Northwest **Power** and **Conservation** Council

May 9, 2017

MEMORANDUM

TO: **Council members**

FROM: **Ben Kujala**

SUBJECT: **Briefing on recent weather compared to past years**

BACKGROUND:

Presenter: Ron Abramovich, water supply specialist, Natural Resources Conservation Service; Jay Breidenbach, warning coordination meteorologist, National Weather Service Boise; and Troy Lindquist, senior hydrologist, National Weather Service Boise

Summary: Weather conditions in the region have led to a high volume of water going through the hydro generation system. This panel will discuss how these conditions differ from previous years. The weather also effects the regional use of electricity. While the weather each year gives an opportunity to provide some context to the data we use in planning the power system, this year has some particularly unusual characteristics. The panel will explore the comparison of the weather experienced this year to previous year's experiences.

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Executive Director

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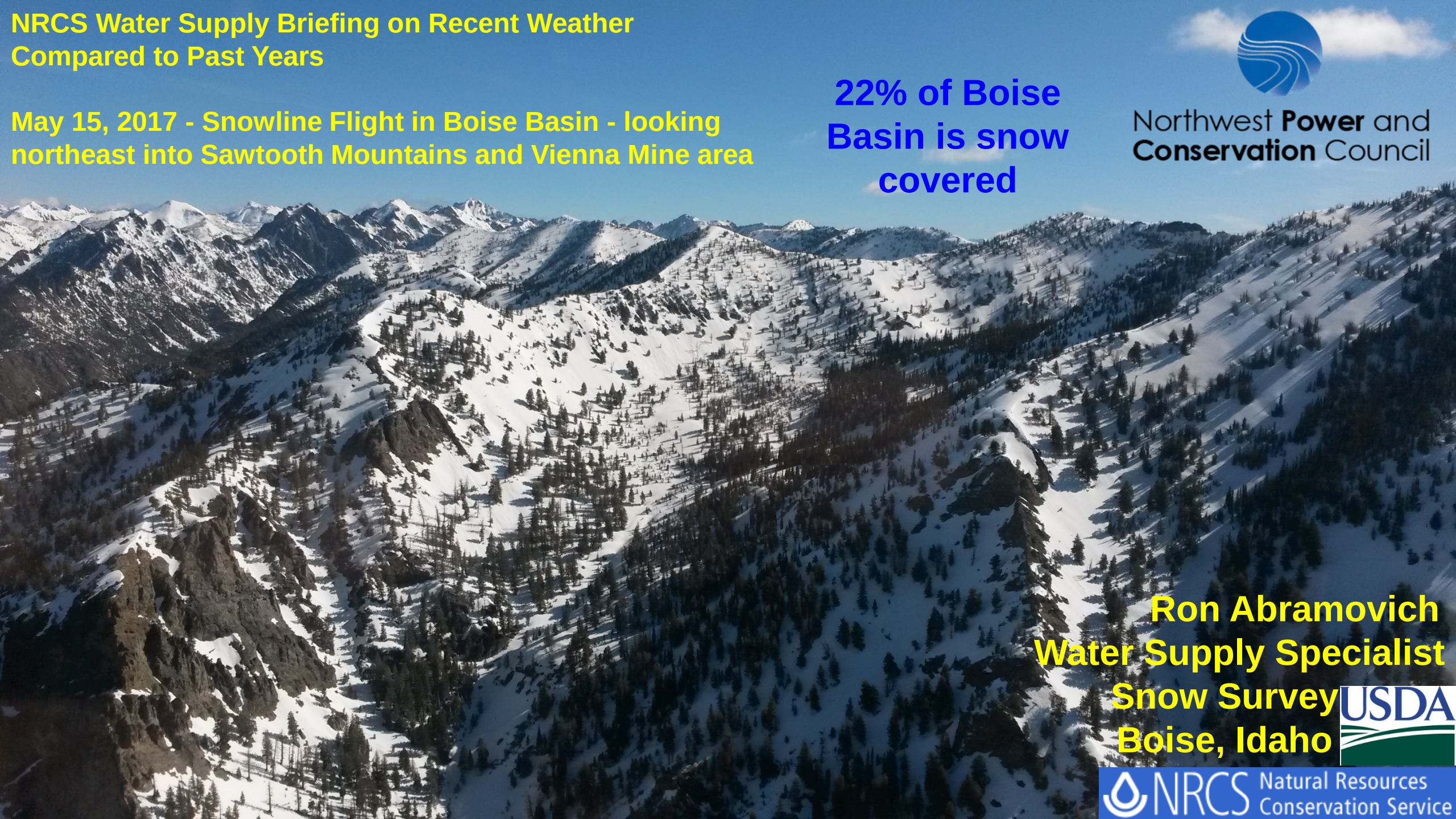
NRCS Water Supply Briefing on Recent Weather Compared to Past Years

