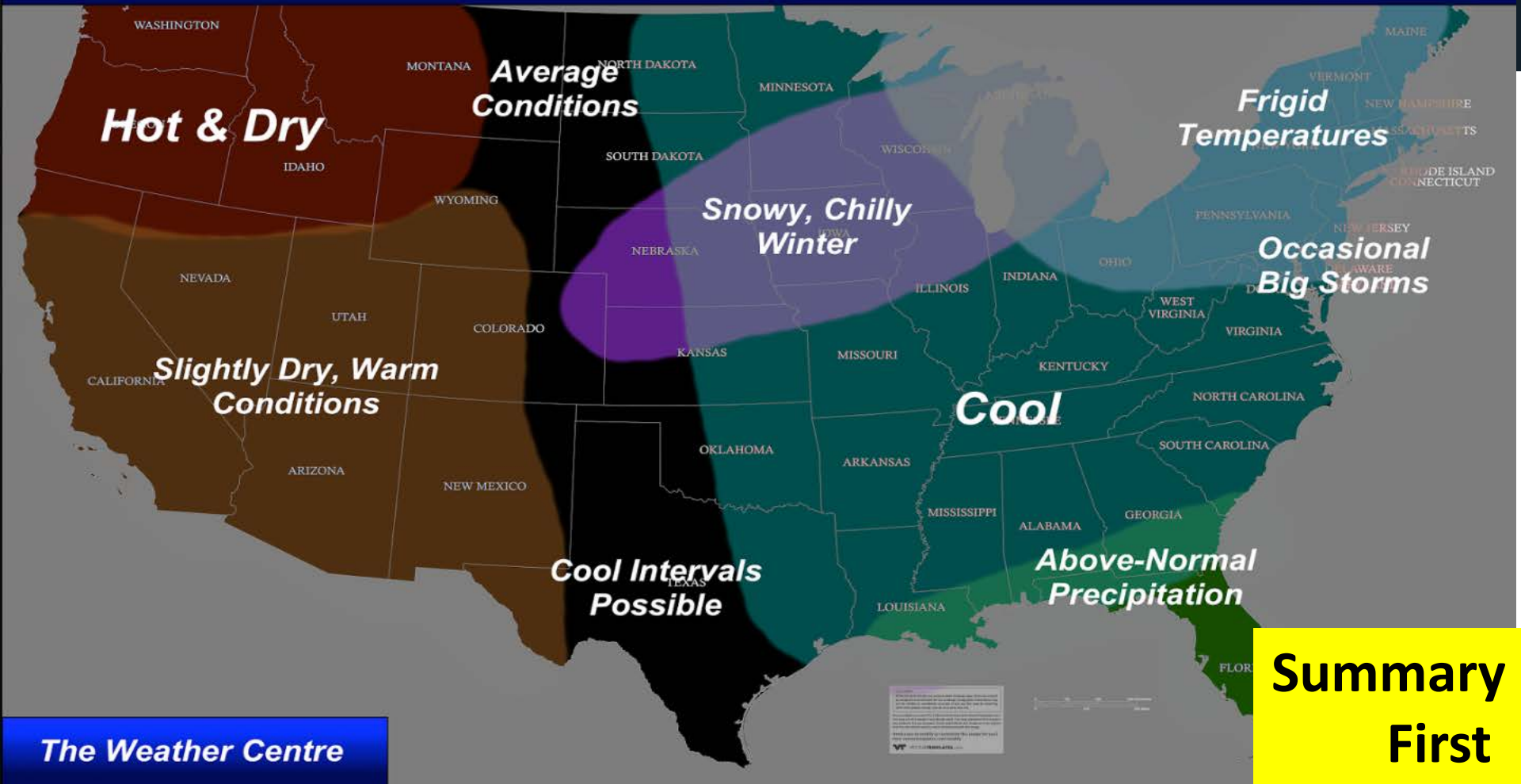
Official 2014-2015 Winter Forecast

By Andreat 12:00 PM

"Second Consecutive Frigid Winter Expected..."

Summary First

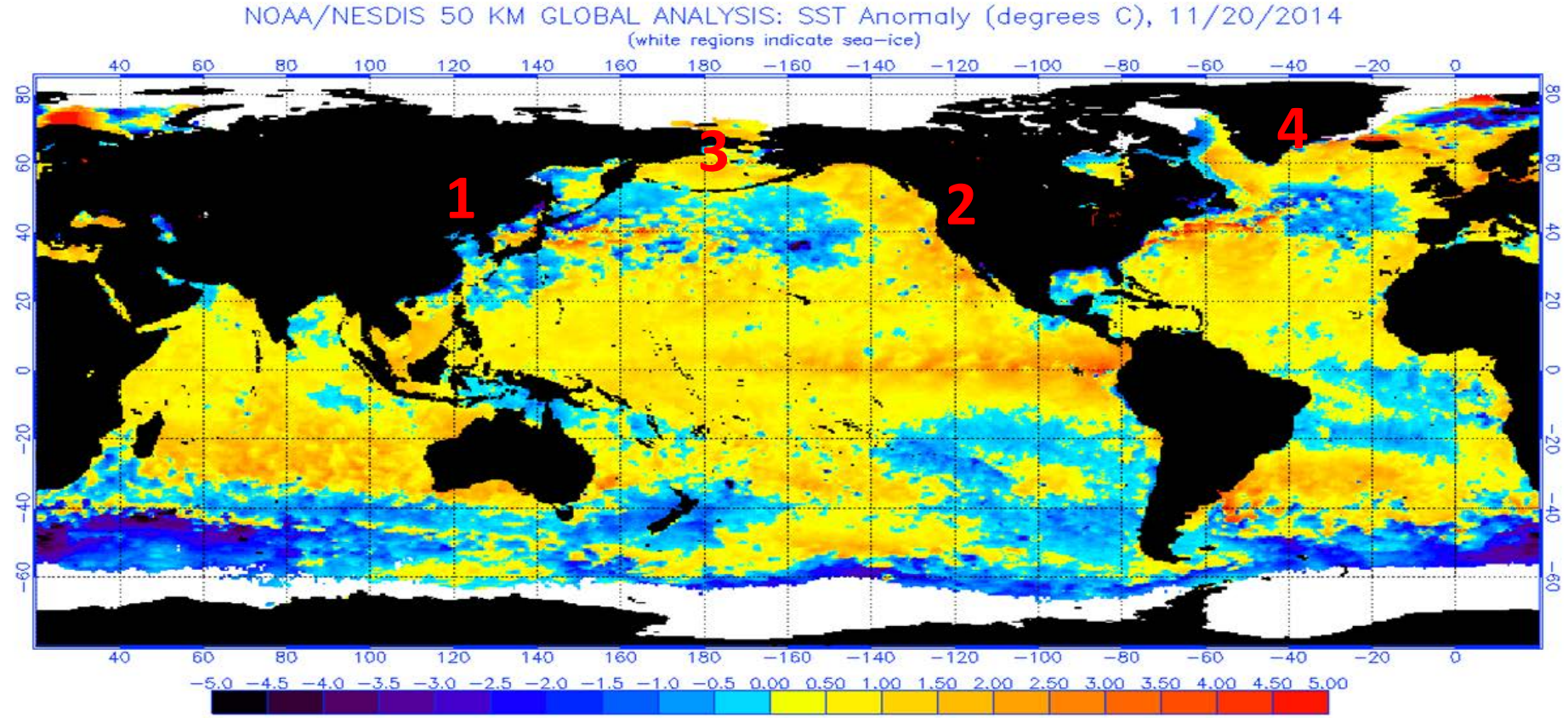
Official 2014-2015 Winter Forecast



The Weather Centre

Summary First

Sea Surface Temperatures Nov 11, 2014



1. Below Normal SST Anomalies in the Sea of Japan

In the Sea of Japan, located to the west of Japan, we see a swath of below-normal to well below-normal sea surface temperature anomalies (henceforth abbreviated as SSTAs). These below-normal water temperatures were recently stirred up by the passage of a Typhoon Halong in early August, making quick work of what had previously been a rather

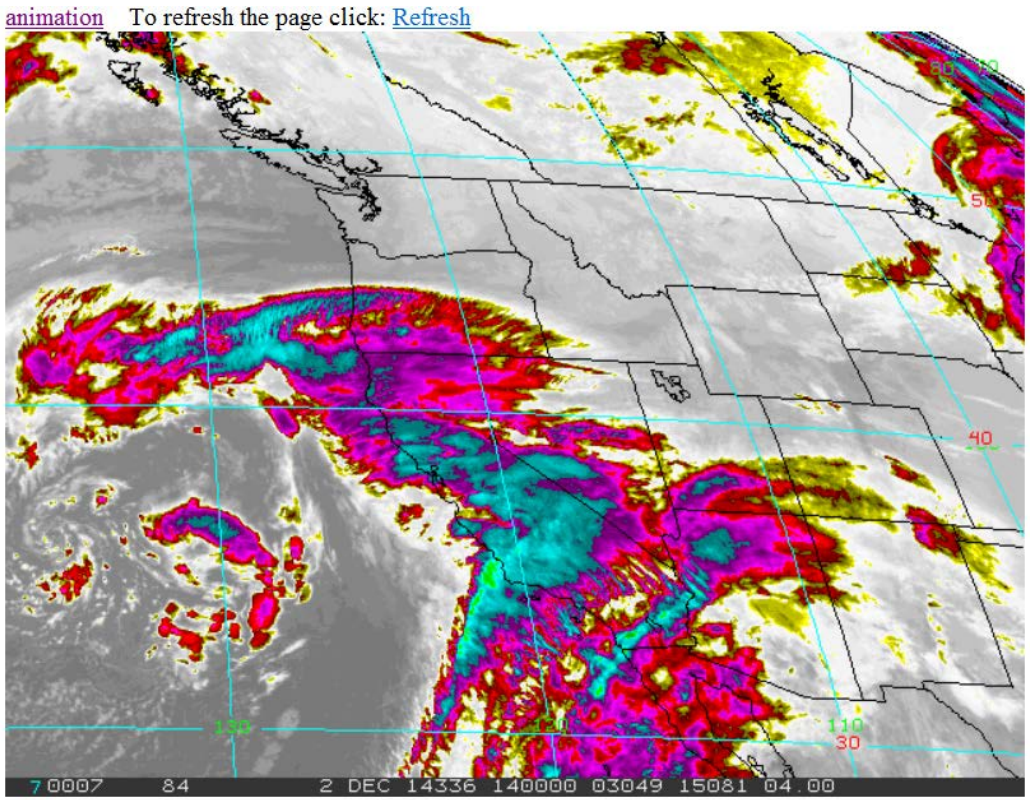
2. Well Above-Normal Water Temperatures in the Gulf of Alaska

3. Well-Above Normal SST Anomalies in the Bering Sea

4. Above-Normal SST Anomalies Near Greenland

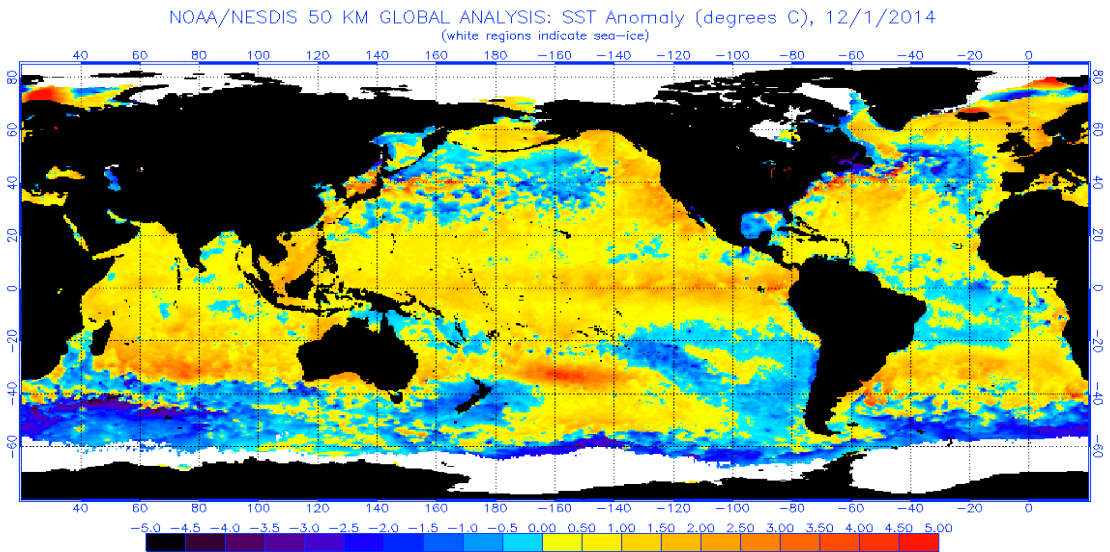
Summary First

Satellite image Dec 2, 2014



- ***Weather outlooks now encompass looking globally at climate conditions around the world to understanding how they impact our local water supply.***

El Nino Storm Track Pattern



- ***Teleconnections*** **– climatic indexes**
  Key is understanding their correlations AND influence on current weather, snowfall, streamflow, your business & more…

Hmmm… what does this have to do with our water supply?

Teleconnections – climatic indexes

Primary Ones: **Kings & Queens**

PDO Pacific Decadal Oscillation – 20 to 30 year cycle (average 27 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 **Knights Rooks Bishops**

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

In May - declared back in positive phase

Additional Climate Indices: **Pawns Bishops Rooks**

AMO Atlantic Multi-decadal Oscillation

AO Artic Oscillation

SSW Sudden Stratospheric Warming

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

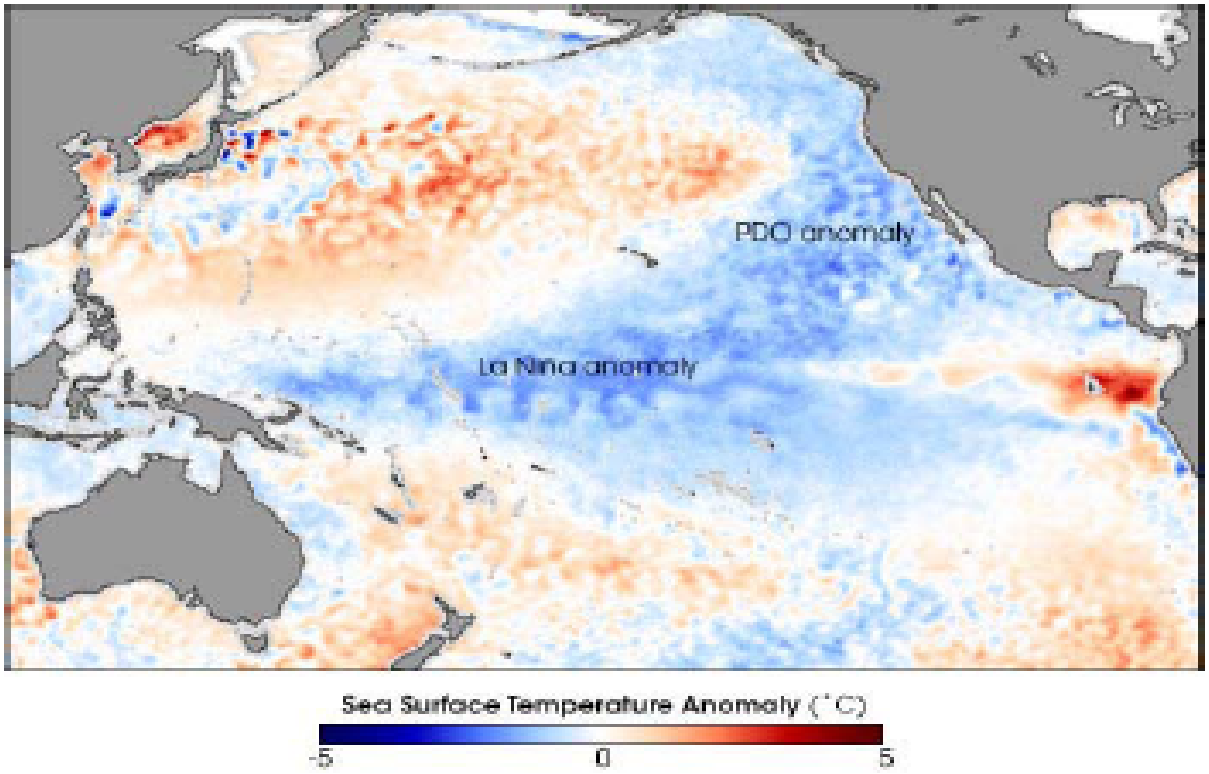


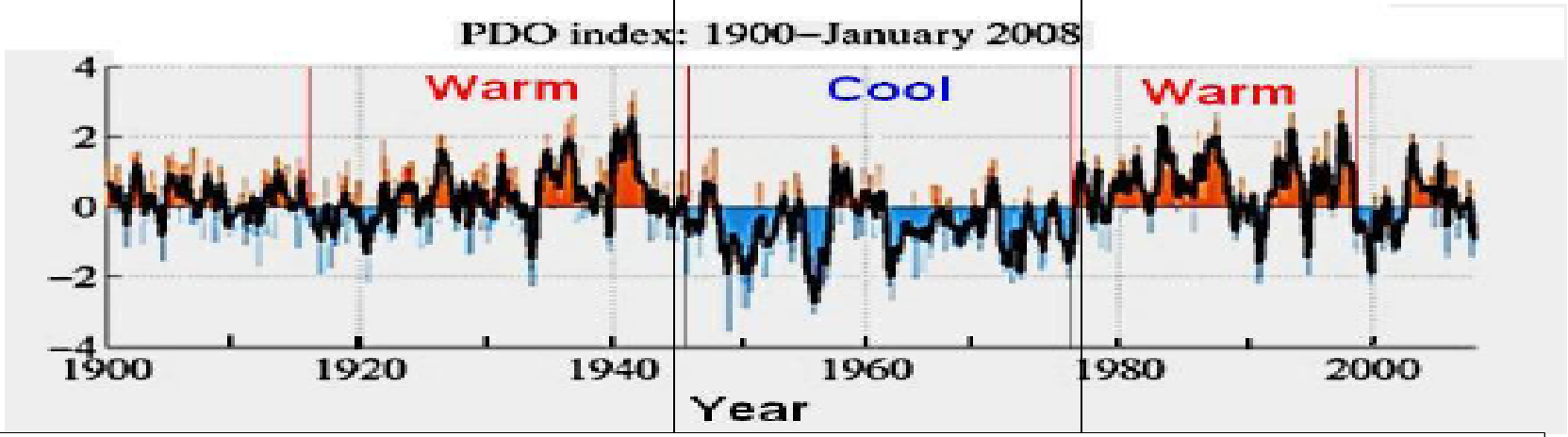
Figure 1. Cooling of the Pacific Ocean and setting up of the PDO. Sea surface temperature anomaly in the Pacific Ocean from April 14–21, 2008. The anomaly compares the recent temperatures measured by the Advanced Microwave Scanning Radiometer for EOS (AMSR-E) on NASA's Aqua satellite with

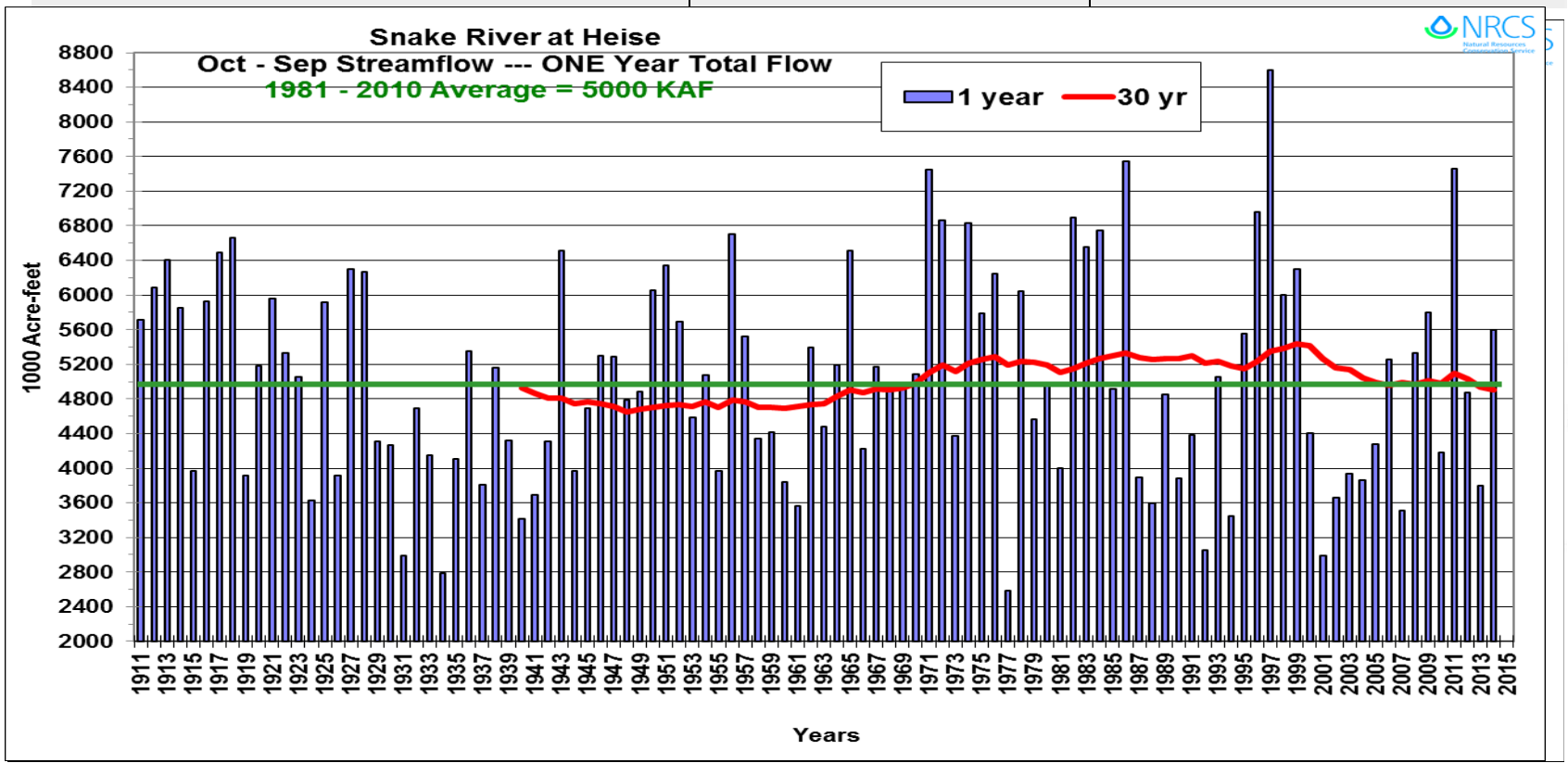
Winter 2014 - 2015

- **PDO in cool phase since at least summer 2007 (or 1999)**
- **warm phase since Jan 2014**

Teleconnection Relationships

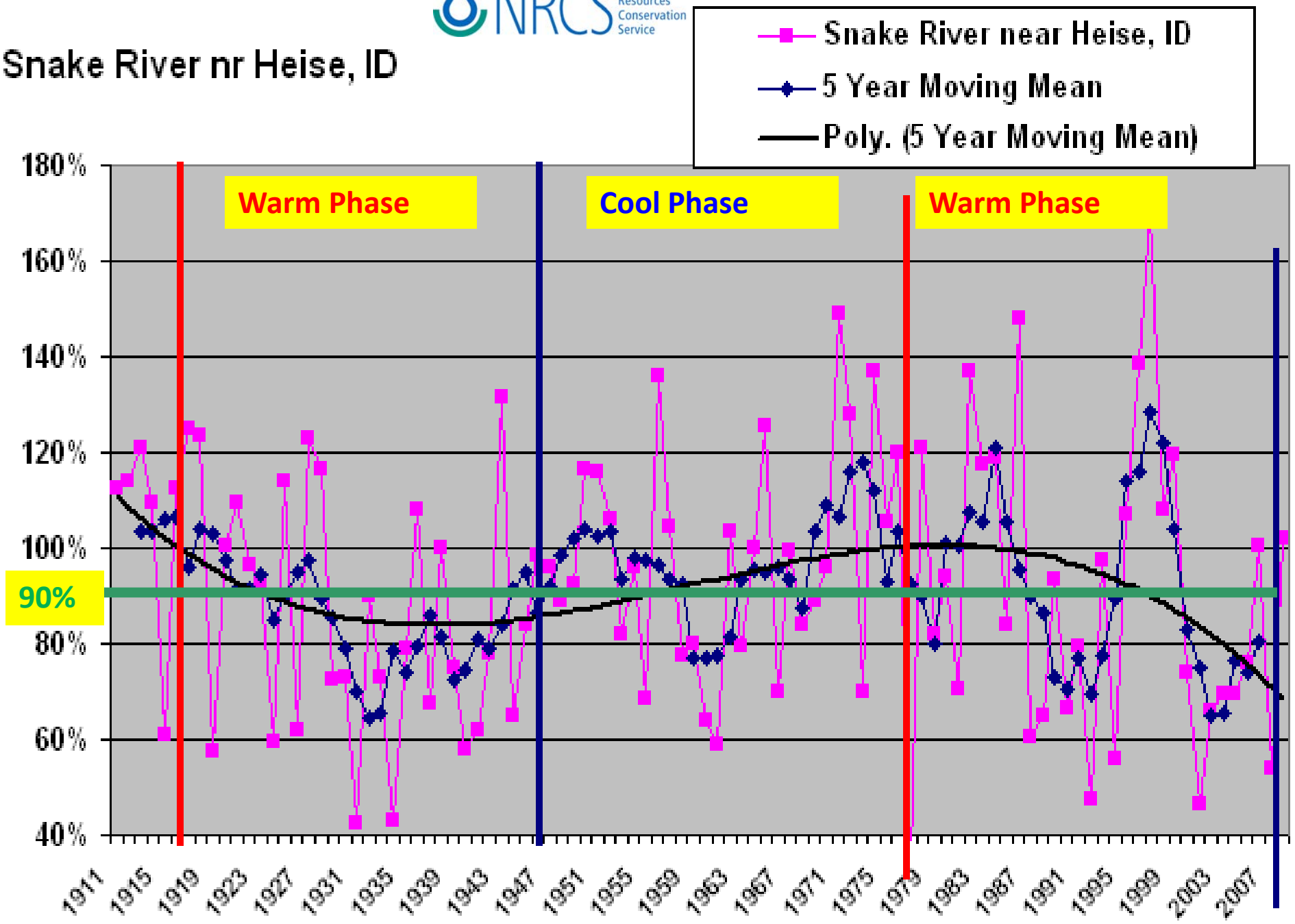
As shown by the historic pattern of PDOs over the past century (Fig. 2) and by corresponding global warming and cooling, the pattern is part of ongoing warm/cool cycles that last 25-30 years.