May 15, 2017 - Snowline Flight in Boise Basin - looking northeast into Sawtooth Mountains and Vienna Mine area

22% of Boise Basin is snow covered

Northwest Power and Conservation Council



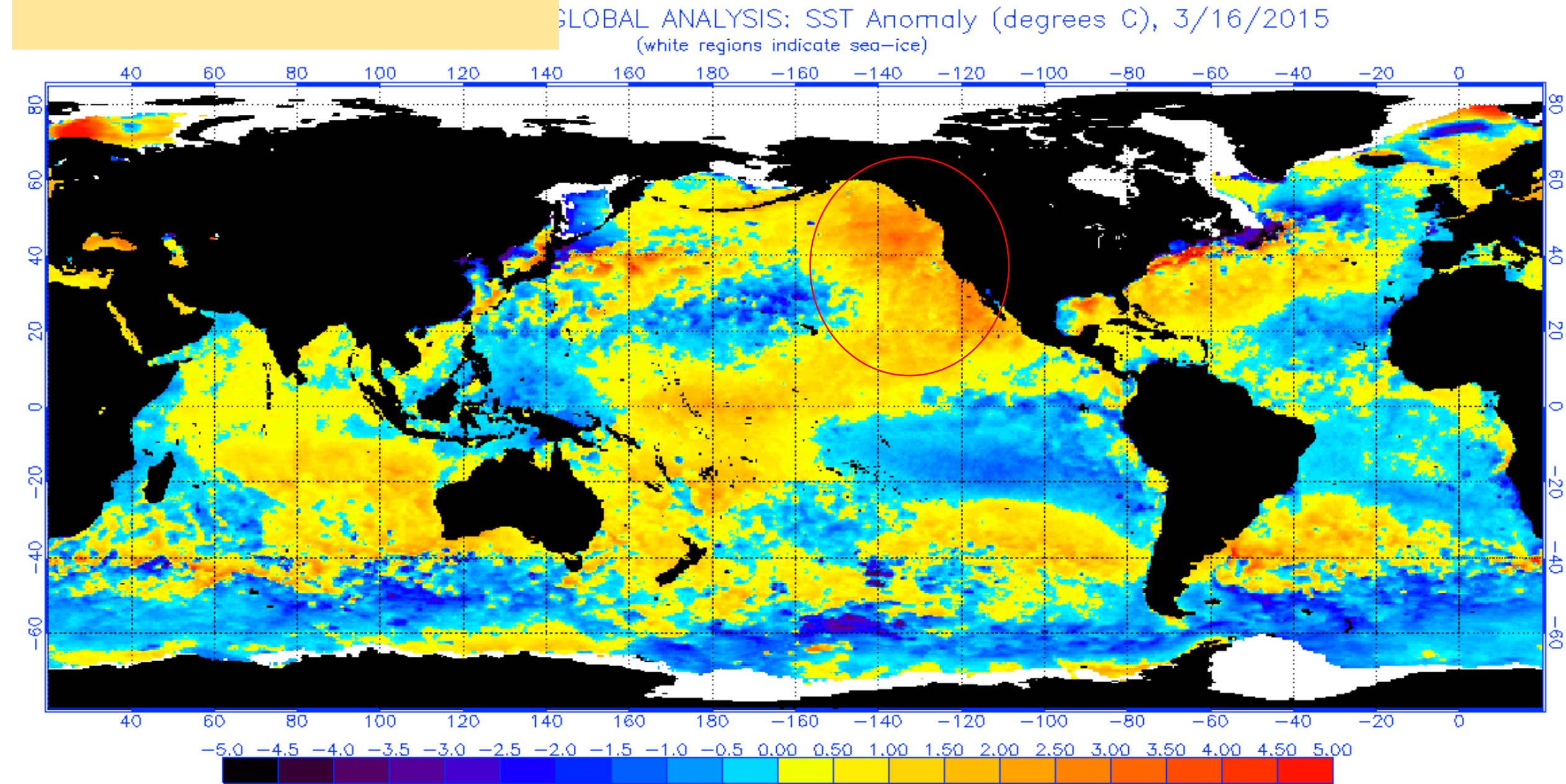
Ron Abramovich
Water Supply Specialist
Snow Survey
Boise, Idaho

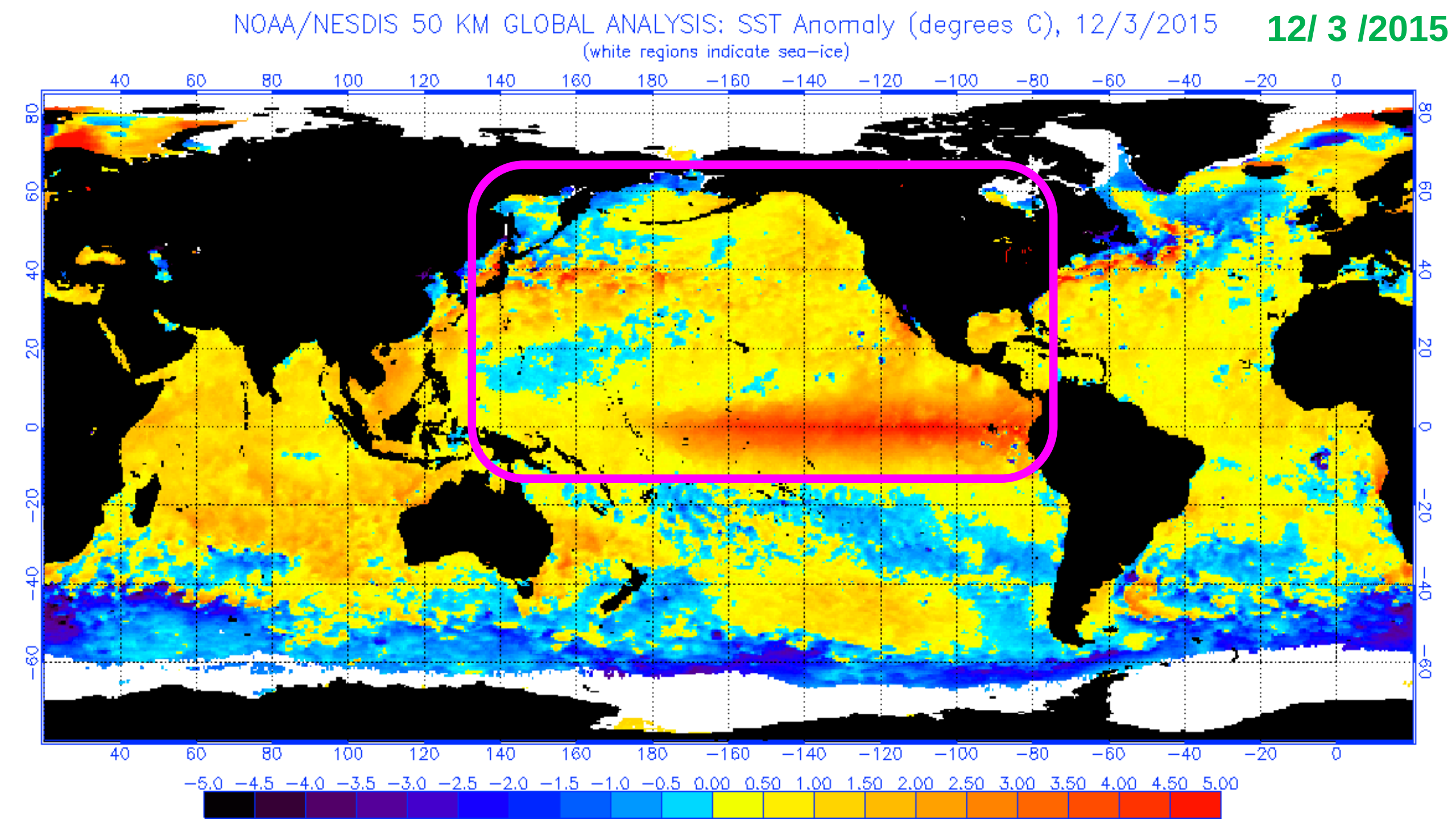
USDA