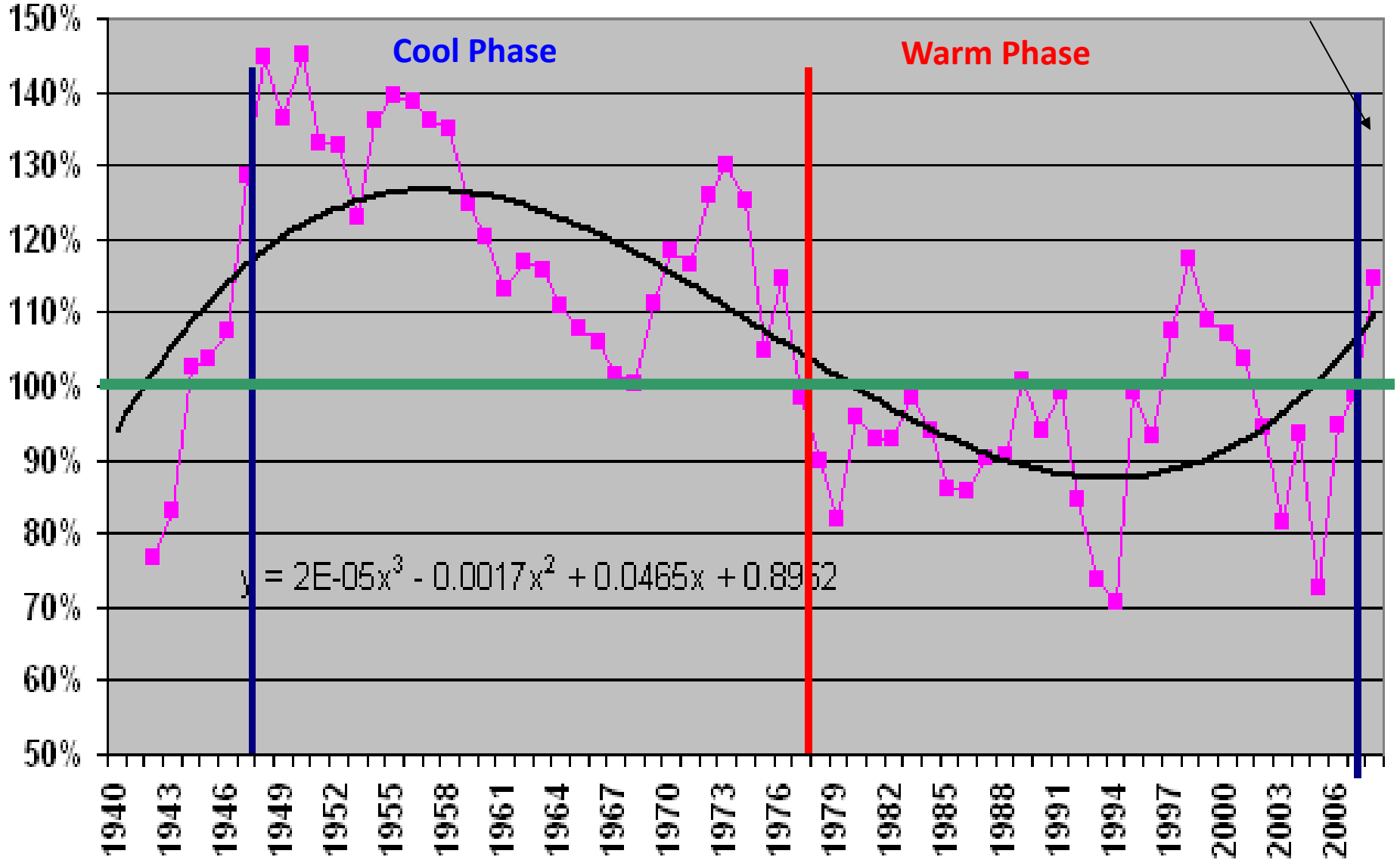
NRCS Natural Resources Conservation Service

Snake River nr Heise, ID



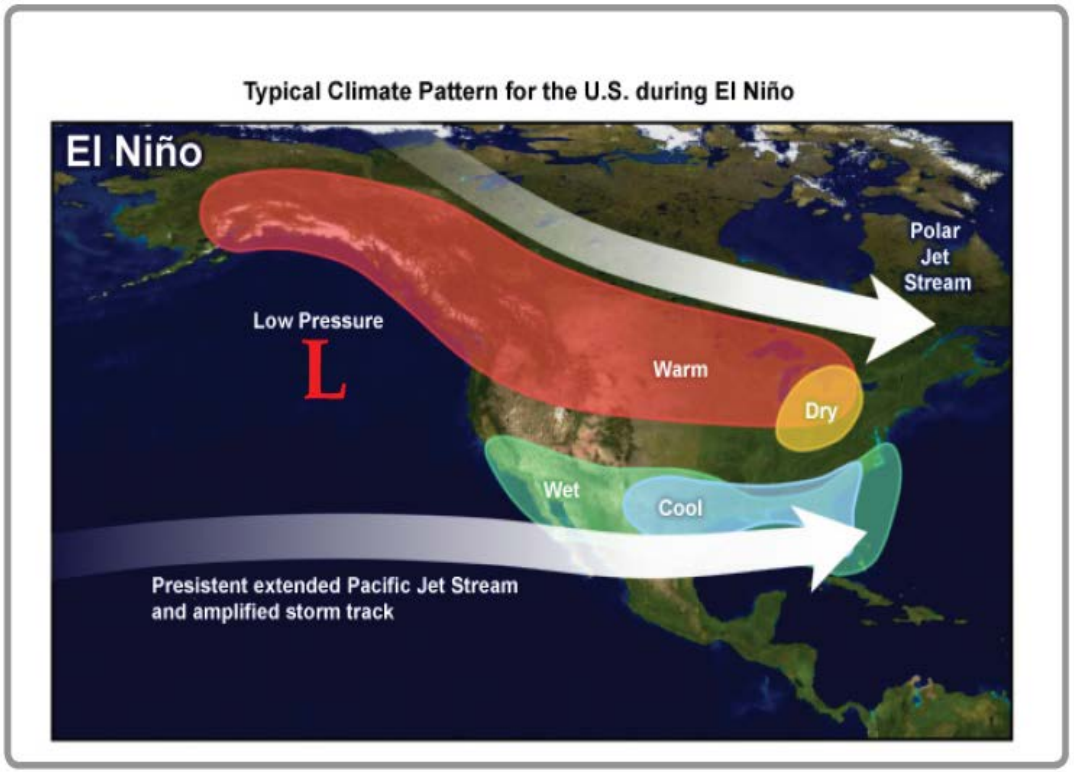
NRCS Natural Resources Conservation Service

NF Coeur d'Alene River
5 Year Moving Average

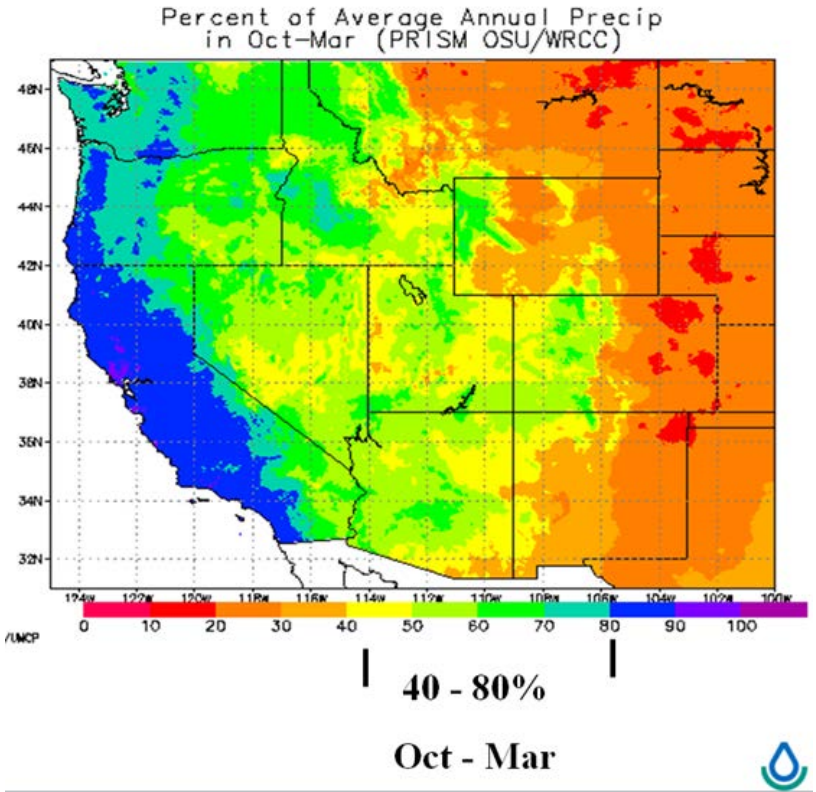


Teleconnection Relationships

Typical El Niño Winter Pattern



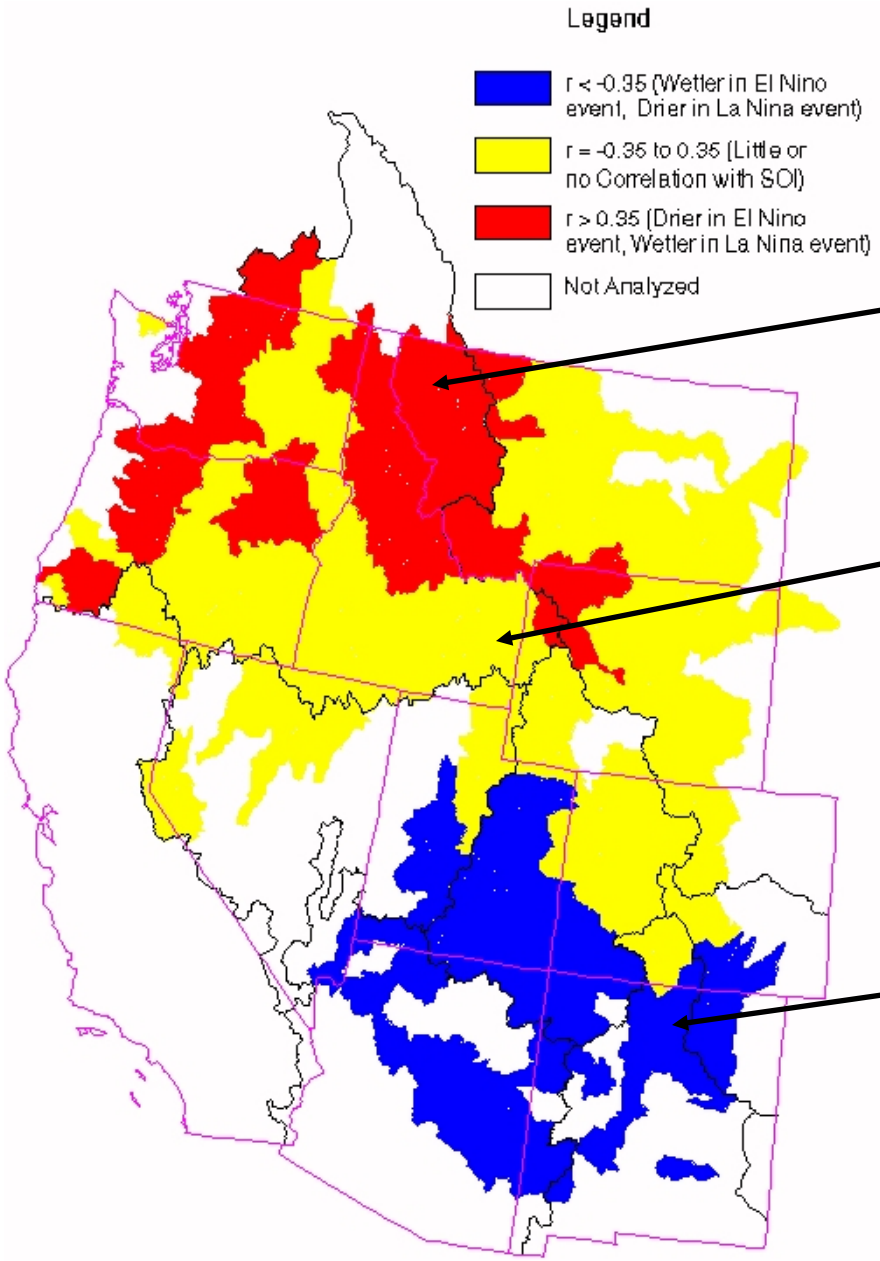
Typical El Niño jet stream patterns across the U.S. include a stronger than usual storm track across the southern U.S., leaving the northern U.S. removed from the average storm track. Image courtesy of NOAA.



Teleconnection Relationships

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

Key is what happens during the July – Nov period

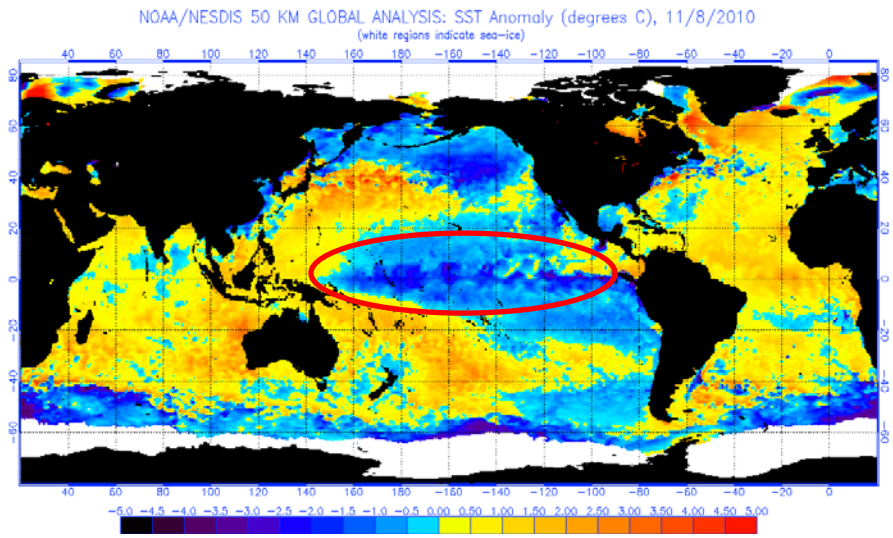


Winter 2014-2015

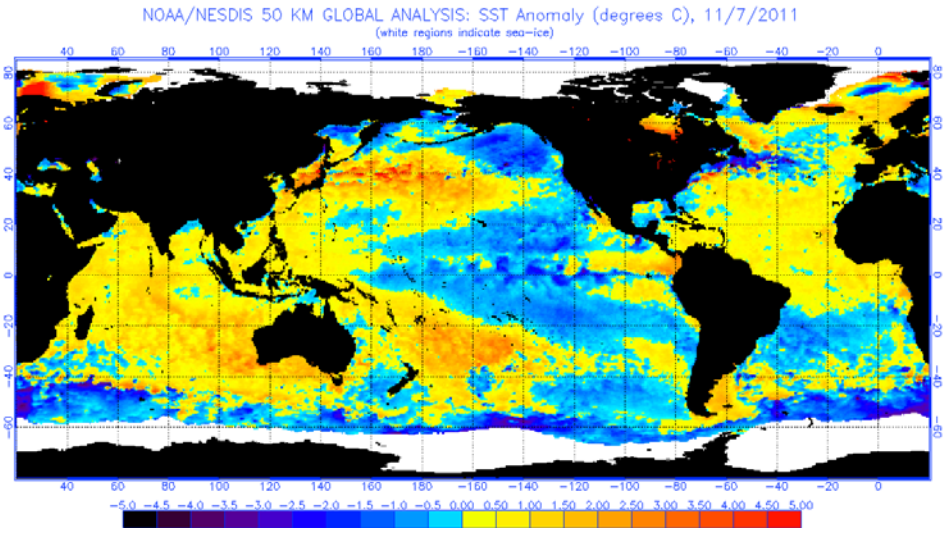
- **ENSO Signal:**

Slight to Moderate El Nino & SOI

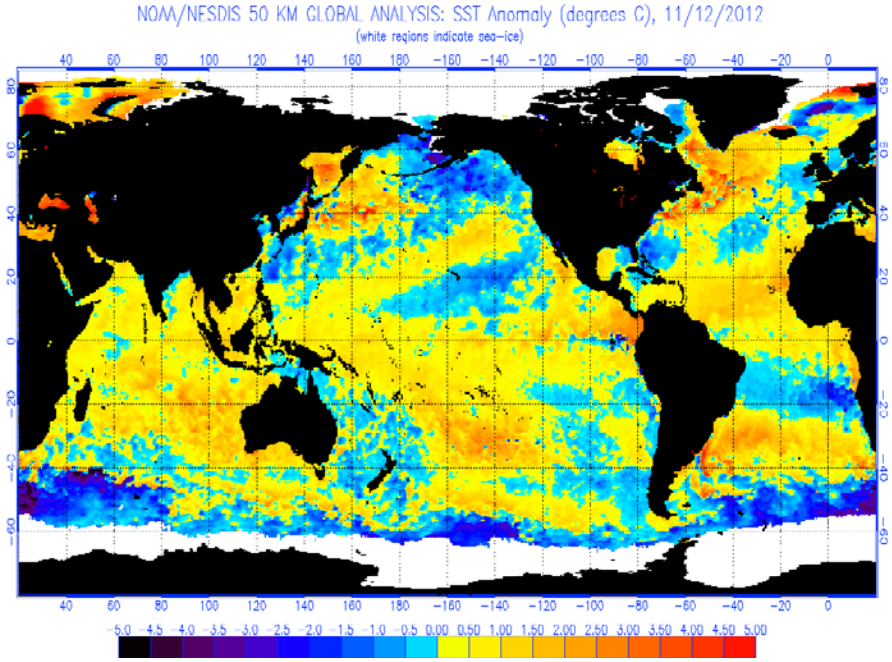
Nov 2010 – Strong La Nina

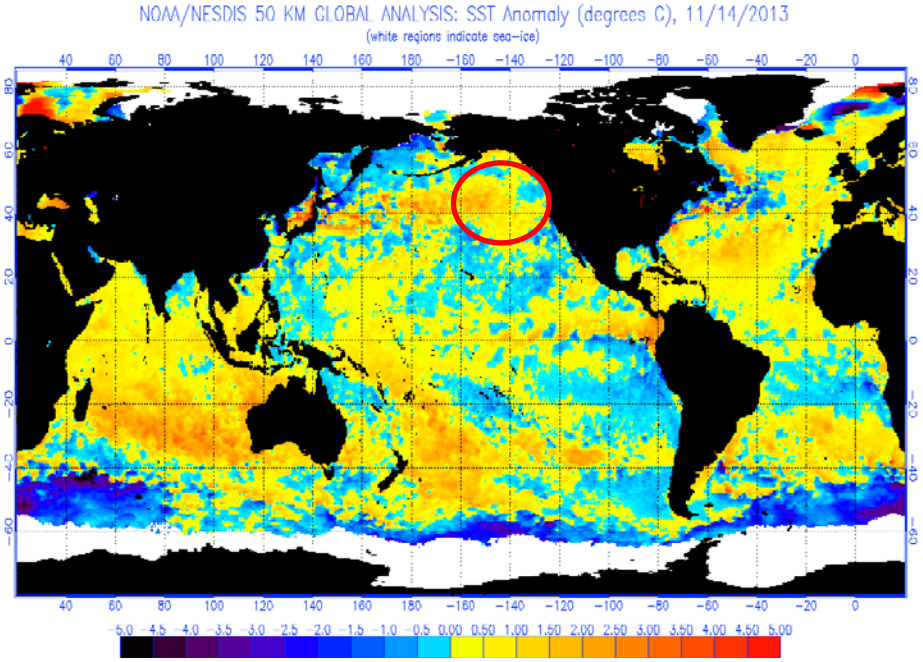


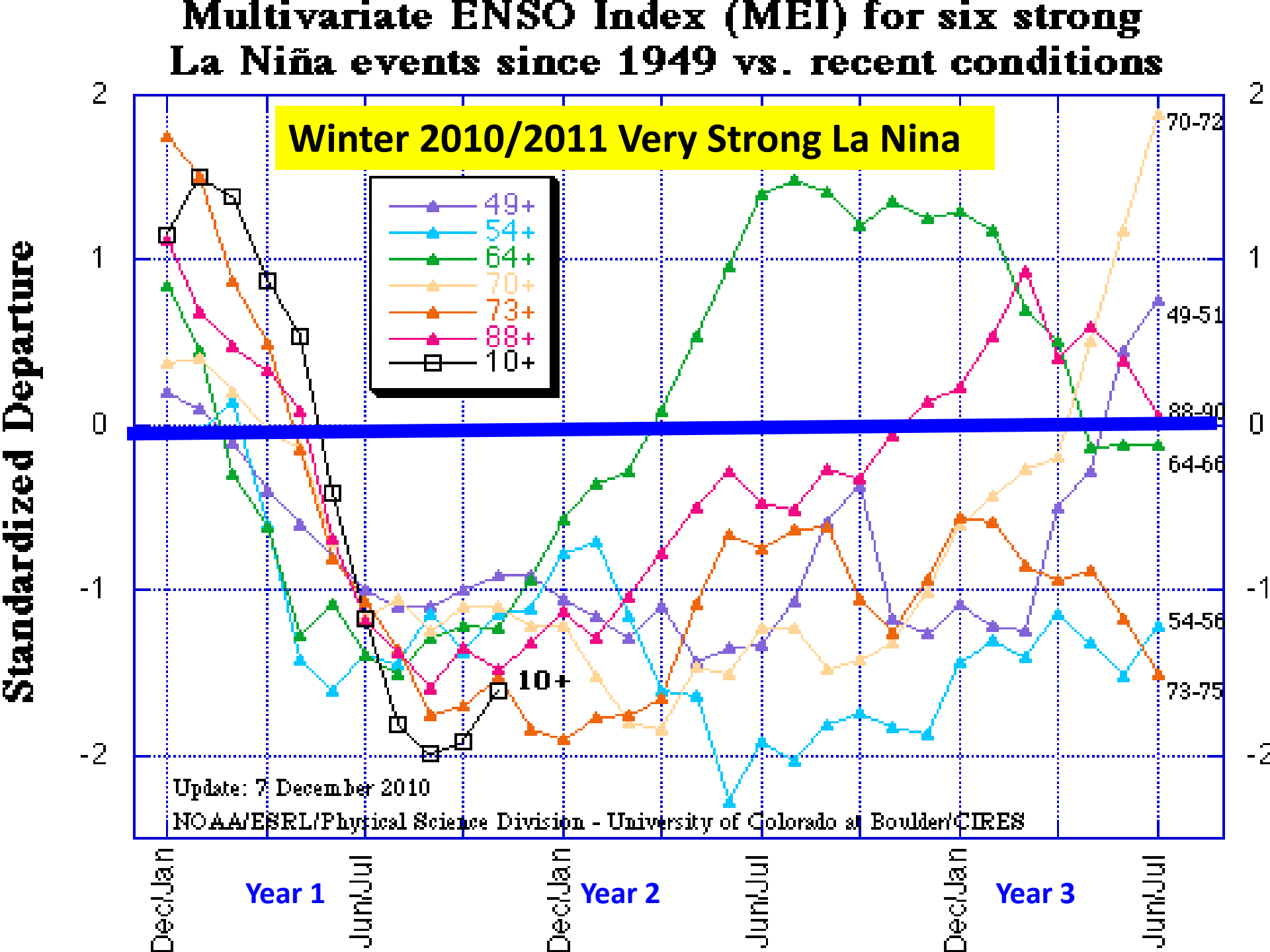
Nov 2011 – Weak La Nina



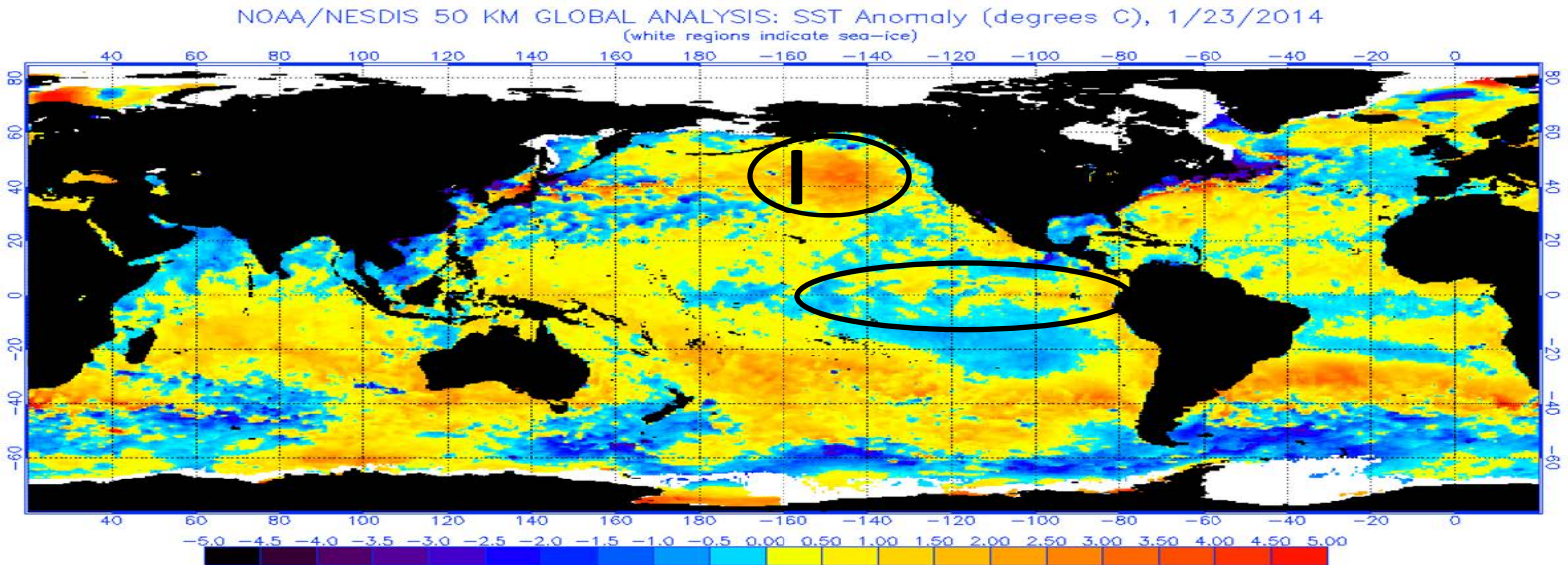
November 2012 ----- Neutral Years ----- November 2013