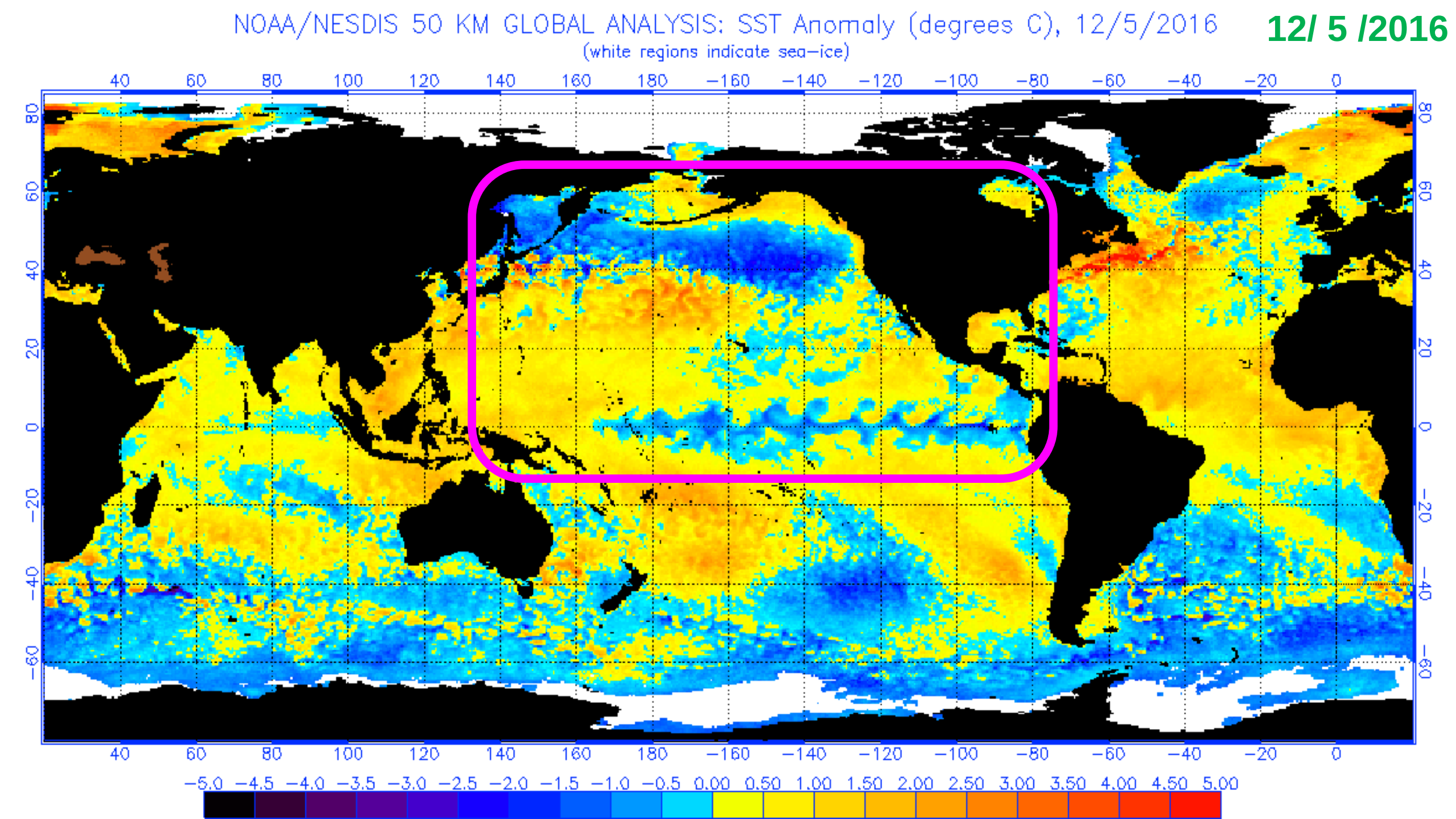
NRCS Natural Resources Conservation Service

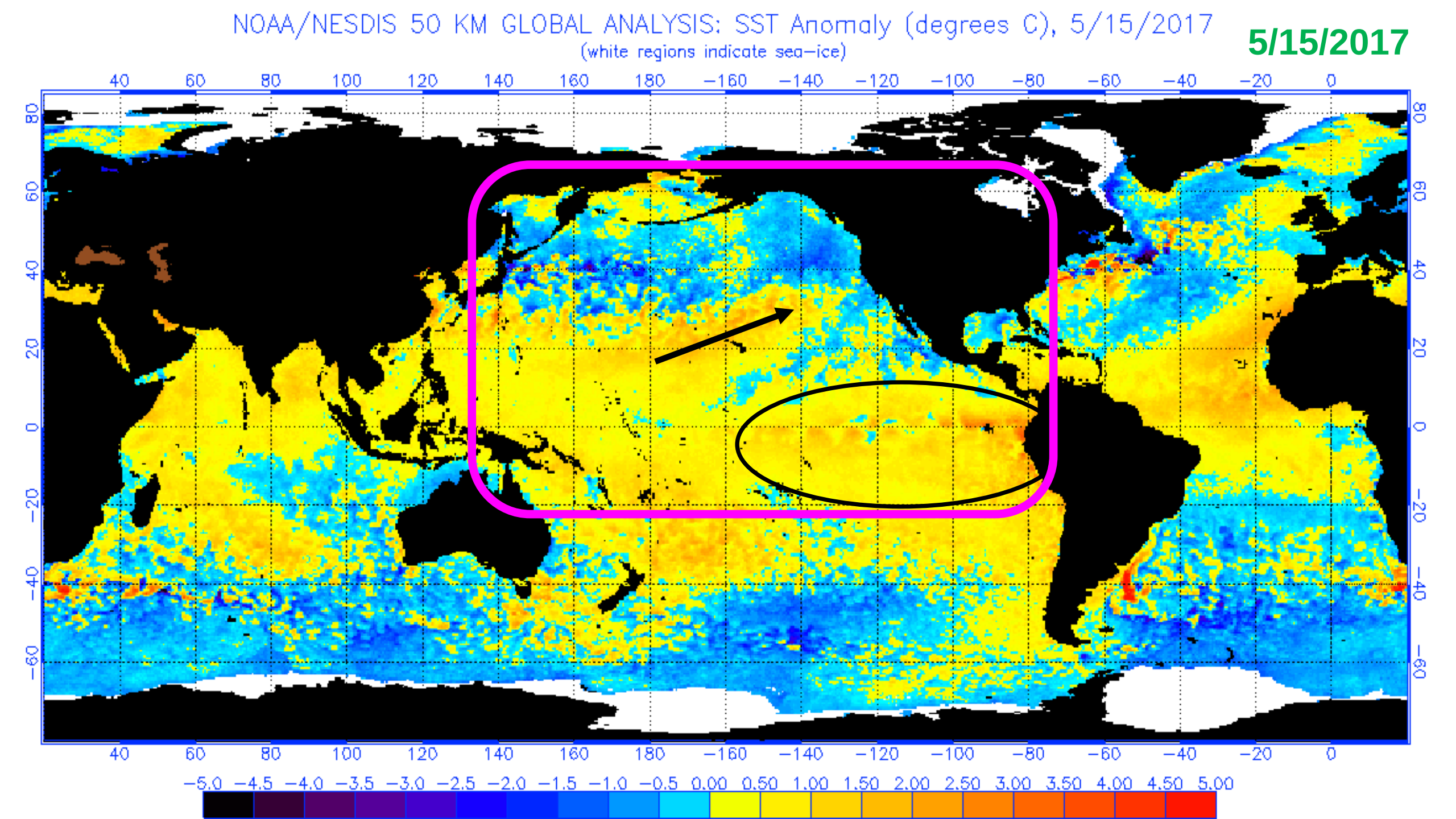
- **Warm waters off west coast: warmest in 60-70 years**