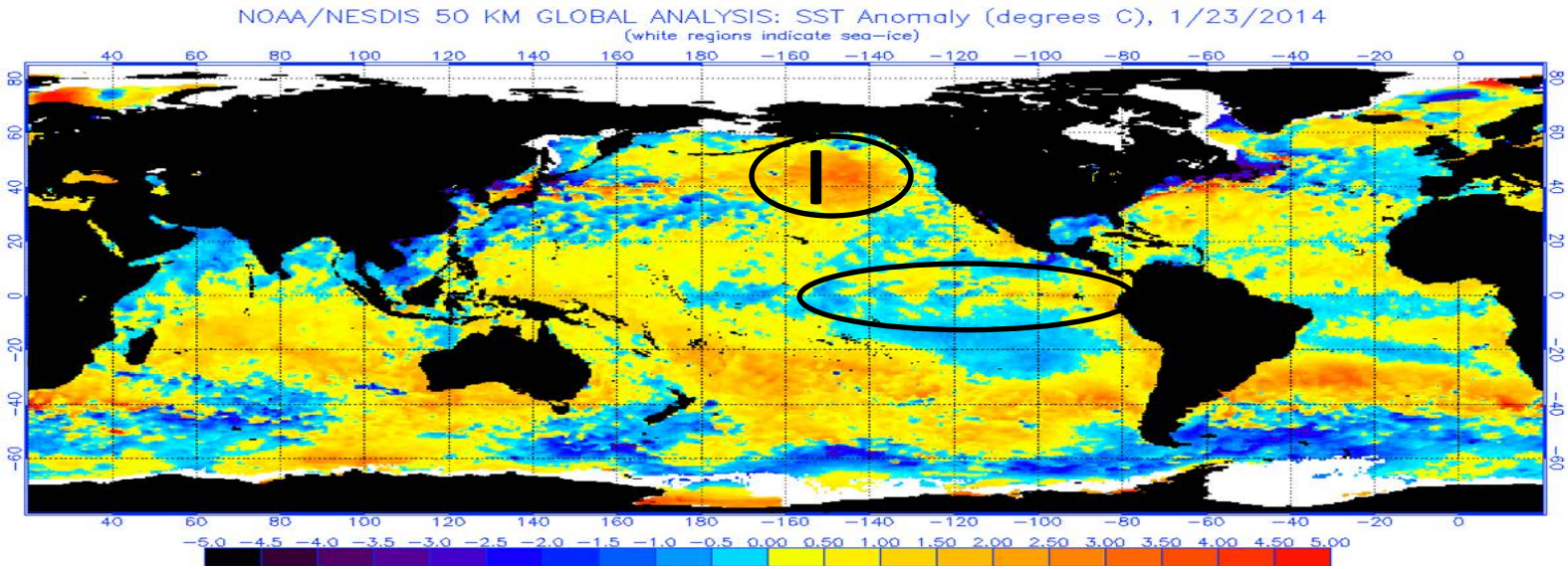

Multivariate ENSO Index (MEI) for six strong
La Niña events since 1949 vs. recent conditions
Winter 2010/2011 Very Strong La Nina
49+
54+
64+
70+
73+
88+
10+
70-72
49-51
88-90
64-66
54-56
73-75
10+
Standardized Departure
2
1
0
-1
-2
Update: 7 December 2010
NOAA/ESRL/Physical Science Division - University of Colorado at Boulder/CIRES
Dec/Jan
Jun/Jul
Dec/Jan
Jun/Jul
Dec/Jan
Jun/Jul
Year 1
Year 2
Year 3

January 23, 2014 – warm water in northeast Pacific developing I



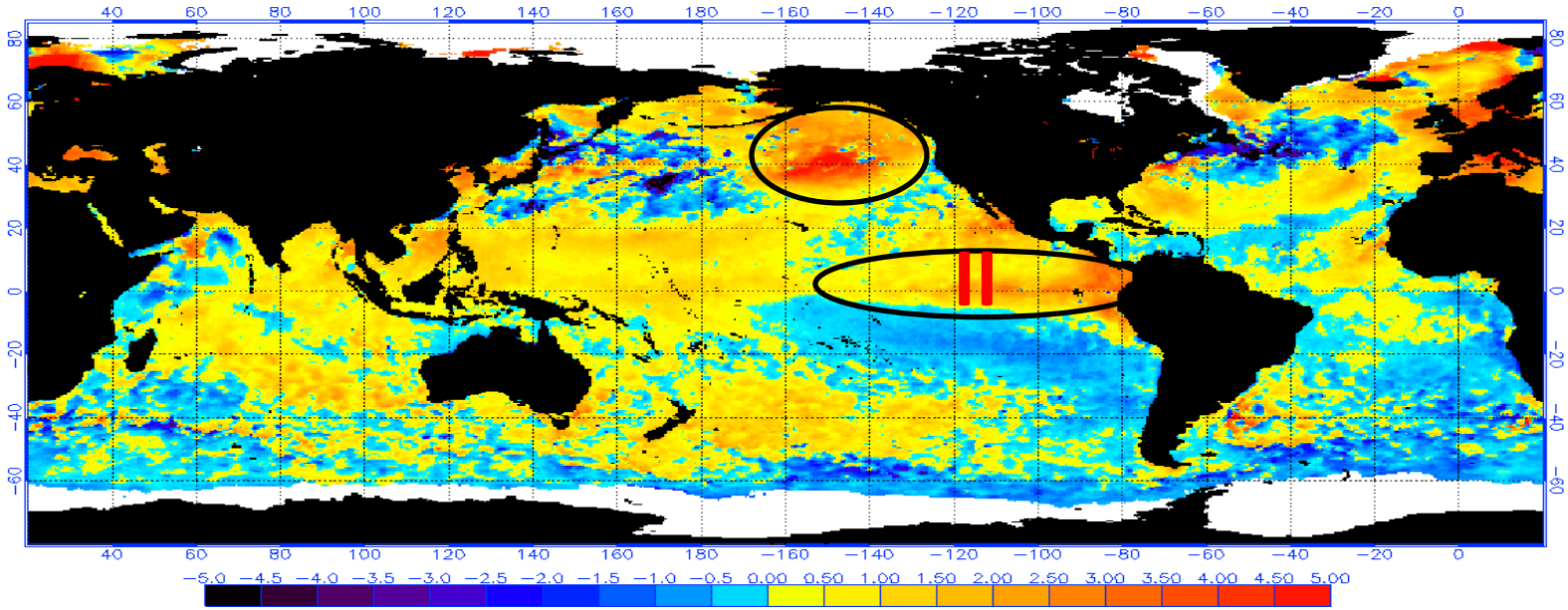
Teleconnection Relationships

January 23, 2014 – warm water in northeast Pacific developing I



Teleconnection Relationships

June 16, 2014 – El Nino Brewing II

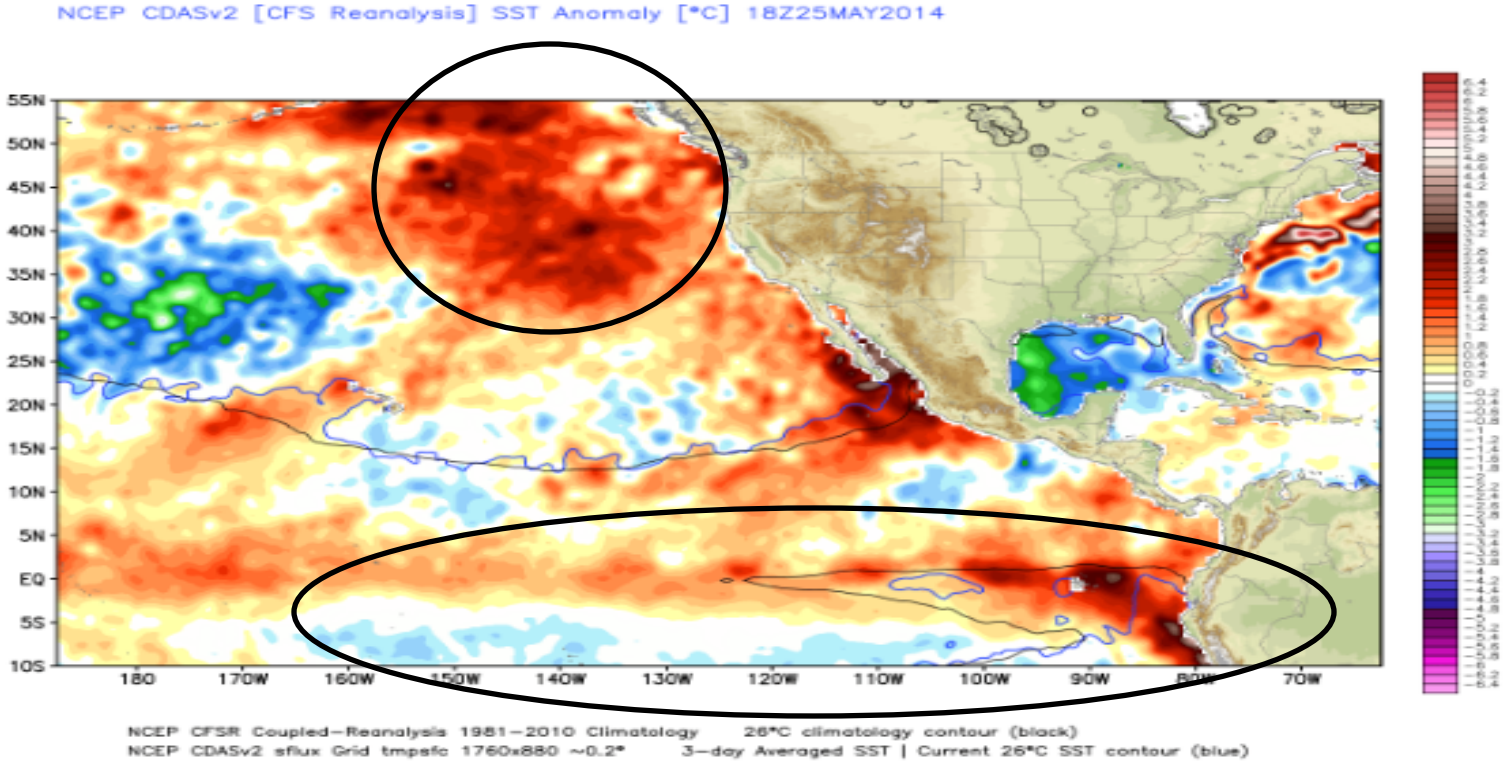


Spring 2014: El Nino Watch for Summer 2014

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.

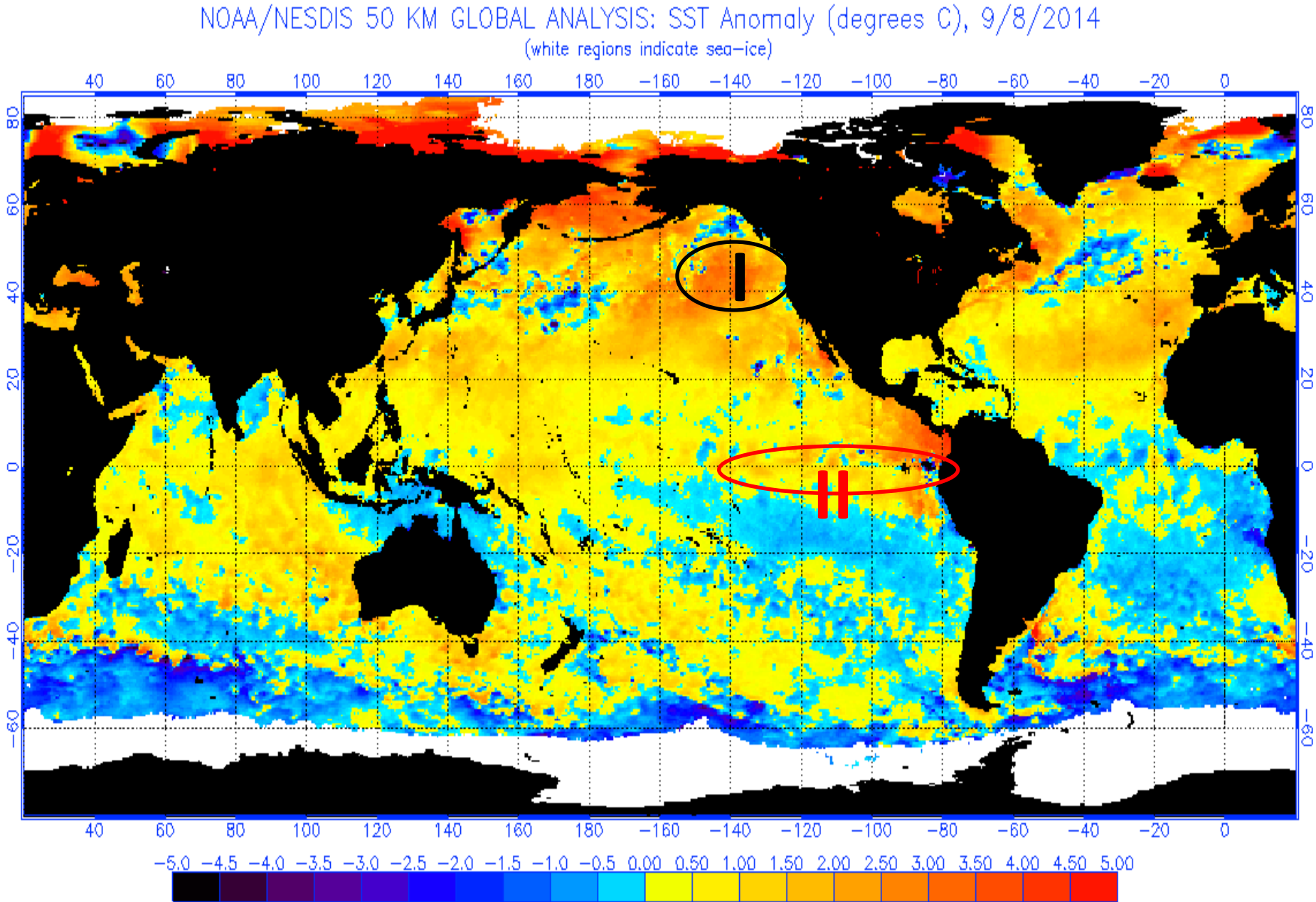


It has been there for at least 6 months and probably isn't going anywhere with El Nino developing to the south. Another reason we will likely see warmer than average temps this summer, along with the data we're seeing elsewhere referenced in a posting last week.

El Nino Watch for Summer 2014

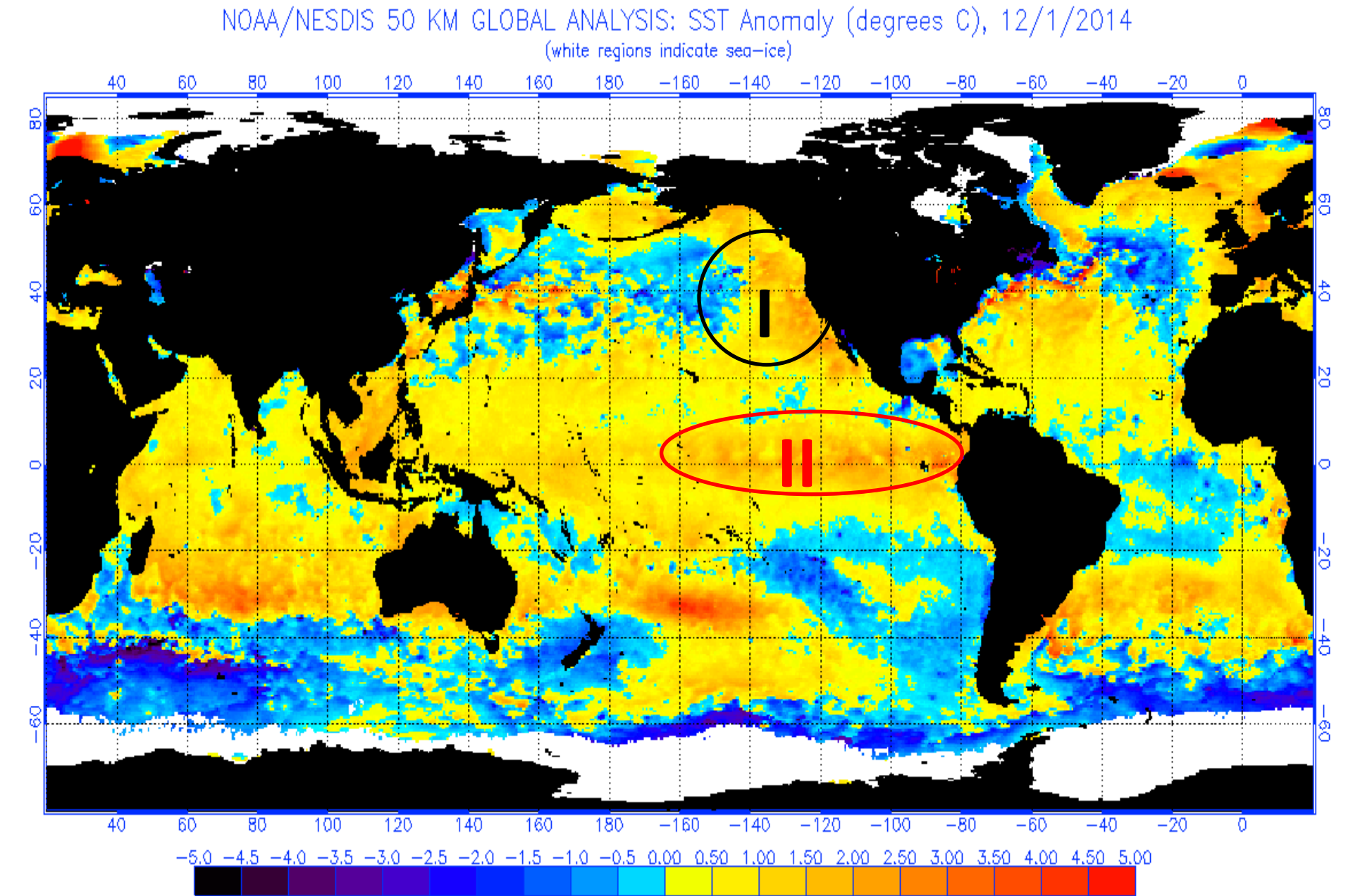
June: 75% Chance El Nino will develop by Summer or Fall

Sept 8, 2014 – Sea Surface Temperatures Map
Strong Typhoons may have influenced change in SST



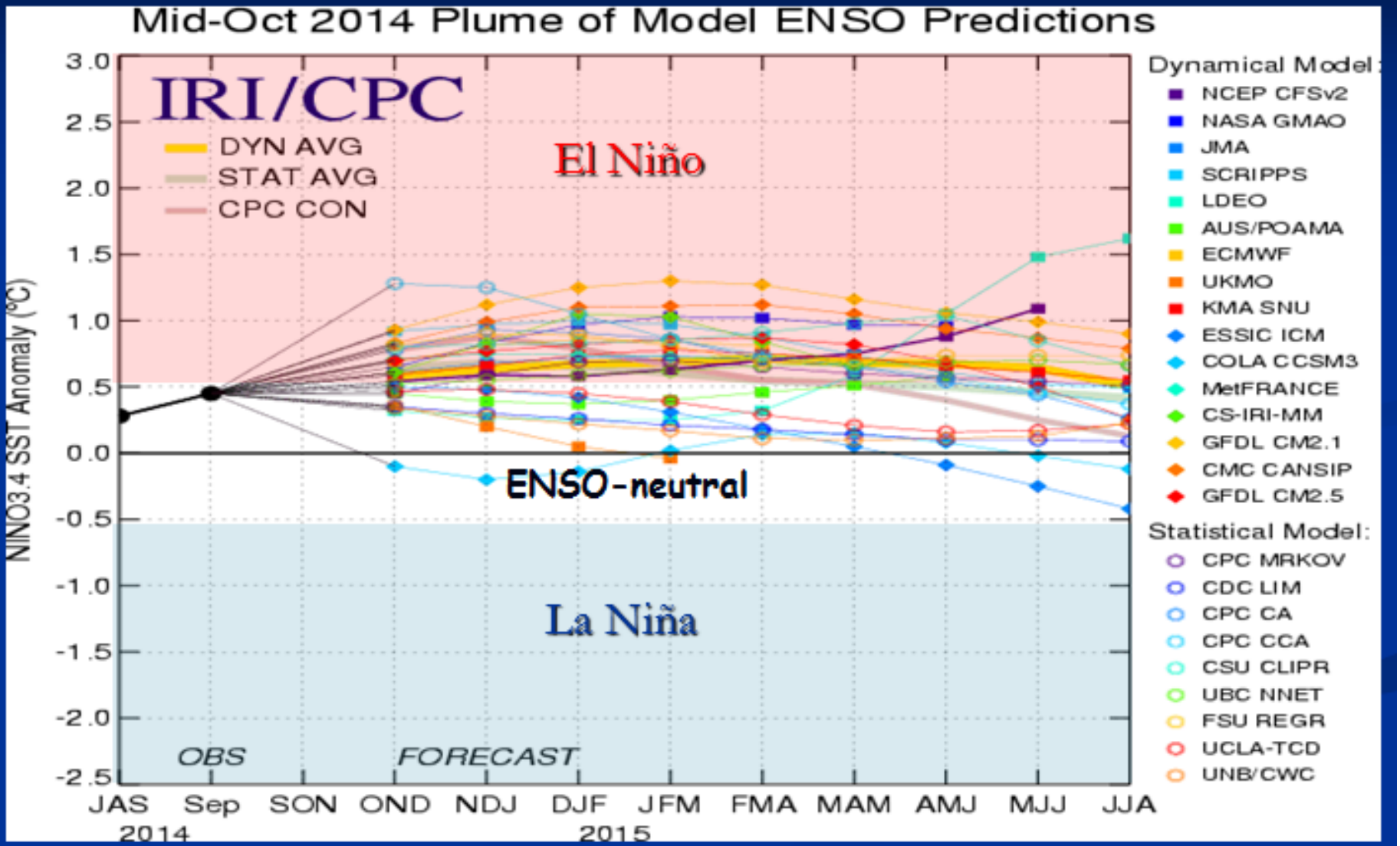
Nov 20, 2014 – warm water still present in northeast Pacific I

Week to Moderate El Nino still brewing II



ENSO Predictive Models

Computer models favor weak El Niño development



Courtesy: http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html

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  - **Streamflow forecast accuracy & increasing spring precipitation variability**
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Past Research & Examples of Recent Climate Variability

USDA Natural Resources Conservation Service
National Water & Climate Center

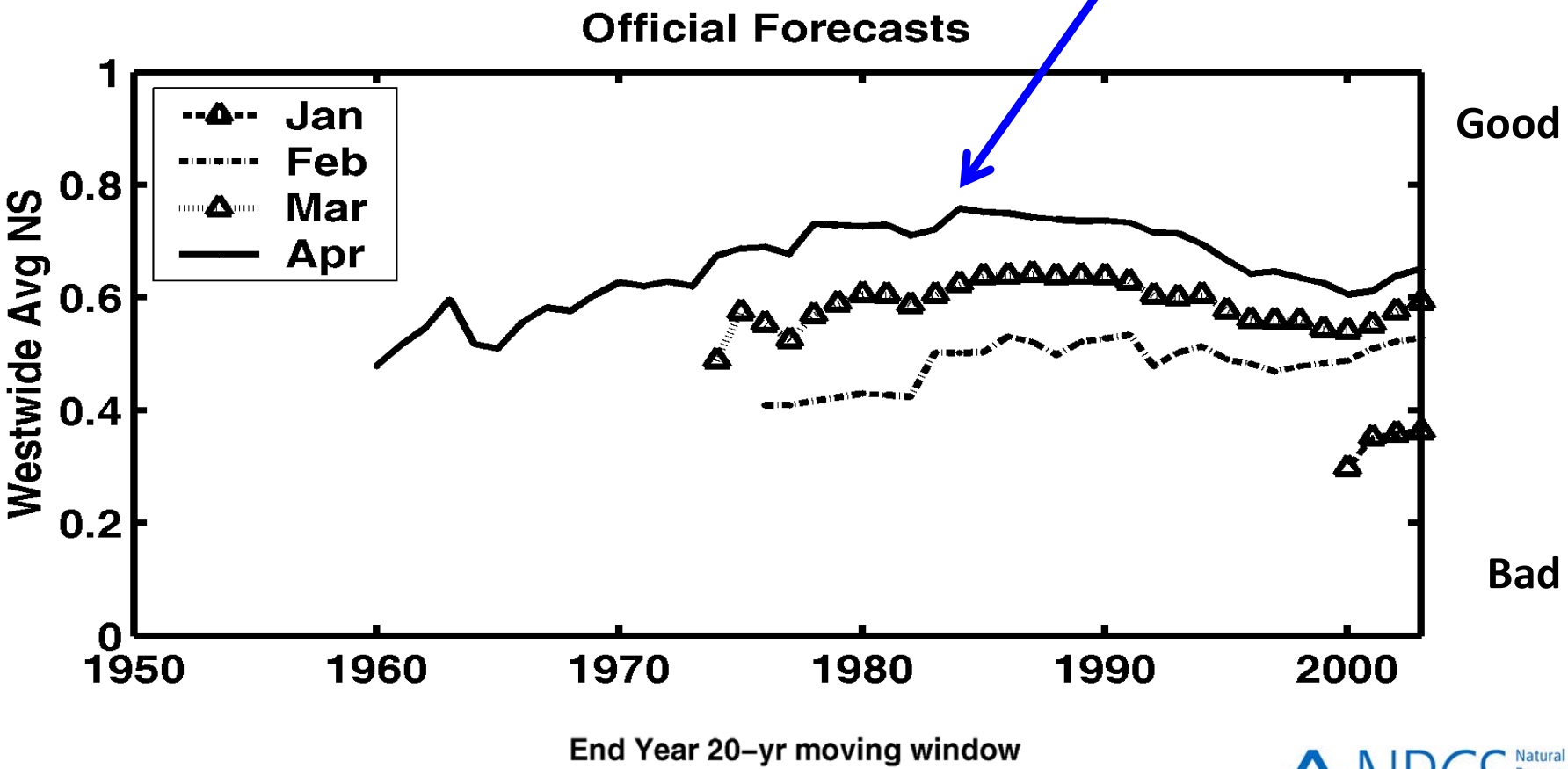
By Tom Pagano who was at USDA NRCS NWCC in PDX

Long-term Trends in Water Supply Forecast Skill

Are there any long-term trends in April 1st water supply forecast skill?