Sea Surface Temperatures March 16, 2015




NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 12/3/2015
(white regions indicate sea-ice)
12/ 3 /2015
40 60 80 100 120 140 160 180 −160 −140 −120 −100 −80 −60 −40 −20 0
80 60 40 20 0 −20 −40 −60
−5.0 −4.5 −4.0 −3.5 −3.0 −2.5 −2.0 −1.5 −1.0 −0.5 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00


NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 12/5/2016
(white regions indicate sea-ice)
12/ 5 /2016
40 60 80 100 120 140 160 180 −160 −140 −120 −100 −80 −60 −40 −20 0
80 60 40 20 0 −20 −40 −60
−5.0 −4.5 −4.0 −3.5 −3.0 −2.5 −2.0 −1.5 −1.0 −0.5 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00


NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 5/15/2017
(white regions indicate sea-ice)
5/15/2017
40 60 80 100 120 140 160 180 −160 −140 −120 −100 −80 −60 −40 −20 0
80 60 40 20 0 −20 −40 −60
−5.0 −4.5 −4.0 −3.5 −3.0 −2.5 −2.0 −1.5 −1.0 −0.5 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00

Analysis of Streamflow in Strong El Nino Years (SE) like 2016

	ENSO	PDO	Streamflow as % of 1981-2010 Average				
			Feb-Sep	Apr-Sep	Apr-Sep	Apr-Sep	Apr-Sep
Year	SE Strong El Nino	pos or neg	Owyhee River blw Dam	Salmon Falls Creek	Big Wood River blw Magic Dam	Snake River nr Heise	Spokane River nr Post Falls
1994	SE	pos	23	36	12	61	51
1988	SE	pos	30	65	24	70	71
1941	SE	pos	83	53	69	73	45
1966	SE	neg	28	39	51	78	90
1973	SE	pos / neg	61	114	51	79	45
1942	SE	pos	122	173	117	86	77
1947	SE	pos / neg	44	50	59	108	90
1952	SE	neg	246	178	263	116	123
1995	SE	pos	124	135	195	118	70
1998	SE	pos	135	138	161	119	82
1983	SE	pos	221	157	282	132	91
1978	SE	pos	110	112	140	133	99
2016	SE	pos	82	122	70	80	66

sorted

	<60
	60-90
	90-110
	~111-130
	>130

Analysis of Streamflow for a year like 2017 that follows a Strong El Nino Year

	ENSO		ENSO	Streamflow as % of 1981-2010 Average					
				Feb-Sep	Apr-Sep	Mar-Sep	Apr-Sep	Apr-Sep	Apr-Sep
Year	SE Strong El Nino	Year Folowing a Strong El Nino		Owyhee River blw Dam	Salmon Falls Creek	Oakley Resv Inflow	Big Wood River blw Magic Dam	Snake River nr Heise	Spokane River nr Post Falls
1966	SE	1967	N	69	88	69	151	109	113
1947	SE	1948	LN	58	86	75	66	97	176
1988	SE	1989	SL	145	100	88	75	102	116
1952	SE	1953	N	56	76	108	92	92	108
1995	SE	1996	N	124	115	118	132	148	116
1978	SE	1979	N	97	116	119	34	90	105
1994	SE	1995	SE	124	135	121	195	118	70
1998	SE	1999	SL	100	108	125	158	131	129
1942	SE	1943	N	137	150	127	259	144	150
1941	SE	1942	SE	122	173	155	117	86	77
1973	SE	1974	SL	120	111	160	184	147	193
1983	SE	1984	N	363	369	330	206	133	112
						sorted			
2016	SE	2017	N or LN	?	?	?	?	?	?