If so, where, when and why?

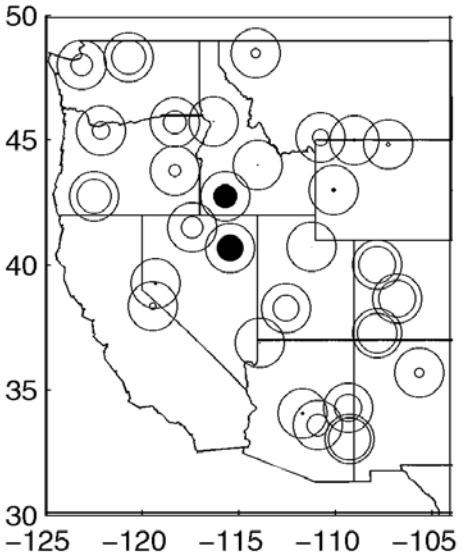
Average skill for all forecasts over 20-yr moving window for the West, as a whole.
April 1 forecast skill peaked around 1985 then slumped afterwards



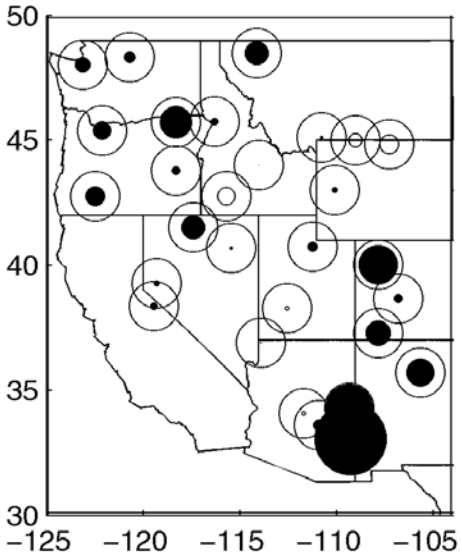
NRCS Natural Resources Conservation Service

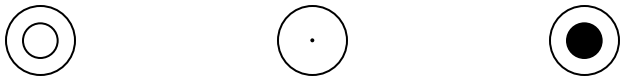
NRCS Natural Resources Conservation Service

1961-80



1981-00





Calm **Typical** **Extreme**

Where is spring precipitation more irregular?

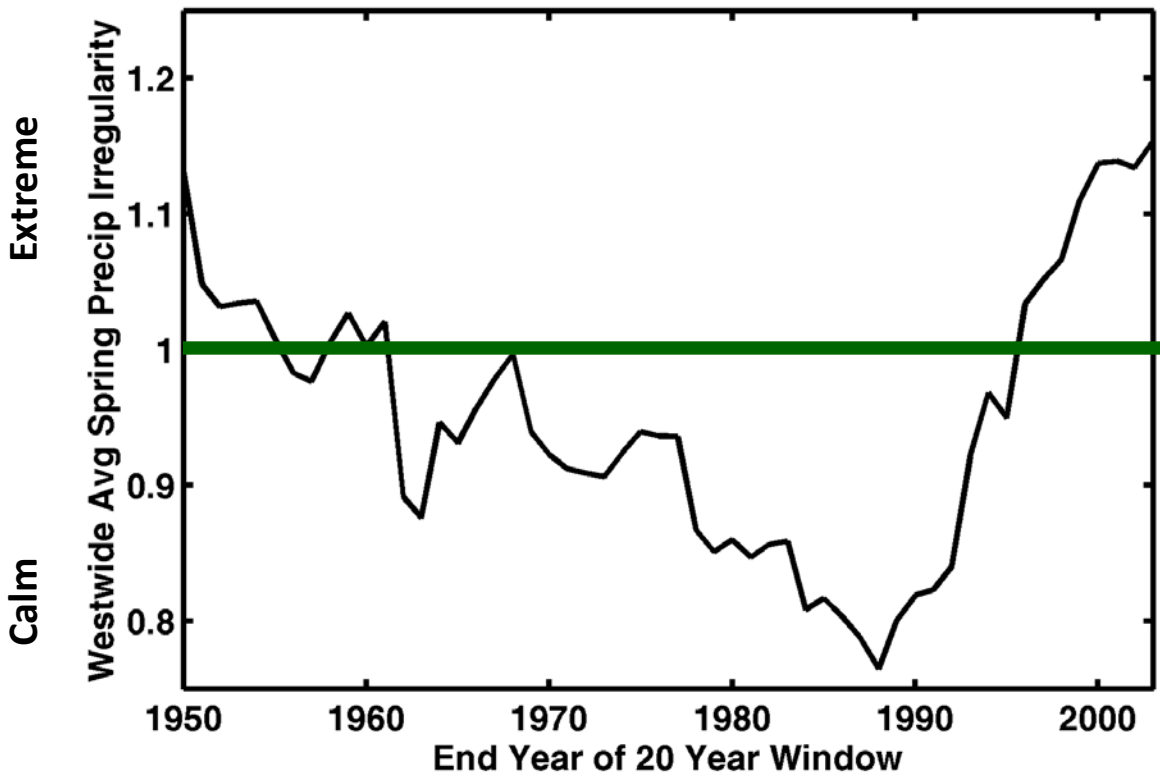
Now, especially in PNW & Southwest, whereas before it was very calm

This matches decline in forecast skill

NRCS Natural Resources Conservation Service

20-year moving window Spring precipitation "irregularity"

Westwide average of 29 basins

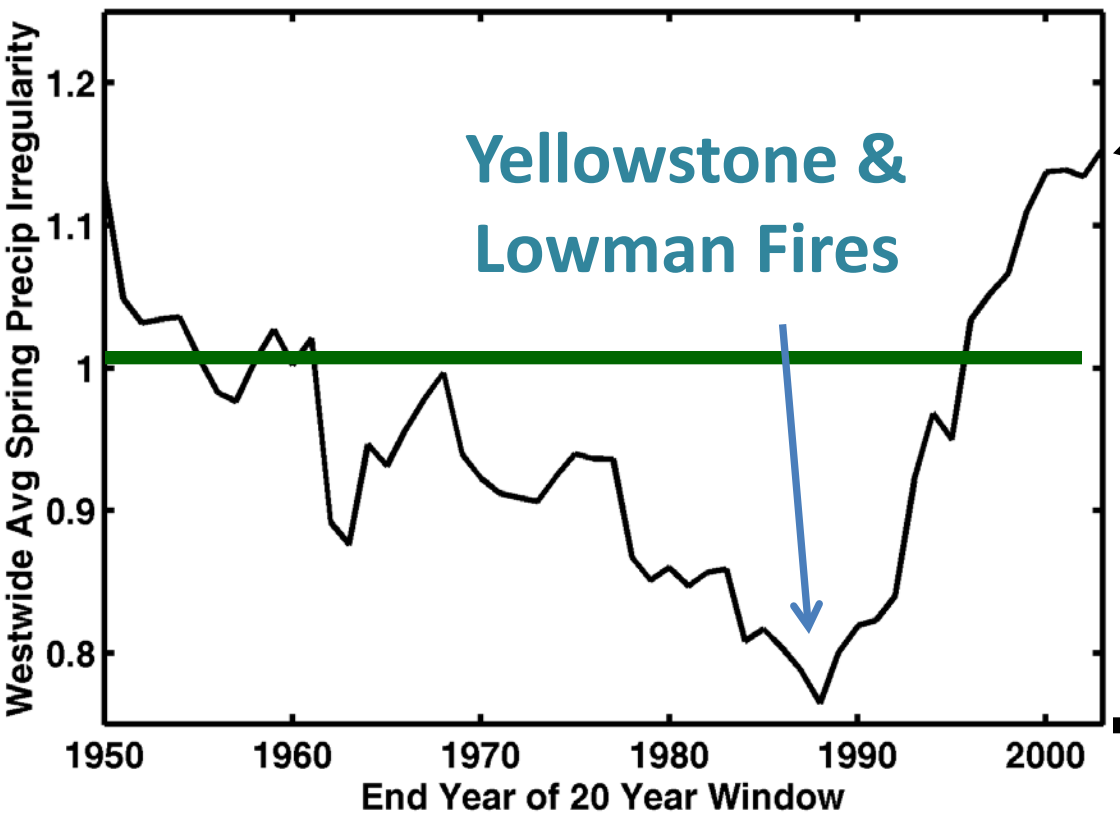


> 1
more extreme than usual

< 1
calm, reliably near-normal

The question is:

Will trend continue?

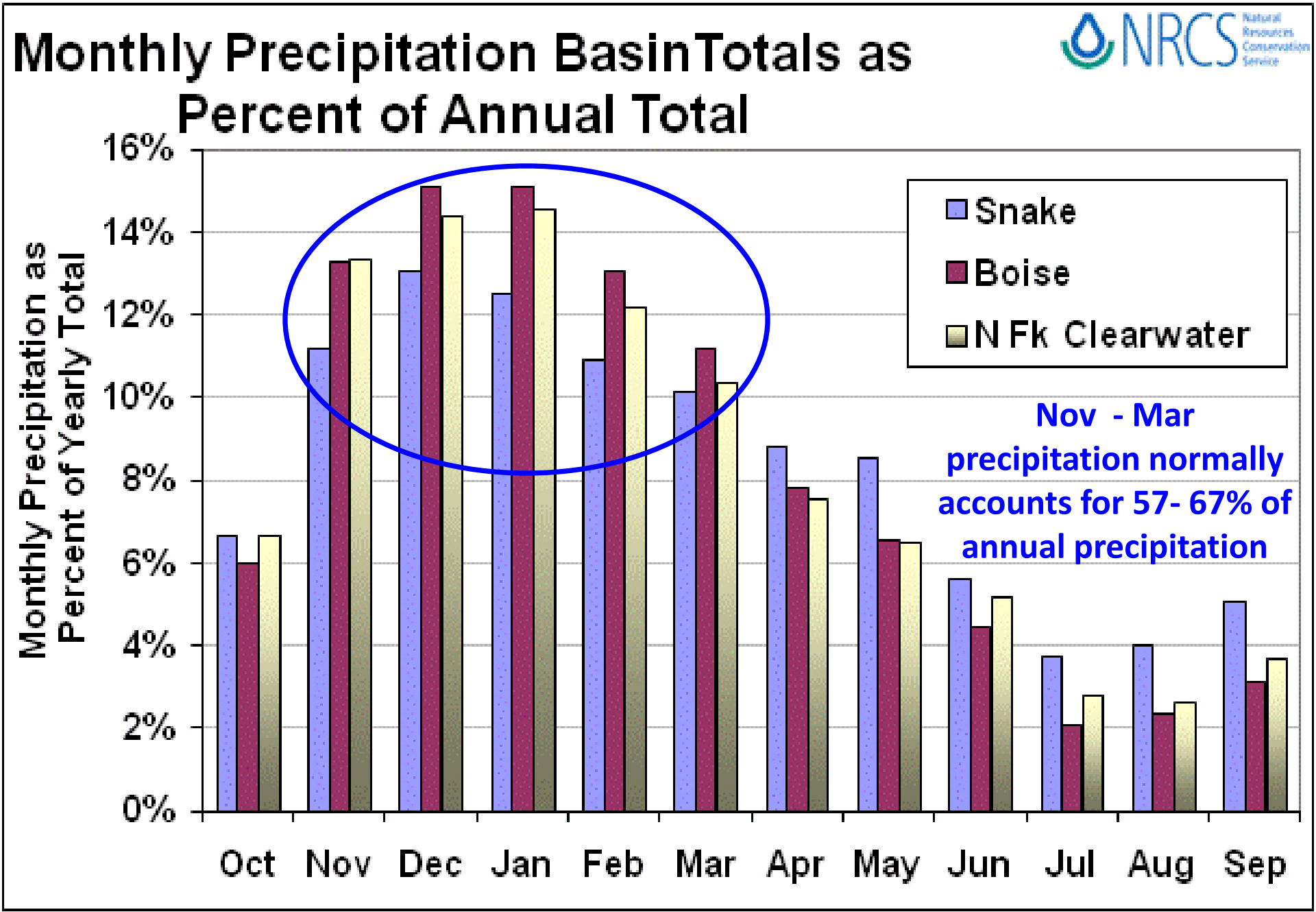


or

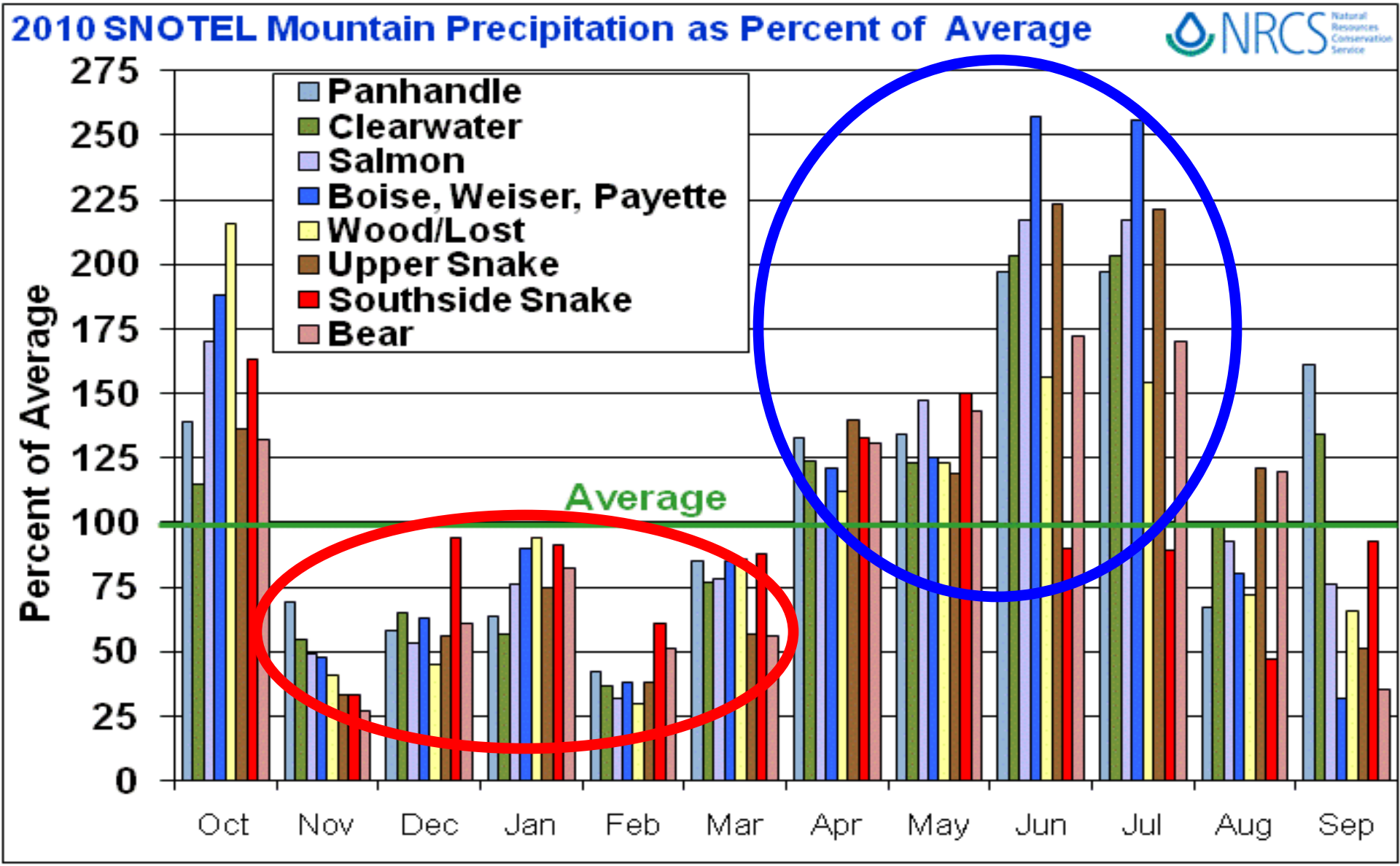
return to normal?

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

Recent Climate Variability

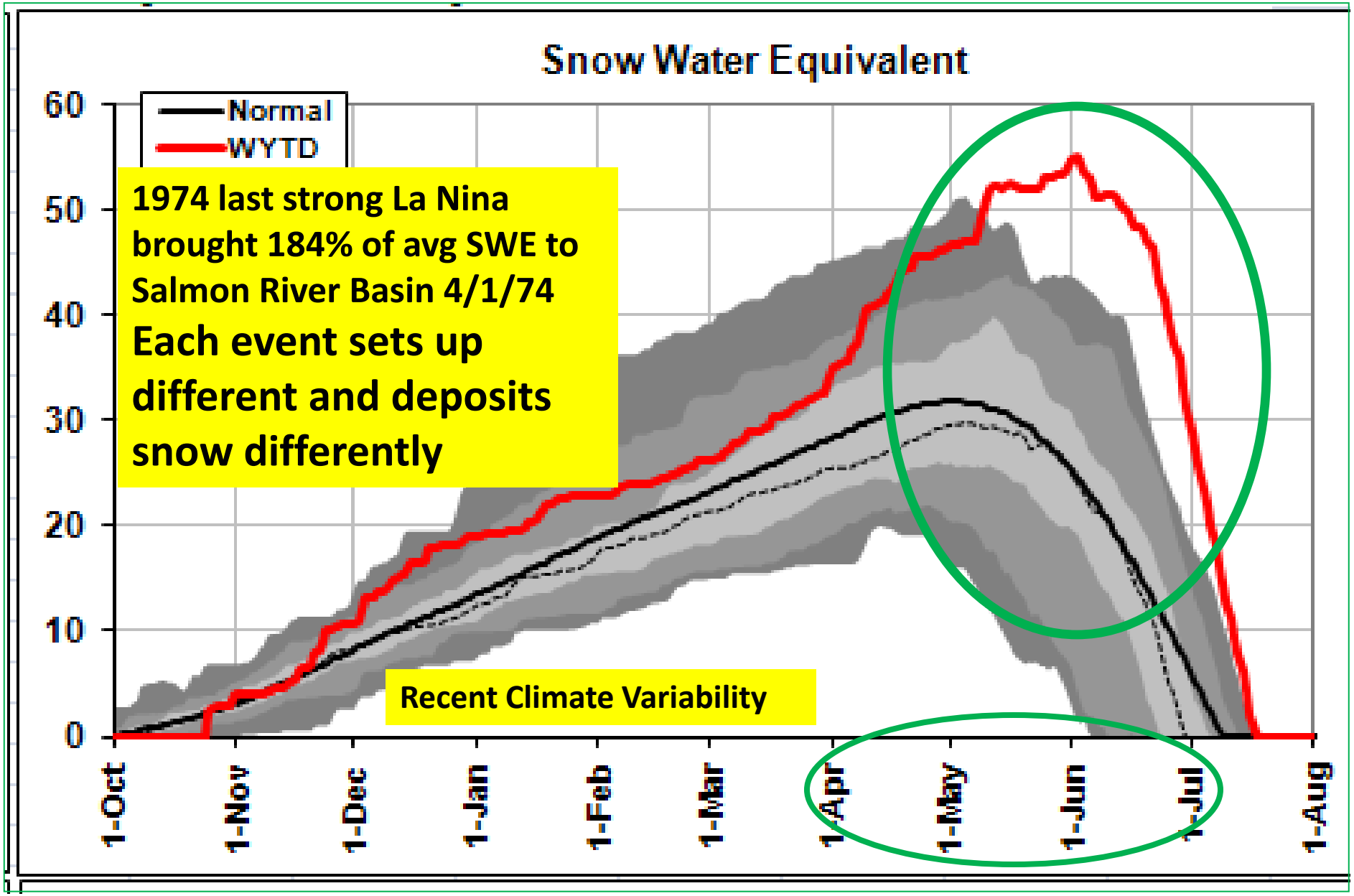


2010 Apr-Jun Precipitation ~ 20 stations received record high amounts



Nov-Mar Precipitation ~90 of 115 sites were 1st-5th driest

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



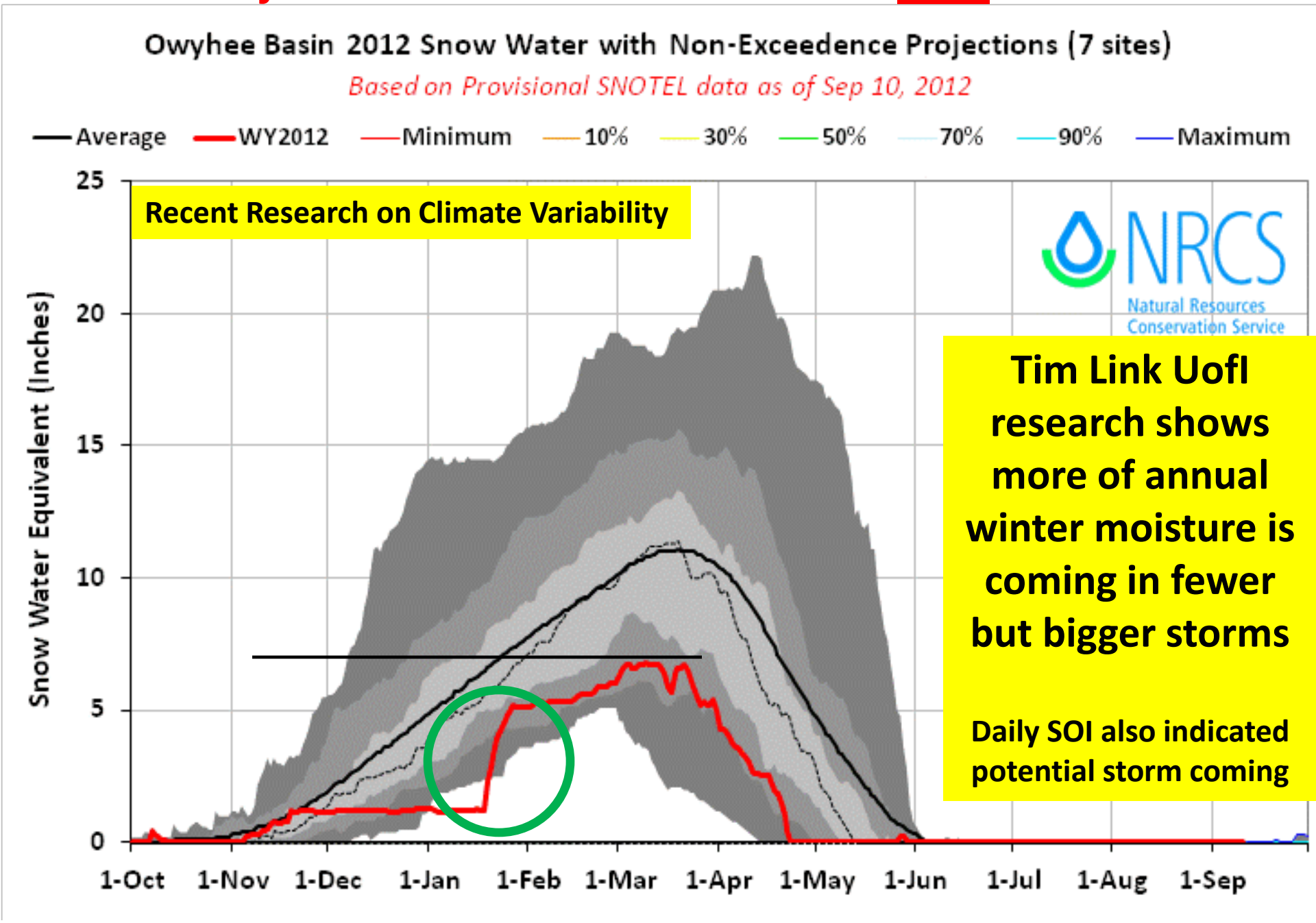
NRCS Snow School Lake Tahoe
Jan 13, 2012

A week later major storms came into the West & Idaho…
allowing Bogus Basin and other western ski areas to open

Recent Climate Variability

NRCS Natural Resources Conservation Service

Jan 2012 Owyhee Basin 7 Station Snow Index were Record Low



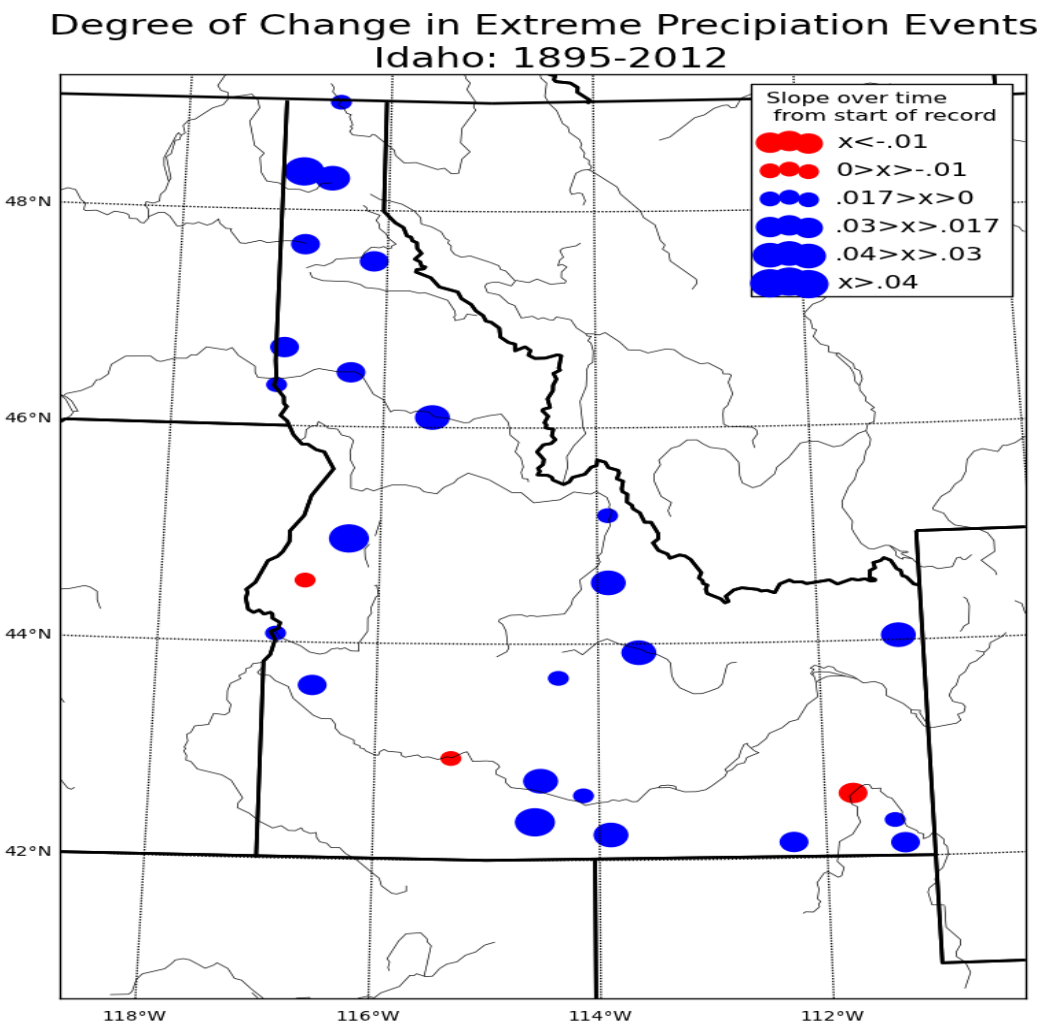
Troy Magney paper – Spatial and Seasonal Changes in Idaho's Max Daily Prec Events: Implications for Ag

Geospatial Laboratory for Environmental Dynamics — University of Idaho Geography

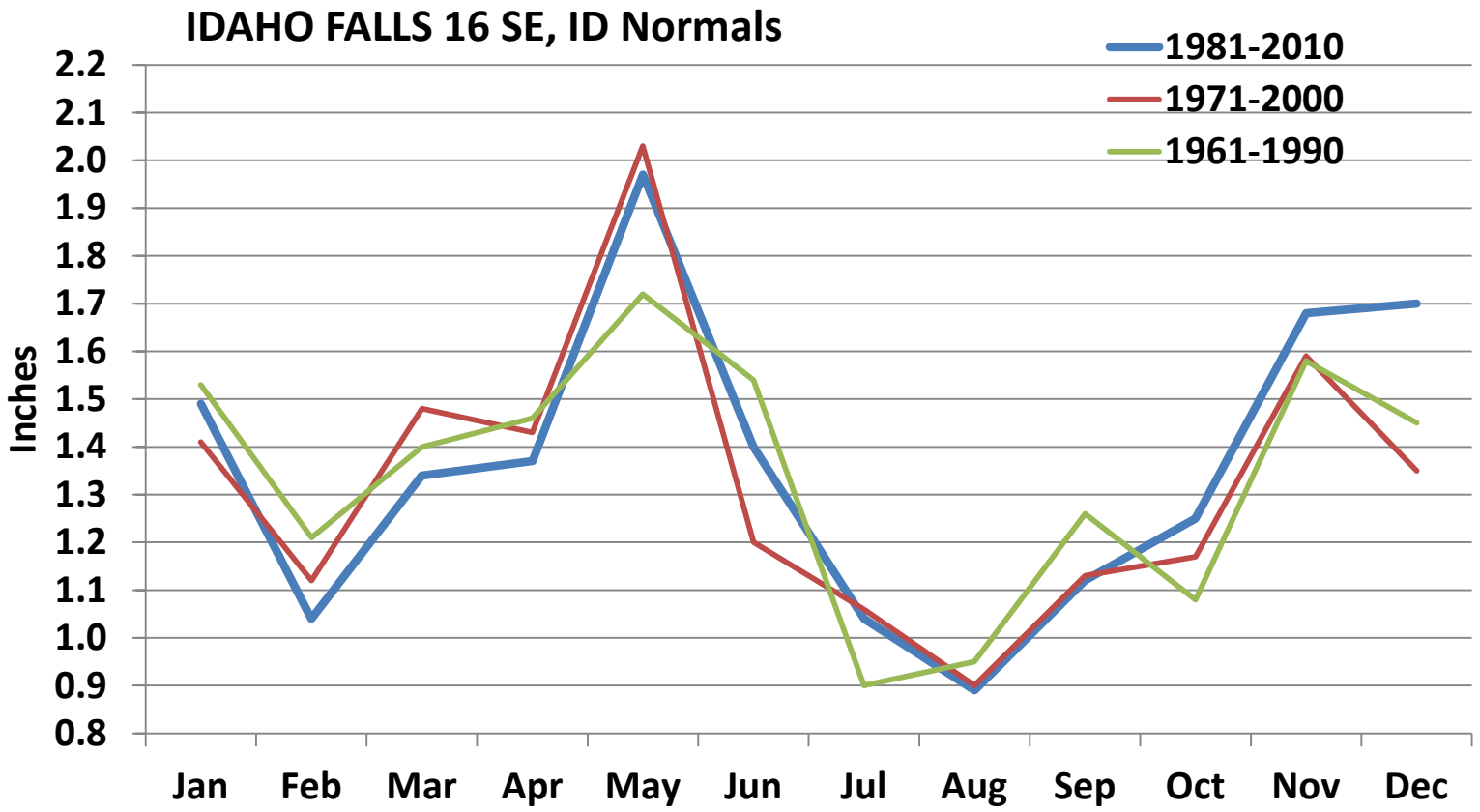
Spatial and Seasonal Changes in Idaho's Maximum Daily Precipitation Events

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[2]**



Recent Research on Climate Variability



IDAHO FALLS 16 SE, IDAHO

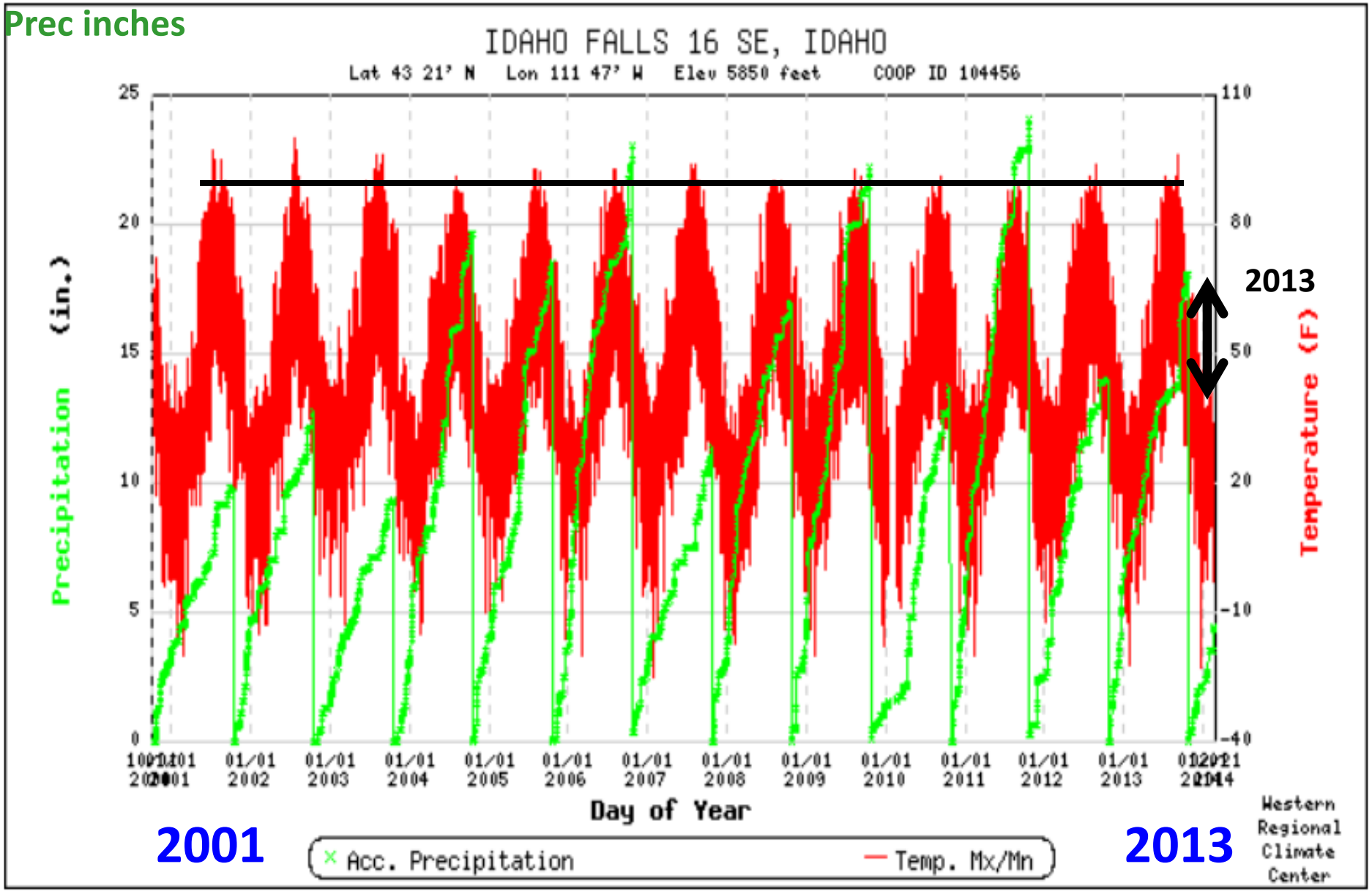
NCDC 1961-1990 Monthly Normals

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1981-2010	1.49	1.04	1.34	1.37	1.97	1.4	1.04	0.89	1.12	1.25	1.68	1.7	16.29
1971-2000	1.41	1.12	1.48	1.43	2.03	1.2	1.06	0.9	1.13	1.17	1.59	1.35	15.87
1961-1990	1.53	1.21	1.4	1.46	1.72	1.54	0.9	0.95	1.26	1.08	1.58	1.45	16.08

Summary-Of-the-Day Graph

Annual 10 13 9 19 18 23 11 17 22 13 24 14 13/17

Prec inches



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Setting the Stage for Winter 2013/2014

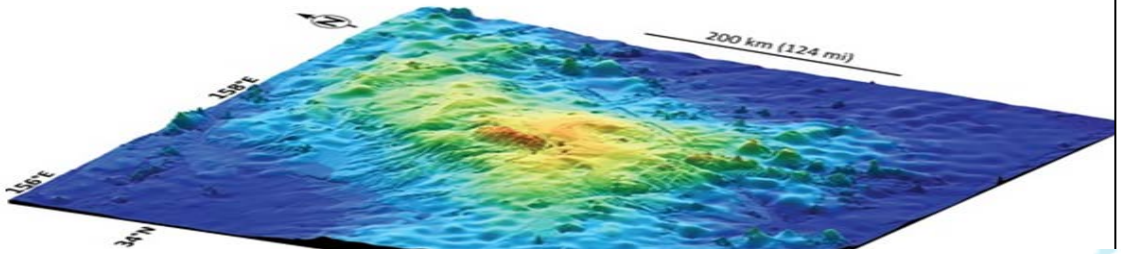
Natural Cycles – rate of change might be key to better understand…

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



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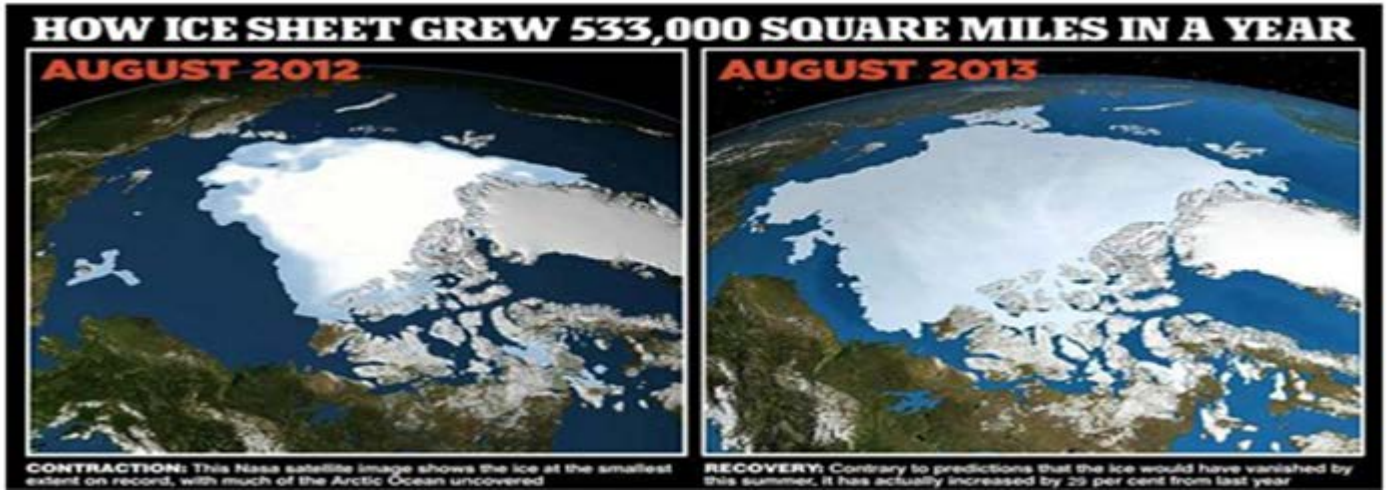
And now it's global COOLING! Return of Arctic ice cap as it grows by 29% in a year

- 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

download large image (2 MB, JPEG, 3368x3368) acquired March 30, 20
download GeoTIFF file (18 MB, TIFF) acquired March 30, 20
download Google Earth file (KML) acquired March 30, 20

In November 2013, a seafloor volcano in the western Pacific Ocean spewed enough material to rise above the water line. The new island, or 'niijima' in Japanese, sprouted just 500 meters from Nishino-shima, another volcanic island that had last erupted and expanded in 1973–74. Four months later, the new and the old are now one island, and the volcanic eruption shows no sign of abating.

NRCS Natural Resources Conservation Service

Setting the Stage for Winter 2014/2015

The Washington Post **Sep 29, 2014**

Science explains why volcanoes are erupting all over the place right now

By Robin Wylie September 29 Follow @rwylie5

Robin Wylie is a PhD researcher in volcanology at University College London.

Some think it's that time of year. Ecuador's Tungurahua volcano erupts. (EPA)

The Earth seems to have been smoking a lot recently. Volcanoes are erupting in Iceland, Hawaii, Indonesia, Ecuador and Mexico right now. Others, in the Philippines and Papua New Guinea, erupted recently but seem to have calmed down. Many of these have threatened homes and forced evacuations. But among their spectators, these eruptions raise question: Is there such a thing as a season for volcanic eruptions?

Recent Earthquake Near Japan

Japan has had: *(M1.5 or greater)*

0 earthquakes today
11 earthquakes in the past 7 days
27 earthquakes in the past month
340 earthquakes in the past year

The largest earthquake in Japan:

this week: 6.2 in Omachi, Nagano, Japan
this month: 6.2 in Omachi, Nagano, Japan
this year: 6.5 in Nago, Okinawa, Japan

Nov 24, 2014

Natural Cycles – might be key to better understand…

Oregon Outdoor Show

- **75% of world's active volcanoes are under water**
- **only 5% of oceans have been explored**

Sept 2014

Iceland's latest volcano eruption worsens

06/09 12:53 CET

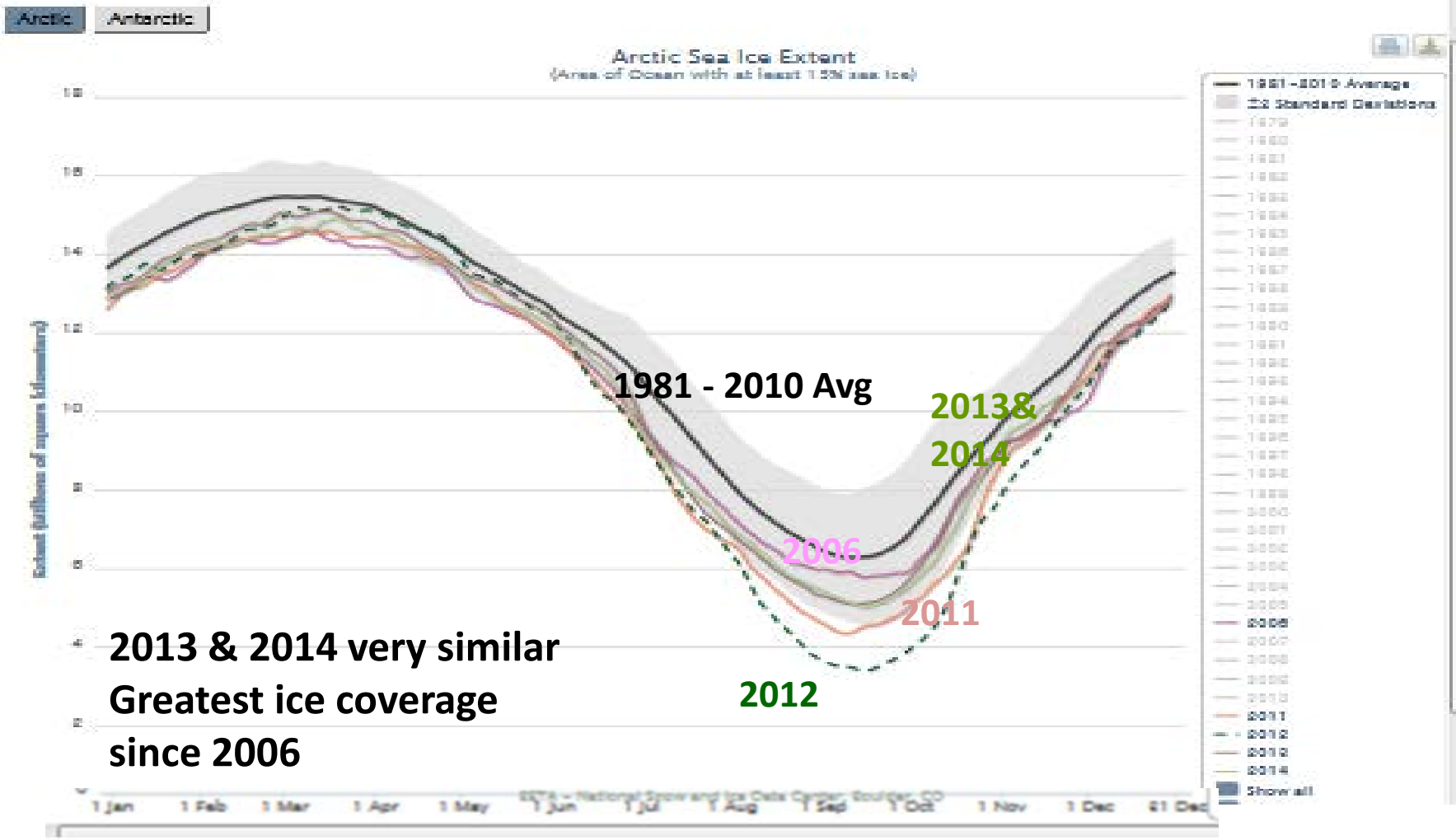
Recent Qu

NRCS Natural Resources Conservation Service

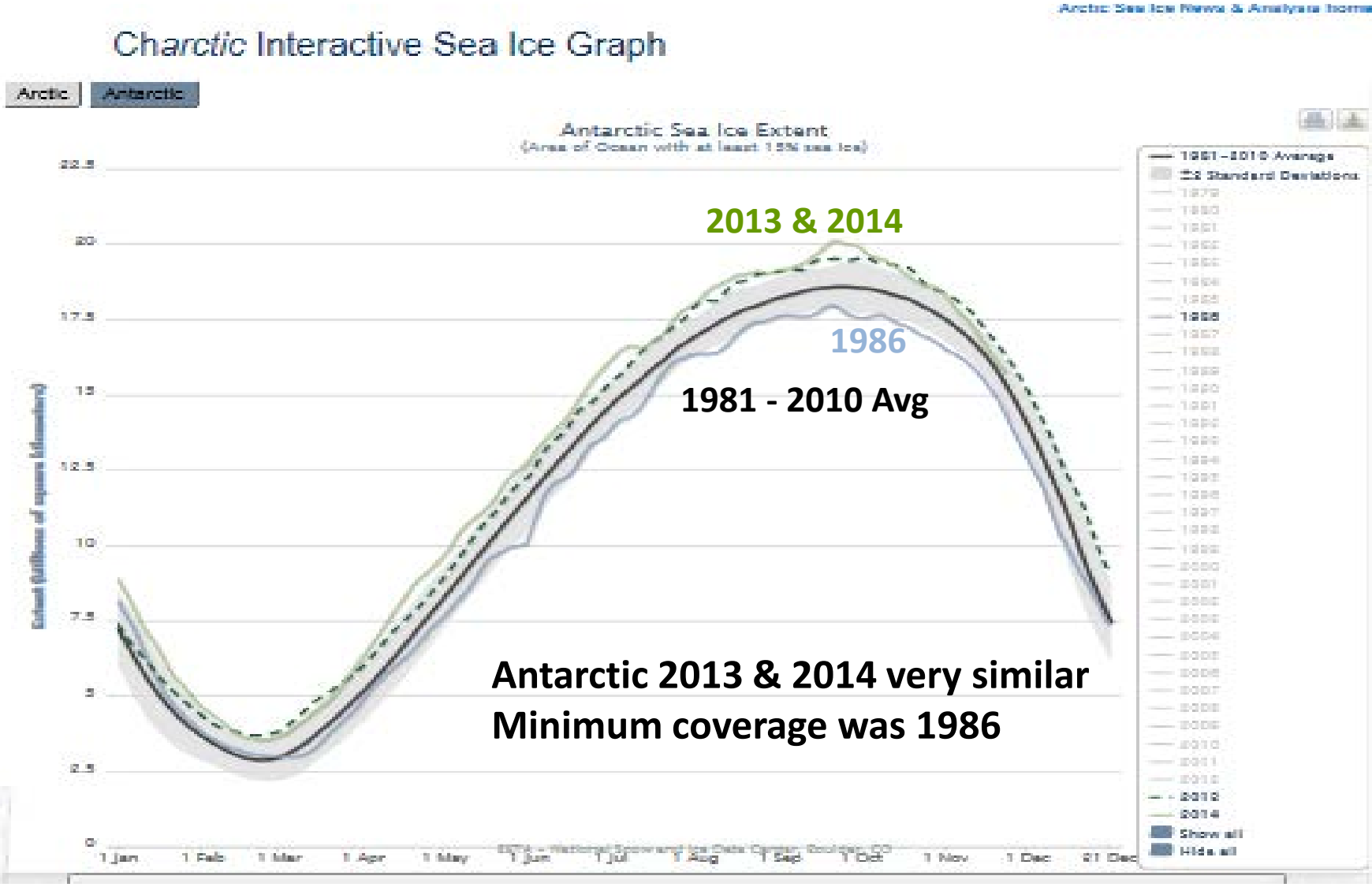
Arctic Sea Ice News & Analysis

Arctic Sea Ice News & Analysis home

Charctic Interactive Sea Ice Graph



Arctic Sea Ice News & Analysis



Fall 2013 – hints at early fall,

- **Cold temperatures were building over Artic, Sept 2013 snow & rain put forest fires out**

- **Fall 2014 - similar conditions present**

Our Crystal Ball isn't always round…

Fall Forecasts for Winter 2013-2014

Weather Forecasts	Streamflow Forecast	Combo
X X X X	X	X

6 Different Sources of Forecasts

Several Different Results

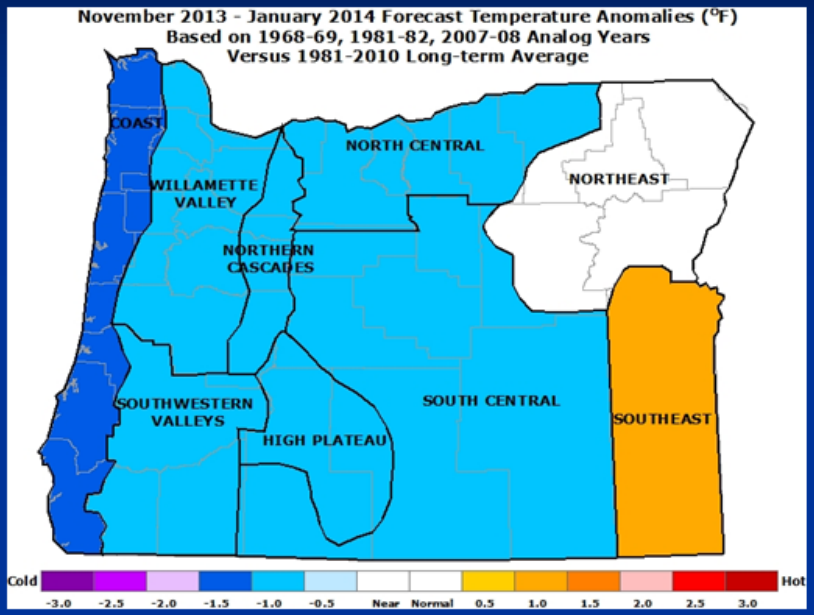
Rule #1

- **Don’t believe the 1st weather forecast you hear**

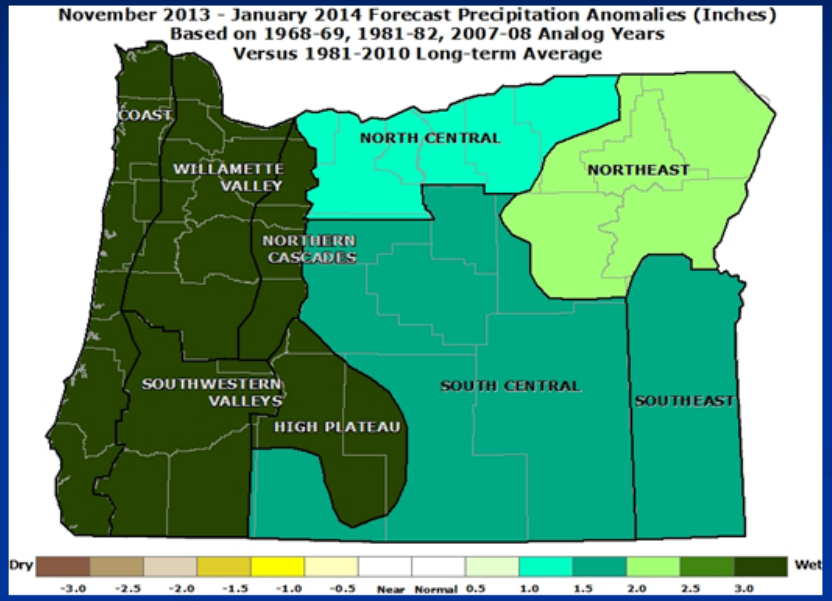
- ***Wait until you hear the Same or Similar forecast from two or more of unrelated sources***

Pete Parsons Nov. 2013 – Jan. 2014 Forecasts

Temperatures



Precipitation



- 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).

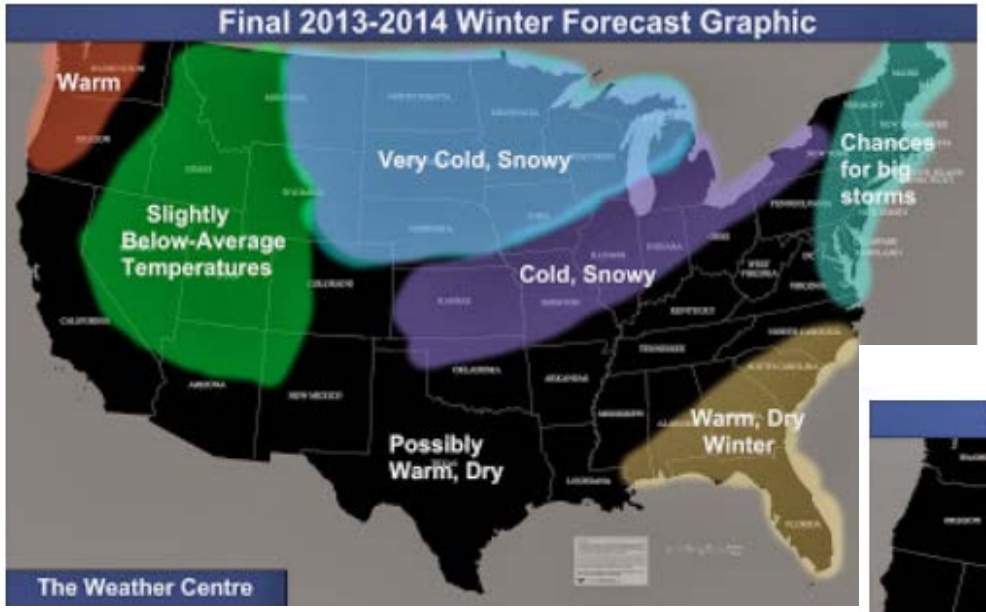
Thursday, October 24, 2013

Final 2013-2014 Winter Forecast

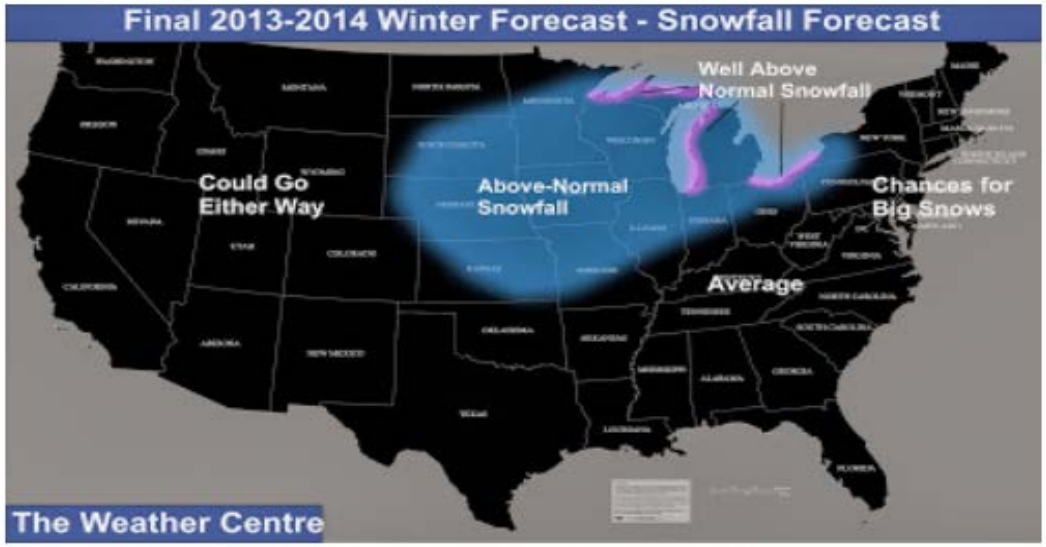
By Andrea at 5:00 PM

"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.



Snowfall



Confidence: Medium to Medium-High

Jan Curtis - NRCS Meteorologist / Applied Climatologist retired after 41 years with several agencies

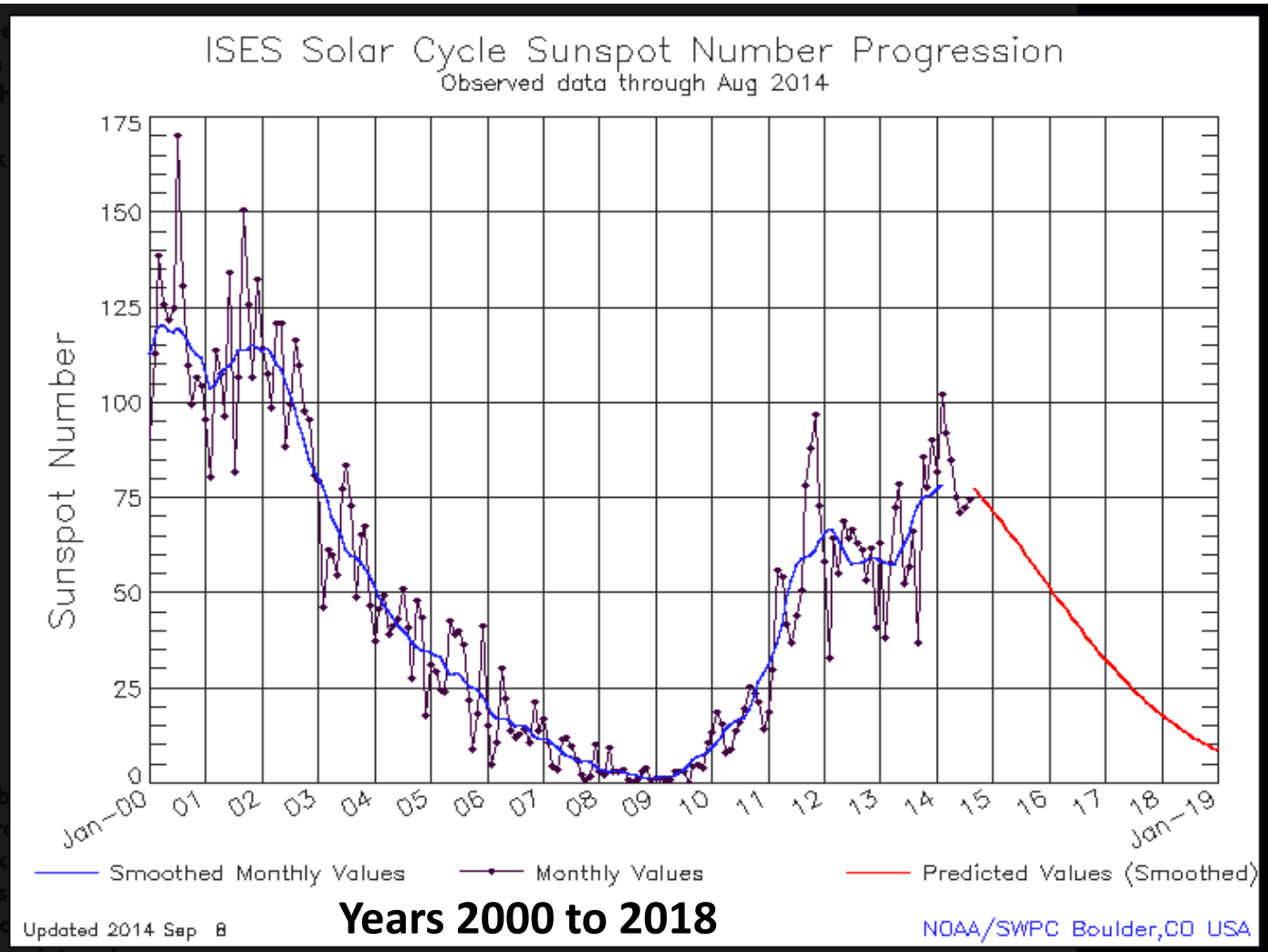
Had a wealth of info about past, current & future weather outlook that might affect snowfall, snow accumulation, snowmelt rates, peak flows, and even fall weather patterns hinting at first frost.

Position is vacant - not sure when/ if it will be filled.

Jan looked at a number of climate indices including solar activity.

2013/14 General forecast - with neutral conditions, winter precip could 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**



Years 2000 to 2018

Sept 9, 2013 - the sun, which should be at SOLAR MAX, is sporting a measly 24 sunspot number (150 is more typical):

Streamflow Forecast & Current Research

BOISE STATE UNIVERSITY

Department of Geosciences in the College of Arts & Sciences

Home » People » Graduate Students »

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- Research

BOISE STATE UNIVERSITY

U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION

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.**

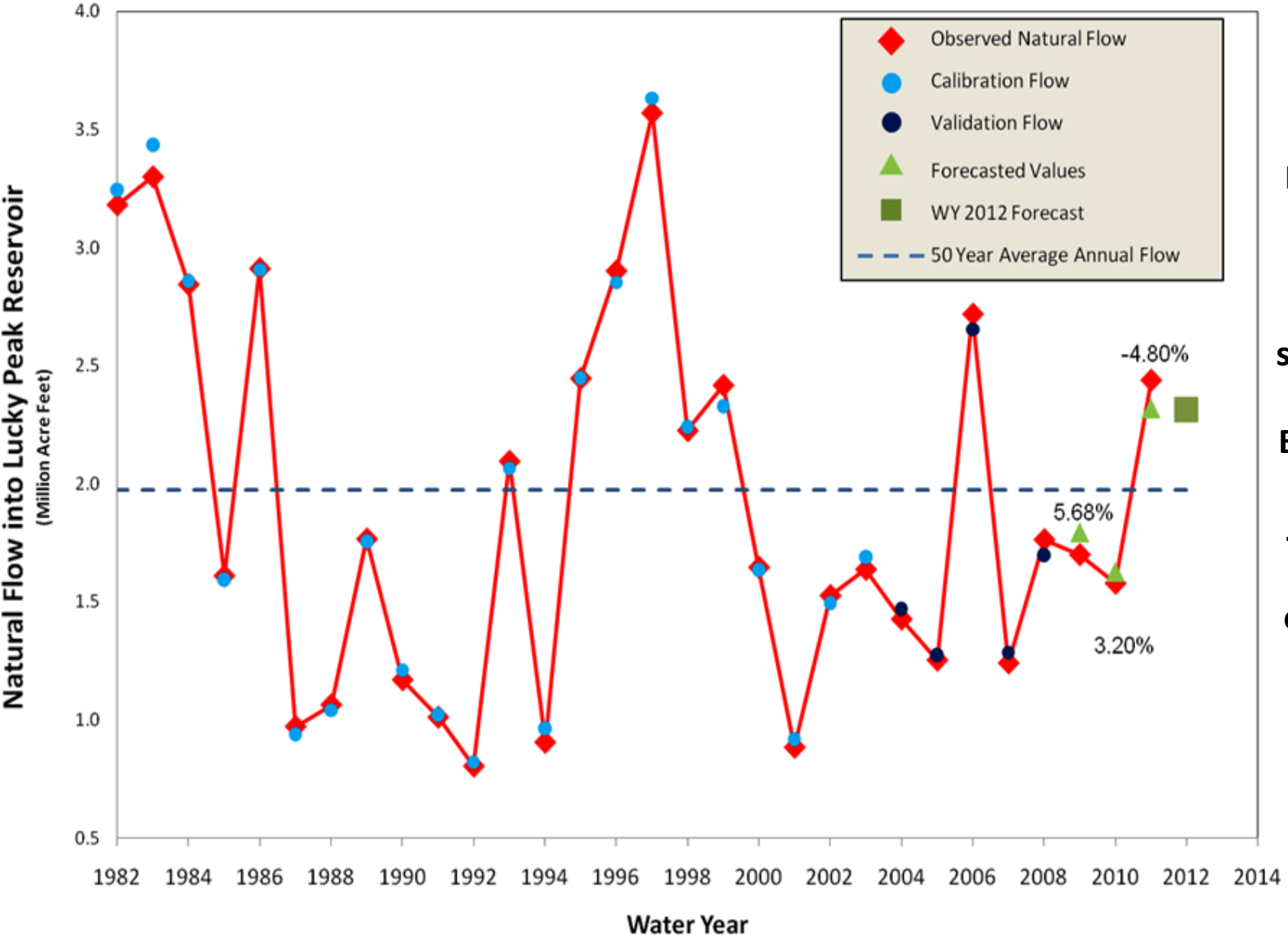
The model results indicate that we will have a slightly wetter first quarter than last year followed by a second quarter that is **significantly** wetter than last year's above average flow. After two quarters of strong flows, the third and fourth quarters drop slightly compared to last year's flows. 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):**

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

** 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



Prediction for 2014 near normal streamflow

Boise River 2014 Apr-Jul Runoff was ~85% of average

Winter 2013-2014 What Happened?

Surf's Up Jan 22, 2014

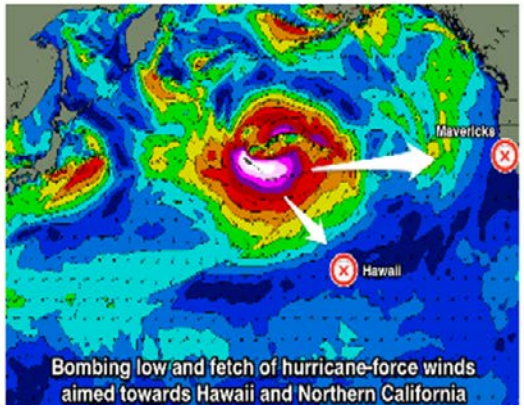
30-40 (60-80) foot waves & erratic winds cancel Hawaii Surfing Event

Three great barrels from Sunday 19/01 at Peahi.

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

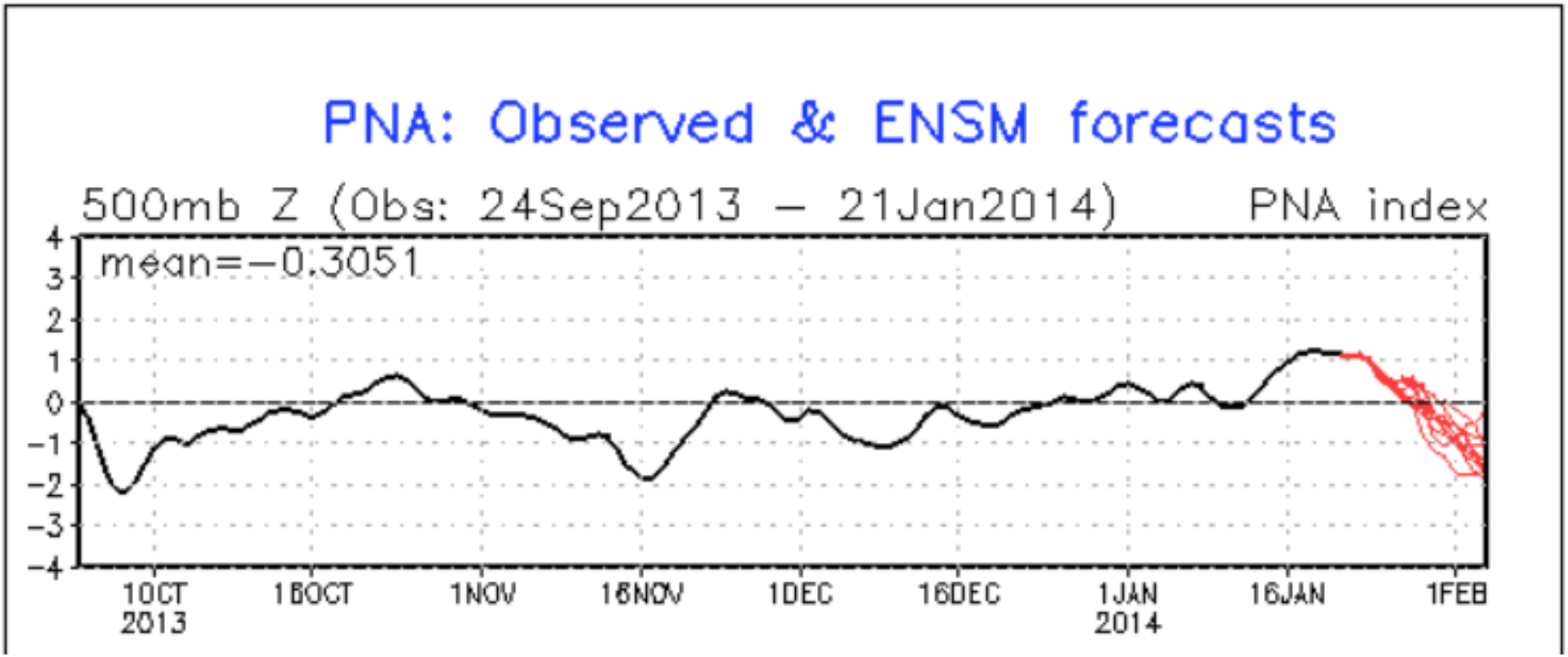
All eyes on Hawaii as huge storm approaches

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.



The PNA is getting interestingly negative:

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



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 2nd consecutive day.

A reading of a 50 does not occur often, based on 23 years of record.

Here are FEW times the daily number SOI 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**

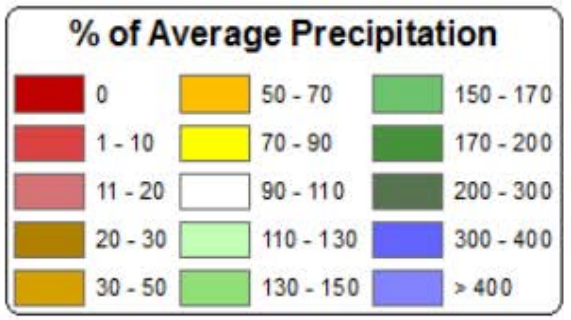
It's no fool proof method, but is now showing agreement with weather models.

Total Precipitation Anomaly: February 2014

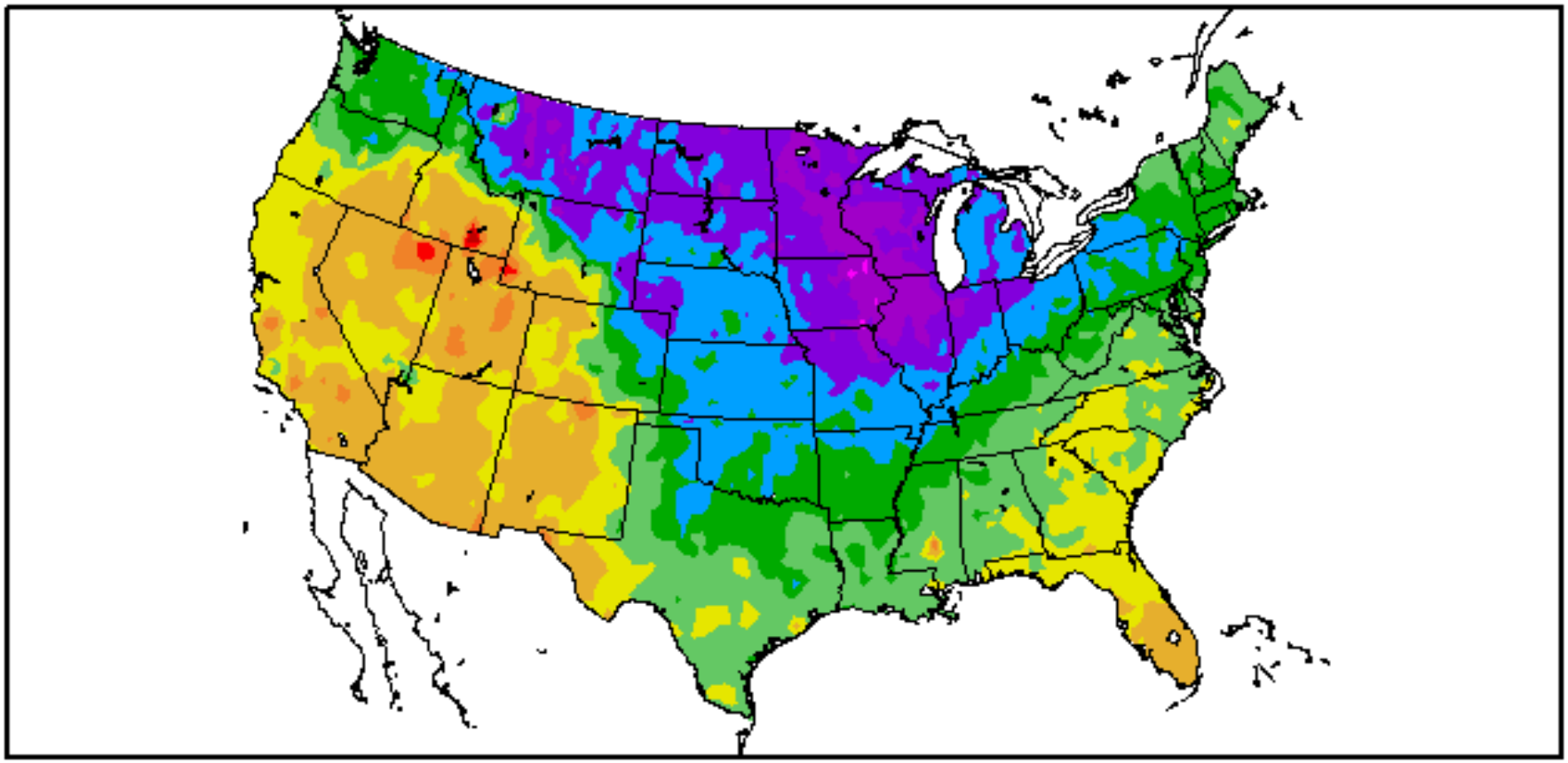
Period ending 28 Feb 2014
Base period: 1981-2010
(Map created 13 Aug 2014)

February SWE Increase:
☆ Lewis Lake Divide SNOTEL had 5th highest Feb increase since records start in 1919

Dry spell starting in Lost Basins



Departure from Normal Temperature (F)
2/1/2014 – 2/28/2014



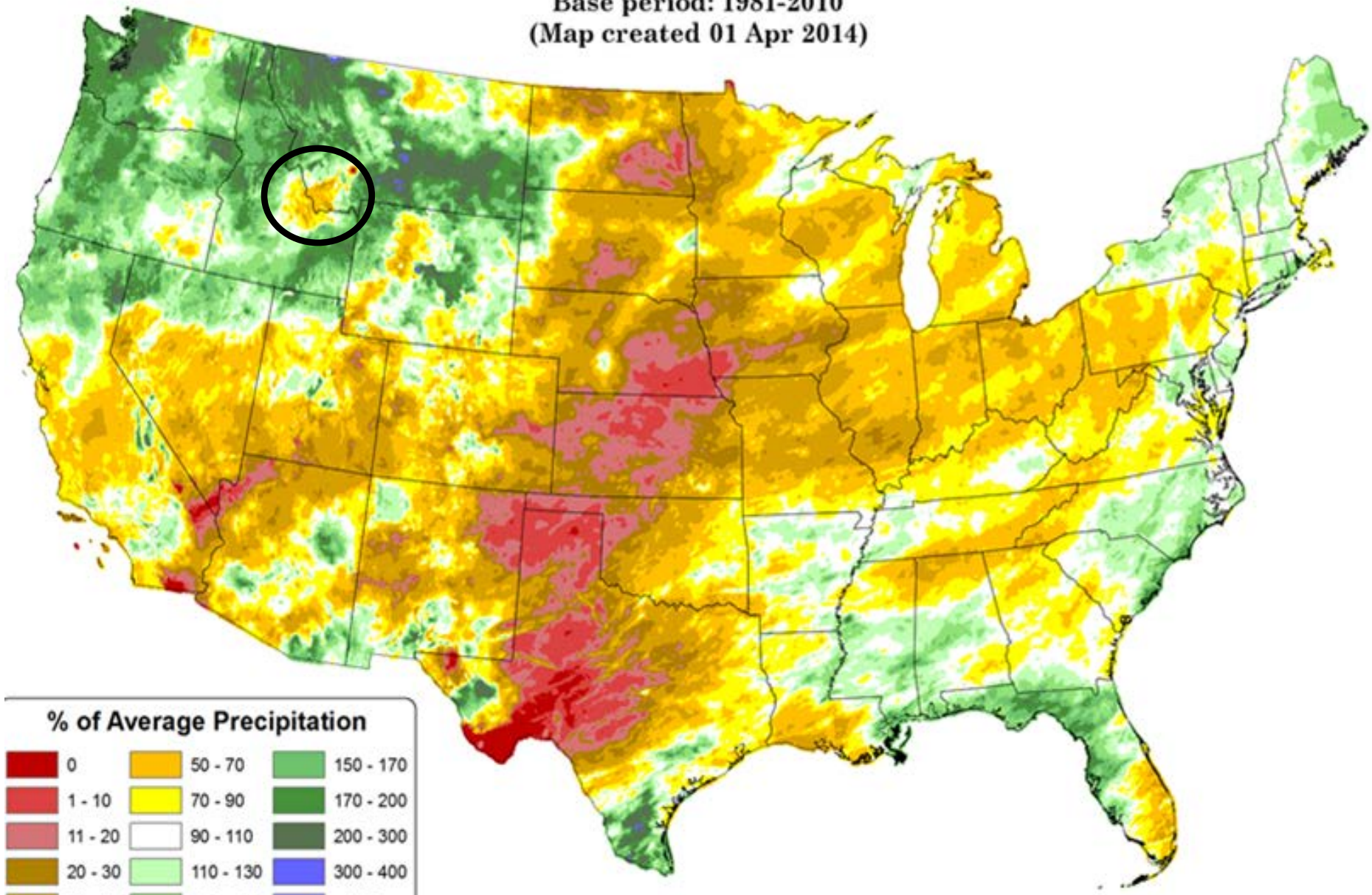
−15 −12 −9 −6 −3 0 3 6 9 12 15

Generated 3/1/2014 at HPRCC using provisional data.

Regional Climate Centers

Total Precipitation Anomaly: 01 March 2014 - 31 March 2014

Period ending 7 AM EST 31 Mar 2014
Base period: 1981-2010
(Map created 01 Apr 2014)



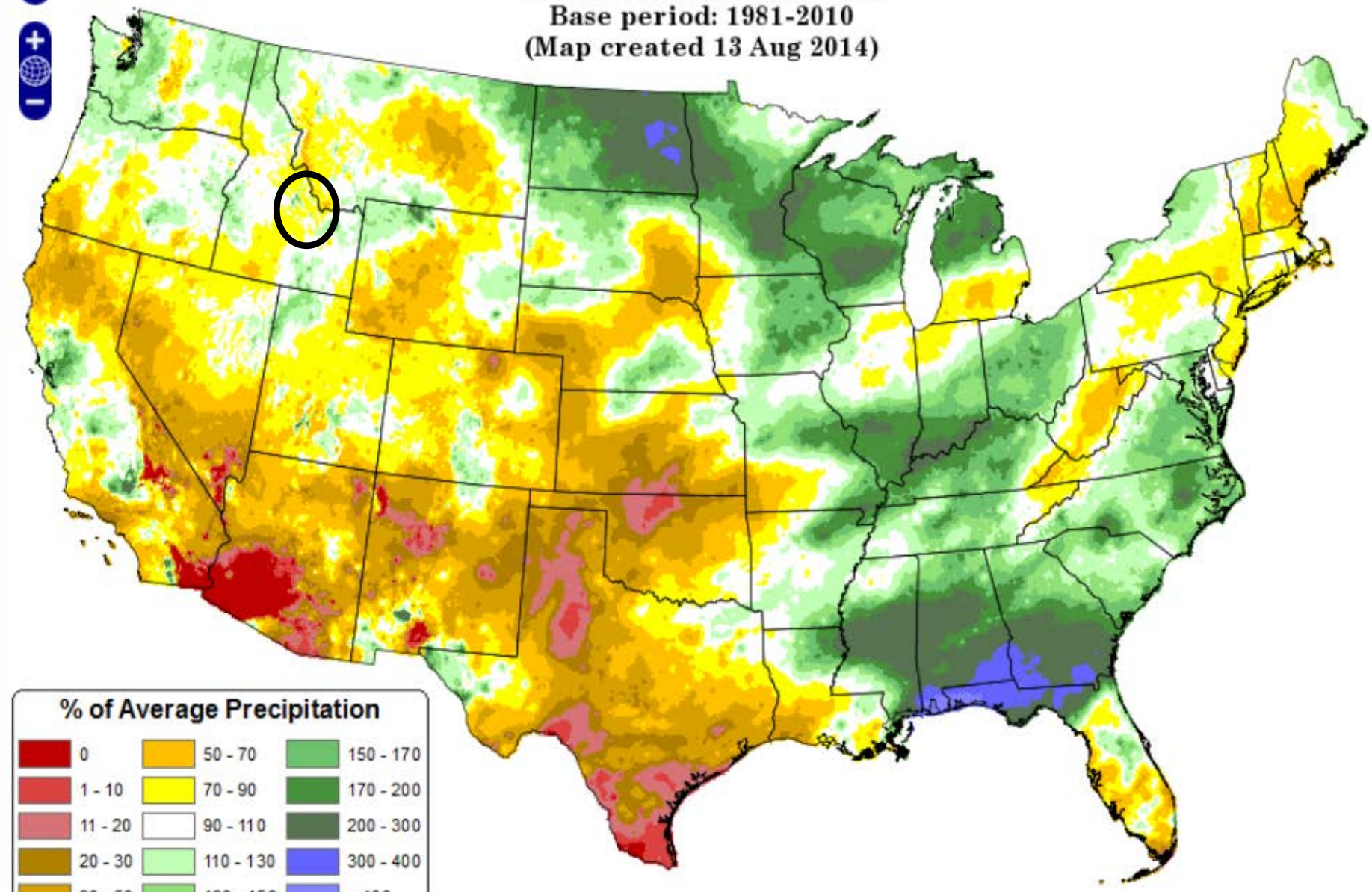
From March 19, 2014 talk

- **Long range and short range forecasts are not showing strong agreement signals, confidence is low in forecasts beyond ~5 days….**

- **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**

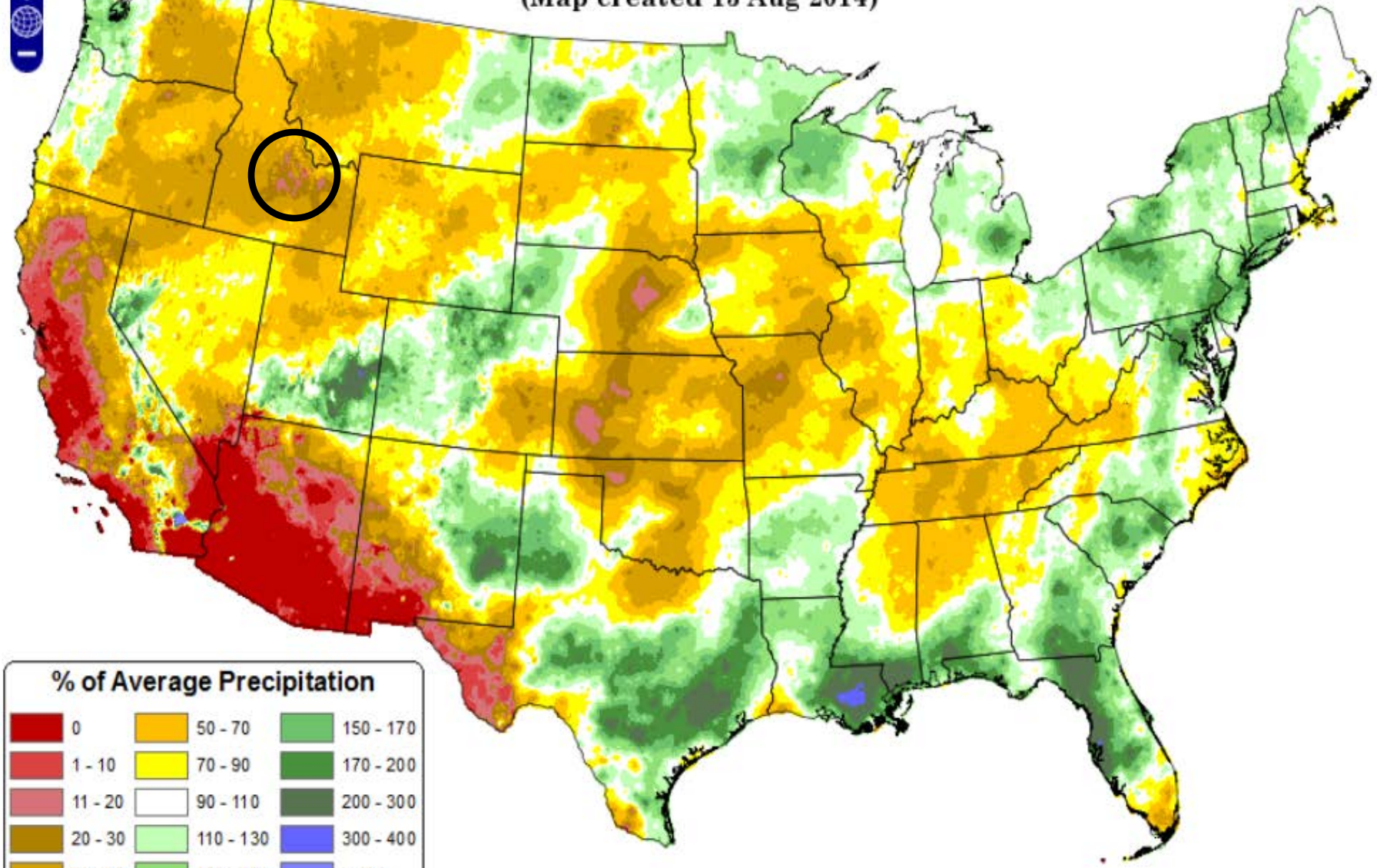
Total Precipitation Anomaly: April 2014

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



Total Precipitation Anomaly: May 2014

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



PRISM Maps

Maps were produced by Oregon State University's PRISM Climate Group.

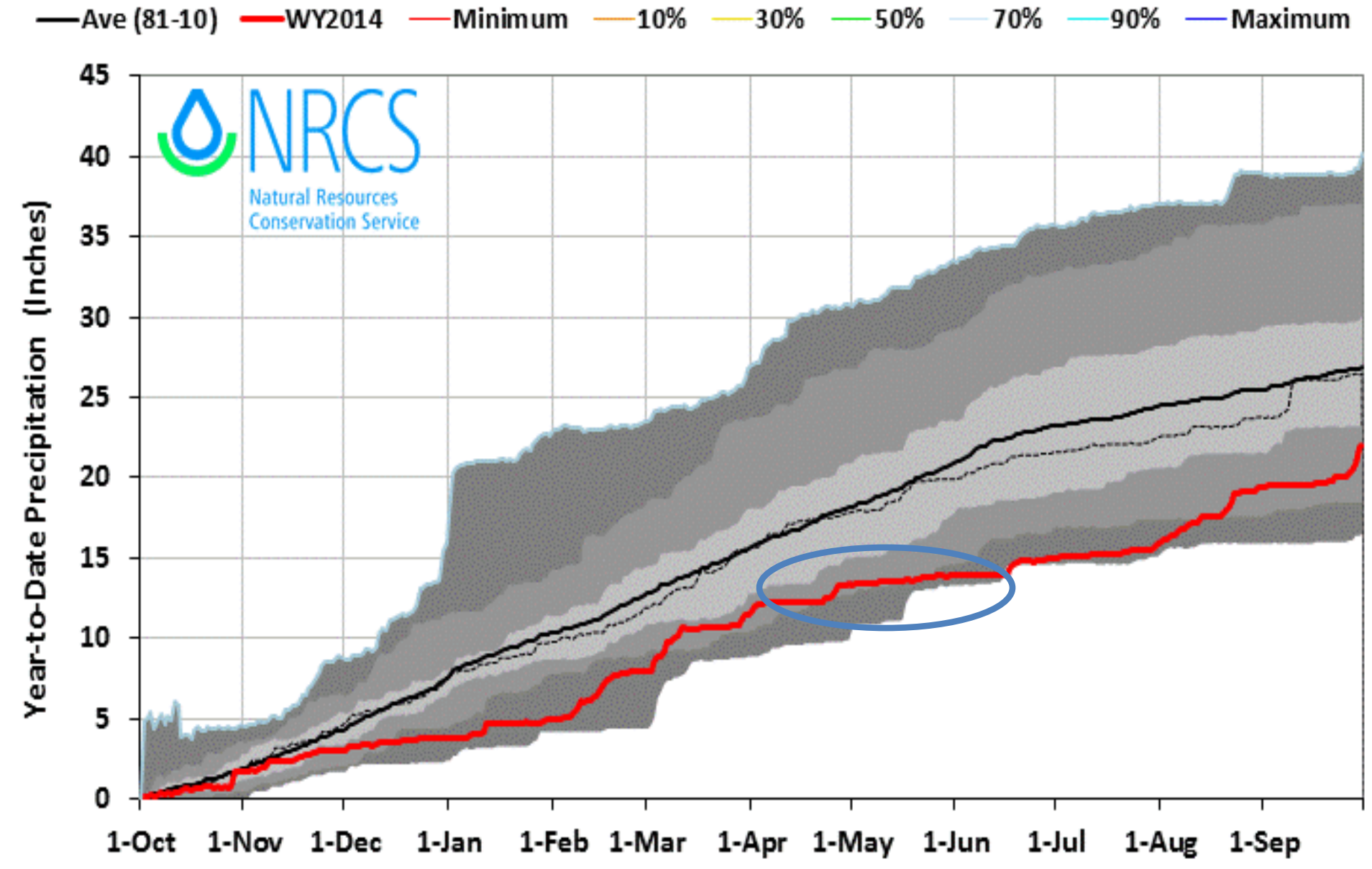
Data and website development are funded by USDA Risk Management Agency (RMA) for crop insurance verification, and quality control of SNOTEL data is funded by NRCS.

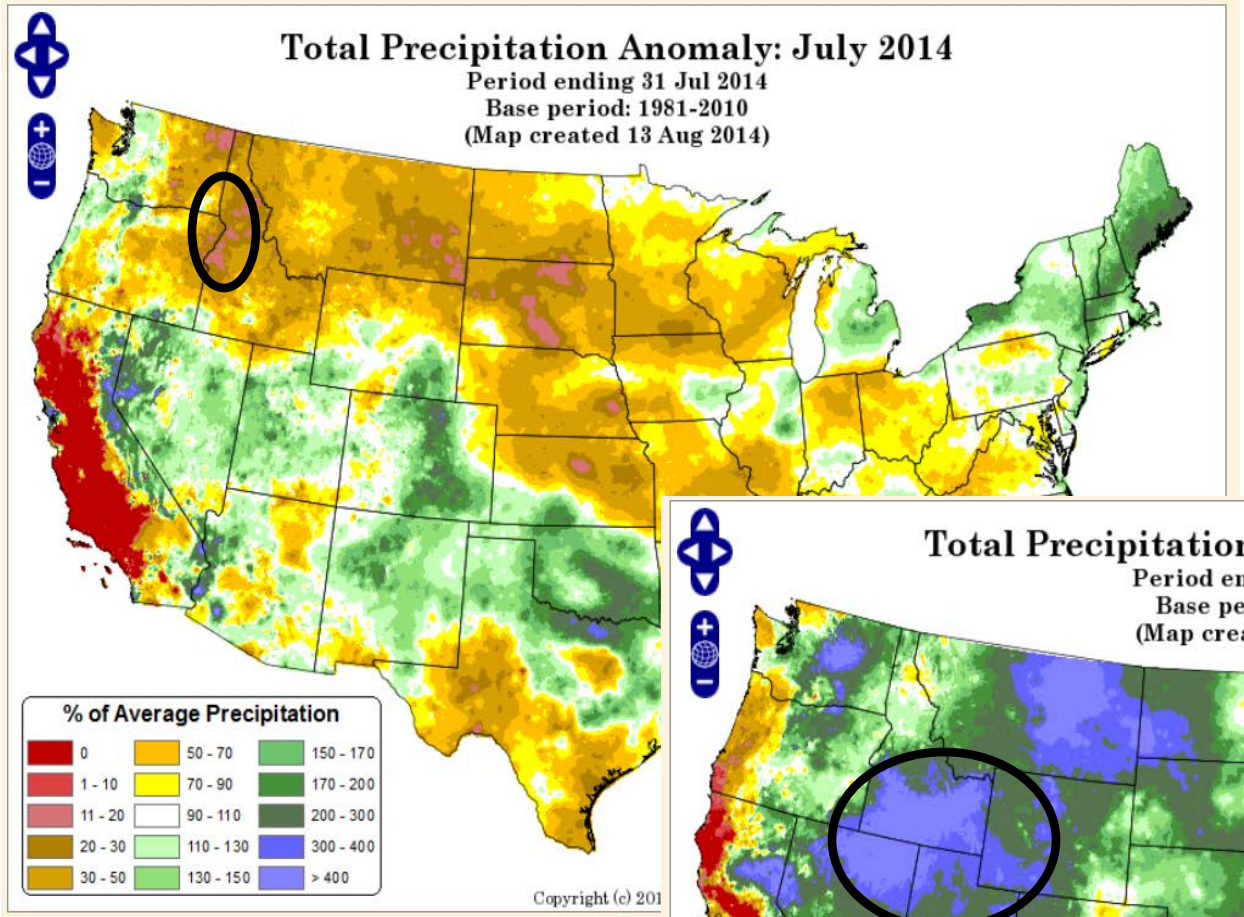
The maps include all SNOTEL stations and many other national and regional networks.

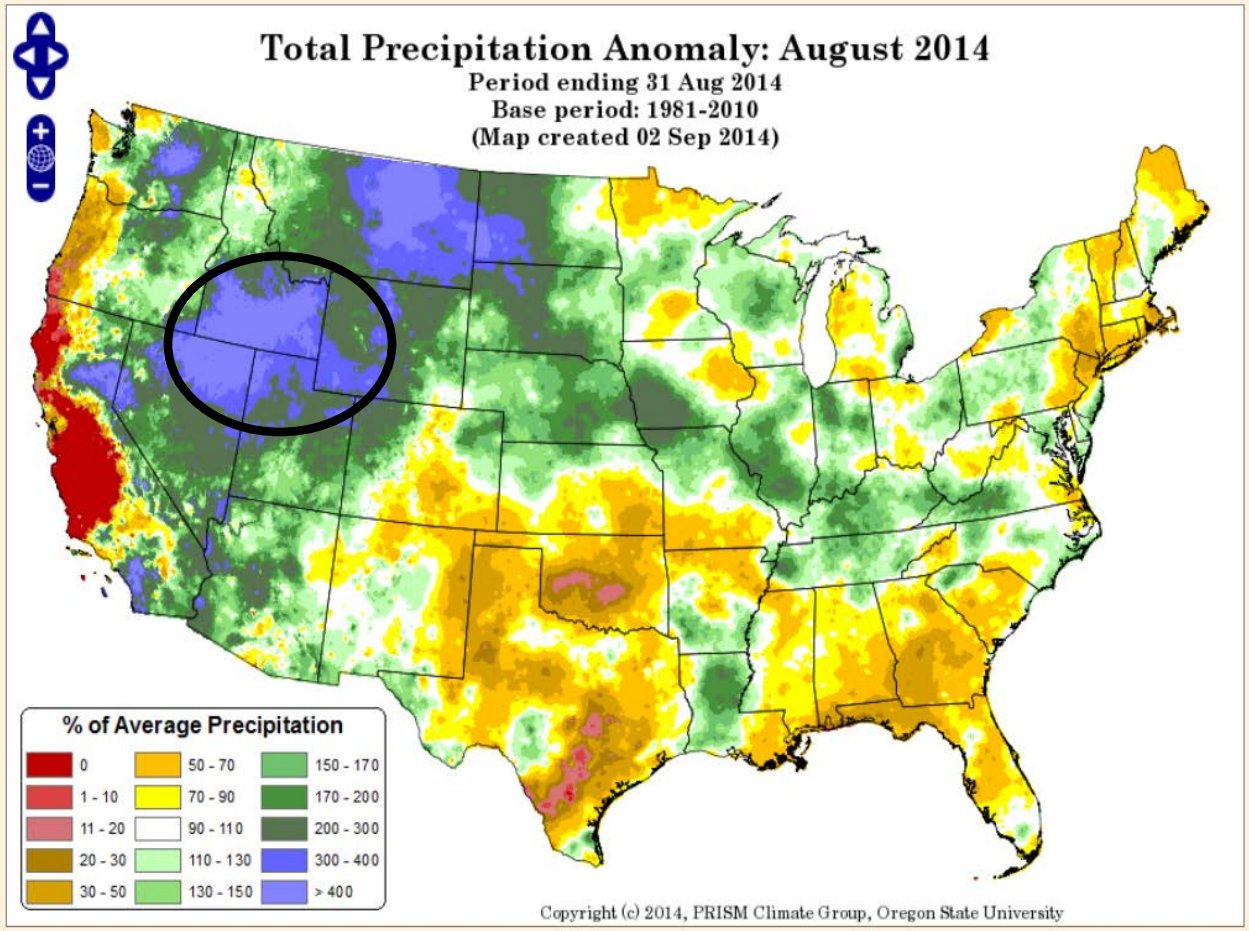
- **Maps are** http://www.prism.oregonstate.edu/

Big Lost Basin 2014 Precipitation with Non-Exceedence Projections (5 sites)

Based on Provisional SNOTEL data as of Sep 30, 2014



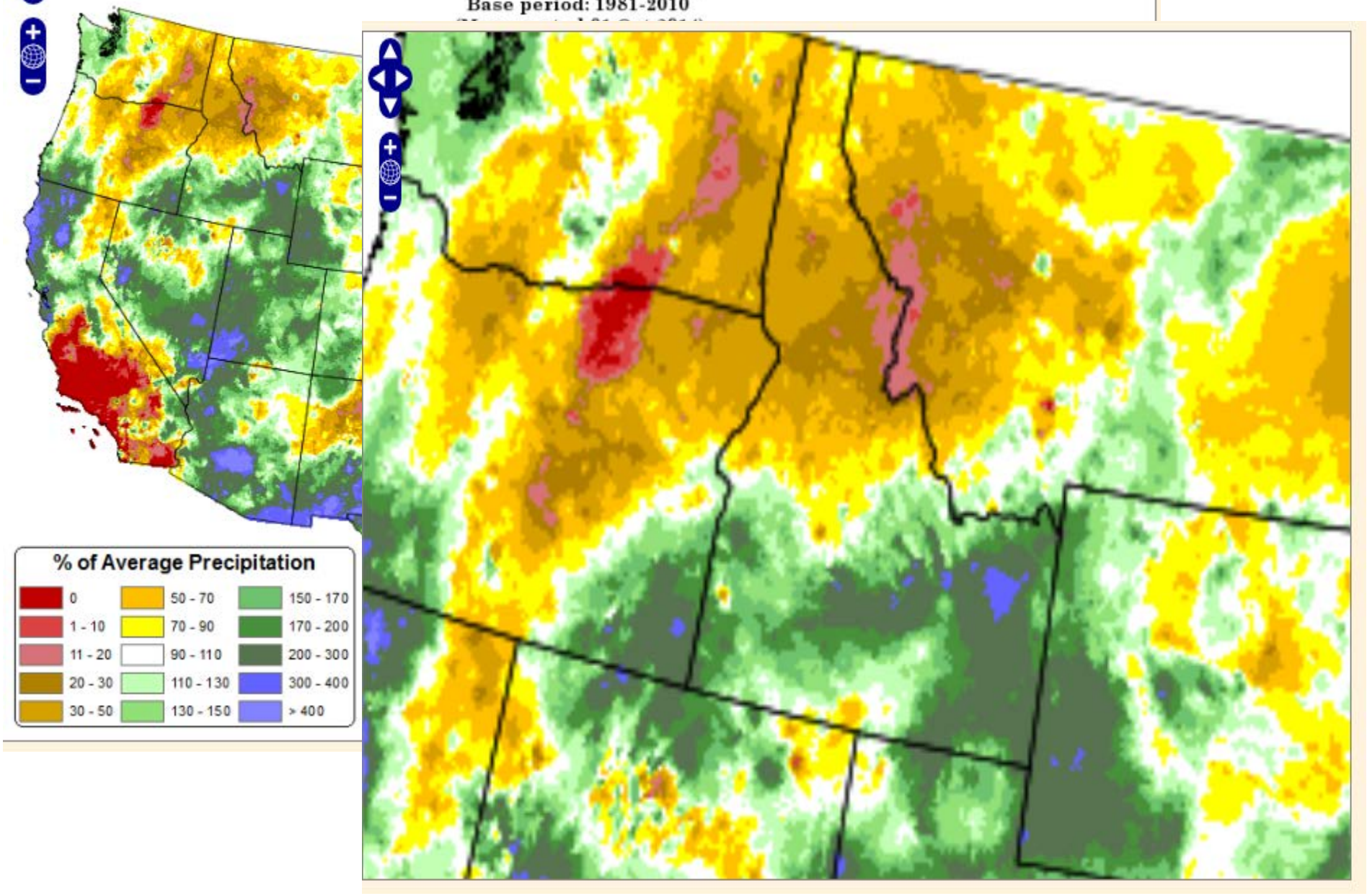

Total Precipitation Anomaly: July 2014
Period ending 31 Jul 2014
Base period: 1981-2010
(Map created 13 Aug 2014)
% of Average Precipitation
0
1 - 10
11 - 20
20 - 30
30 - 50
50 - 70
70 - 90
90 - 110
110 - 130
130 - 150
150 - 170
170 - 200
200 - 300
300 - 400
> 400
Copyright (c) 201


Total Precipitation Anomaly: August 2014
Period ending 31 Aug 2014
Base period: 1981-2010
(Map created 02 Sep 2014)
% of Average Precipitation
0
1 - 10
11 - 20
20 - 30
30 - 50
50 - 70
70 - 90
90 - 110
110 - 130
130 - 150
150 - 170
170 - 200
200 - 300
300 - 400
> 400
Copyright (c) 2014, PRISM Climate Group, Oregon State University

Total Precipitation Anomaly: 01 September 2014 - 30 September 2014

Period ending 7 AM EST 30 Sep 2014

Base period: 1981-2010

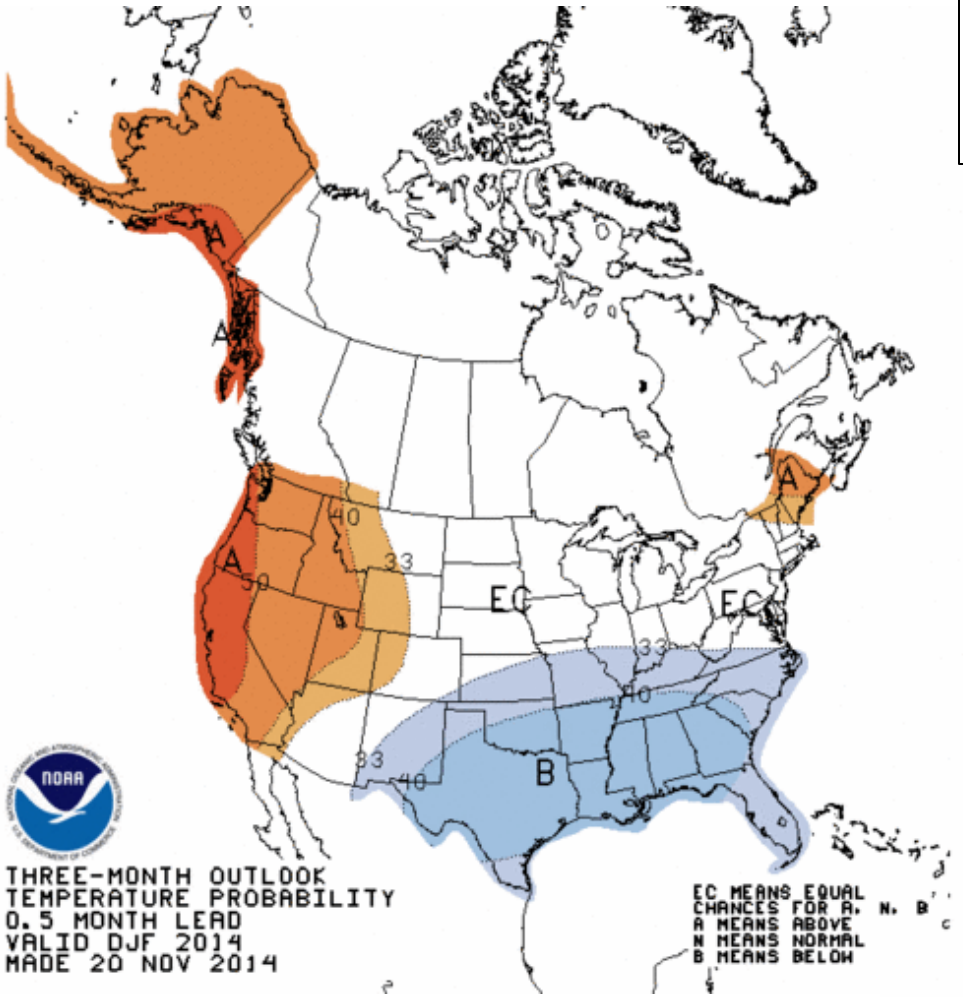


2014/2015 Forecast!

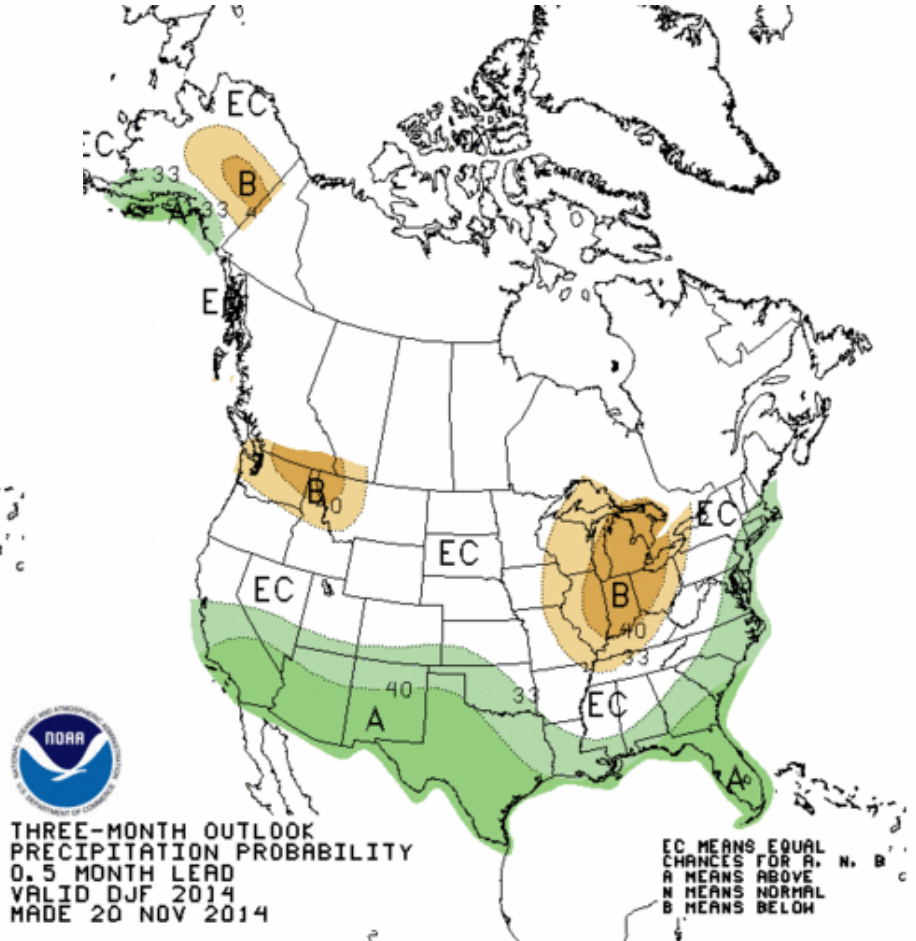
Three-Month Outlooks

OFFICIAL Forecasts

Dec-Jan-Feb 2014-15



Dec-Jan-Feb Temperature
Forecast made Nov 20, 2104



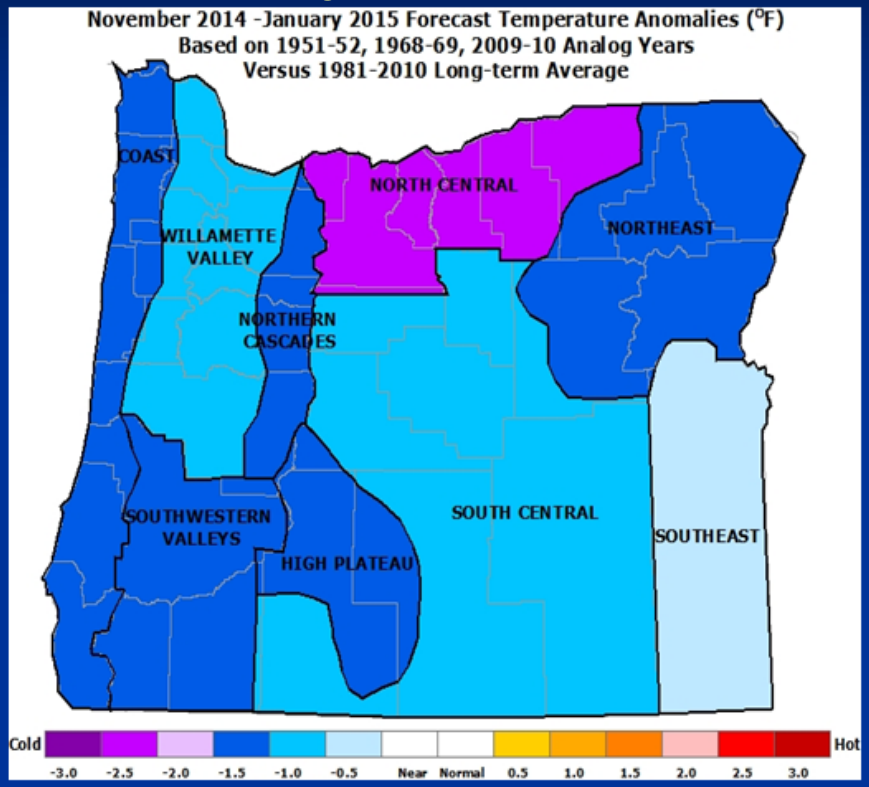
Dec-Jan-Feb Precipitation
Forecast made Nov 20, 2104

Nov. 2014 – Jan. 2015 Forecast

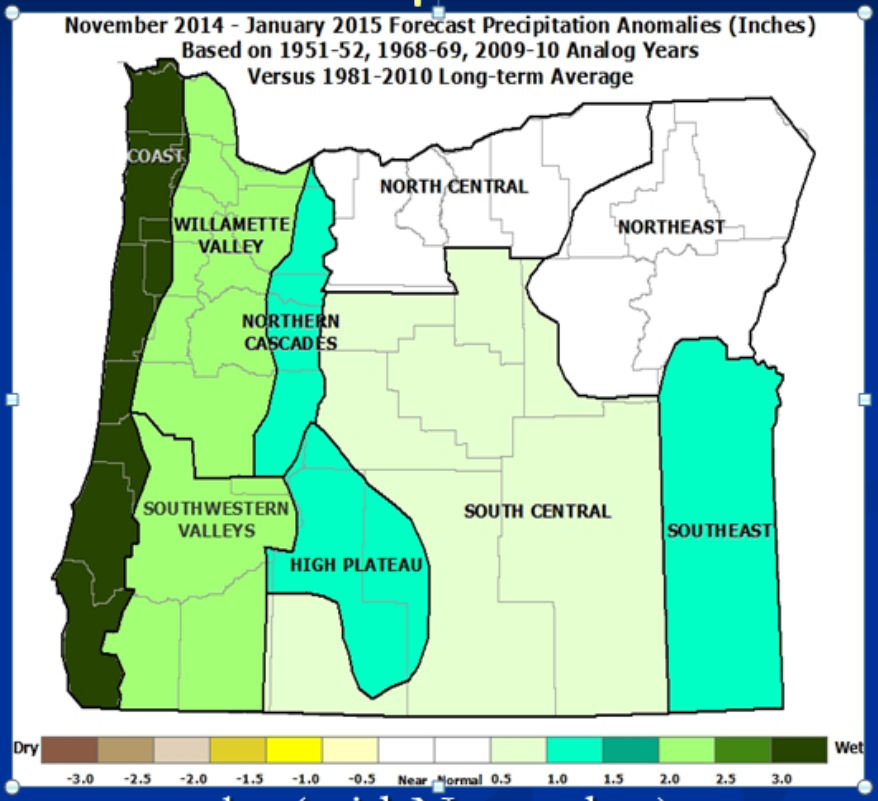
Oregon Department of Agriculture / Programs / Natural Resources / Weather

From Pete Parson ODN
Analog Years 1952, 1969, 2010

Temperatures



Precipitation

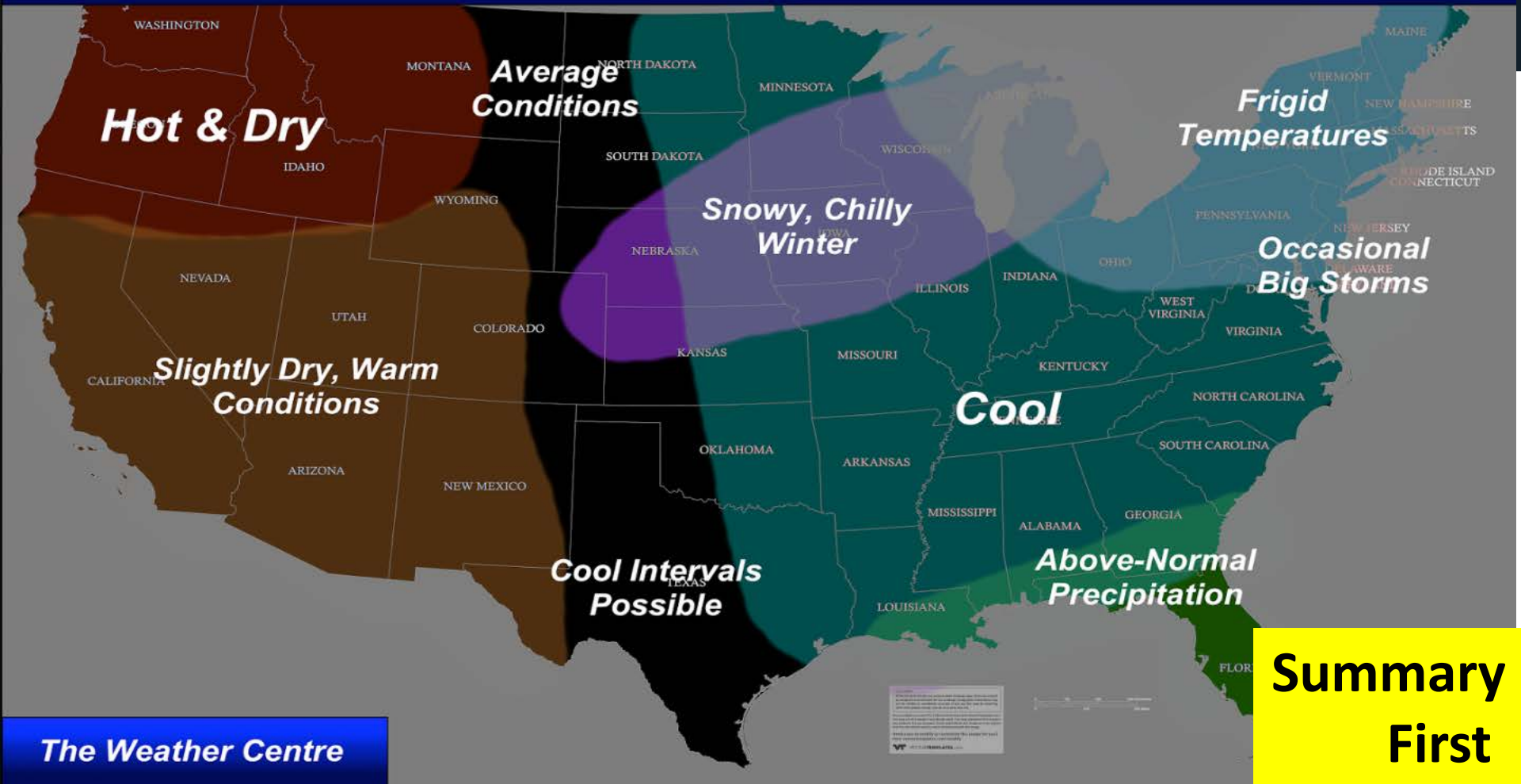


- Look for an early start to mountain snowpacks (mid-November).
- Tremendous variation among analog years for December and January increases forecast uncertainty. A "classic" El Niño produces warmer and drier than average weather, but the opposite extremes can occur…

Nov. 2014 – Jan. 2015 Highlights

- It appears that either a weak or moderate El Niño is likely to develop, which commonly produces cool and stormy conditions in late-autumn, then relatively mild and dry winter weather…below average mountain snow and minimal valley snow.
- However, this scenario is not always the case…
- In stark contrast to the current Climate Prediction Center (CPC) Forecasts, the analog method used here shows that extremely cold and wet weather can't be ruled out for this December and January.
- Dec. 1968 – Jan. 1969, (one of the top analogs for this year) produced multiple Arctic outbreaks with heavy snowfall across much of the state.

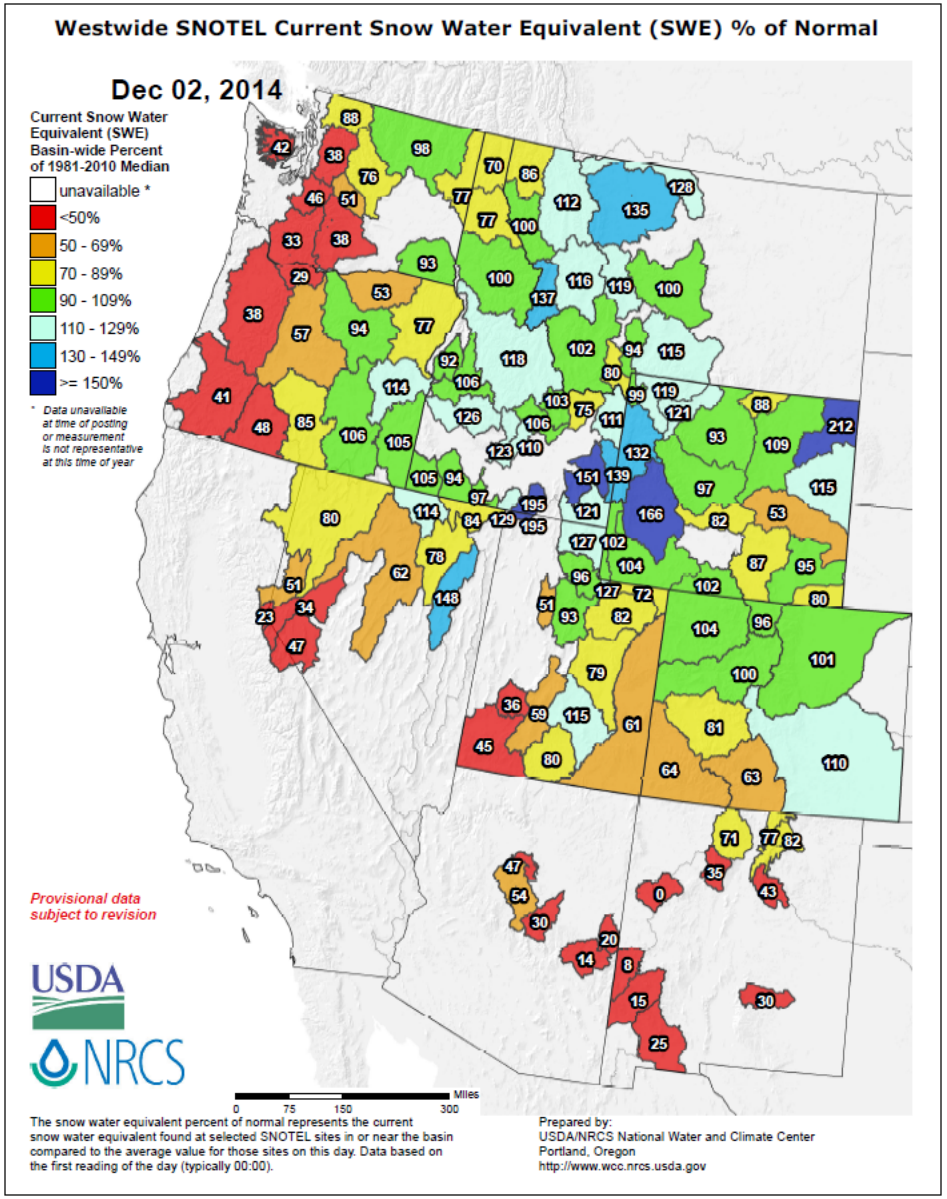
Official 2014-2015 Winter Forecast



The Weather Centre

Summary First

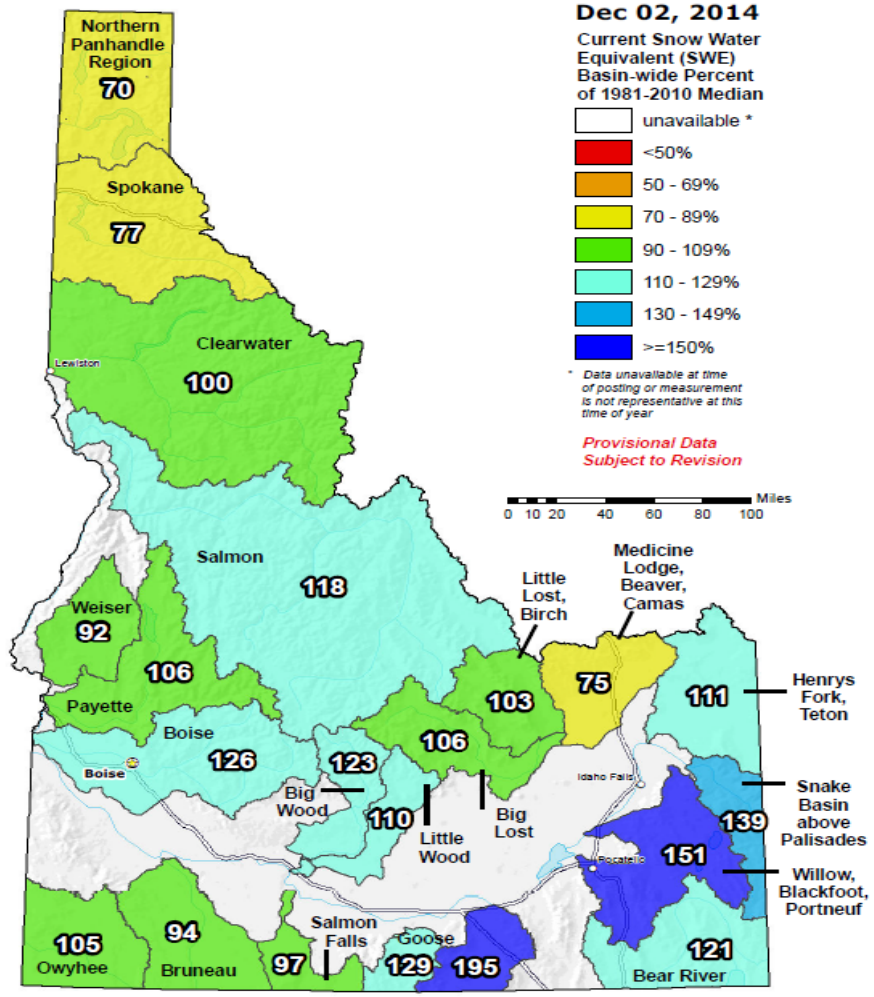
Westwide SNOTEL Current Snow Water Equivalent (SWE) % of Normal



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).

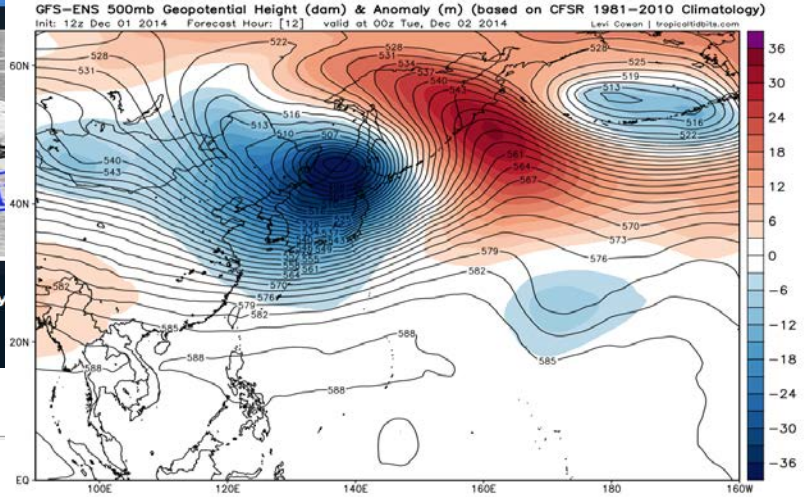
Prepared by:
USDA/NRCS National Water and Climate Center
Portland, Oregon
http://www.wcc.nrcs.usda.gov

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



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



The Weather Centre

Long Range Outlook: Cold, Stormy Period Expected in Mid-December

Posted: 01 Dec 2014 03:49 PM PST

It's looking like a cold and stormy pattern will overtake the US for the mid-December timeframe.

To Summarize:

- A warm start to December is expected (December 1-7).
- A predominantly-cold weather event is anticipated in the middle portion of December (December 7-17).
- A storm system (possibly more than one) could be seen in this December 7-17 time period.
- Following a brief warm spell in the mid-late December period, things could turn stormy again in time for Christmas.

Andrew

Questions/Comments/ Corrections

Our weather is always changing to form our climate.

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


Think Snow!!