12 years

	<60
	60-90
	90-110
	~111-130
	>130

Similar ENSO year 1974,79,95,96,99

Siberia Is Being Clobbered With Snow Already, and That Could Mean a Harsher U.S. Winter Ahead

By Jonathan Belles Published Nov 4 2016 02:43 PM EDT **weather.com**

Russia Could Have Huge Impact on U.S. Winter

A look at how snow in Siberia affects the U.S. and why it's looking like the eastern and central United States will have a cold, snowy winter.

https://weather.com/news/weather/news/snow-siberia-russia-united-states-cold

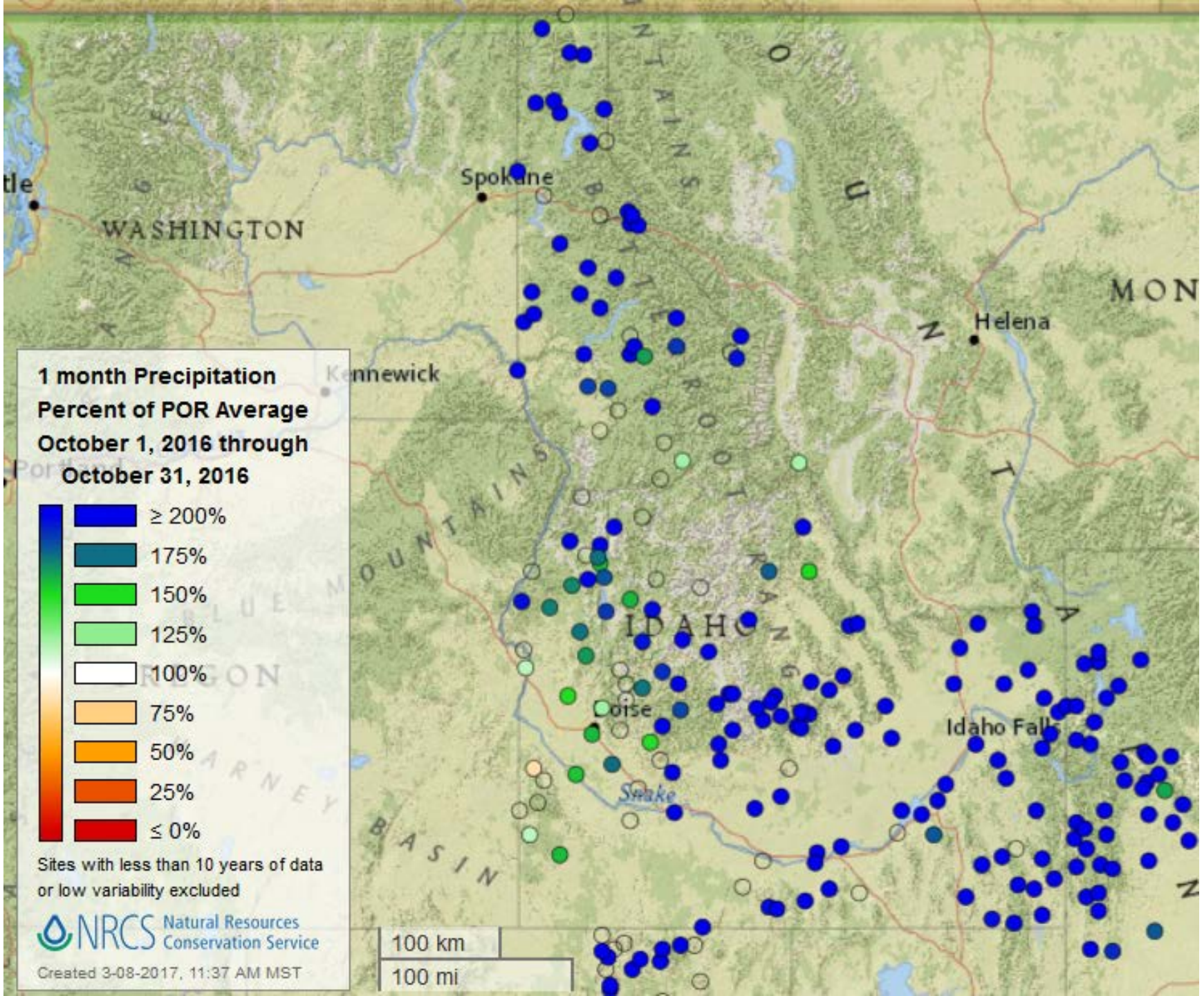
Siberia is known to be one of the coldest places on the planet, but exactly how cold and snowy it gets each year has big ramifications elsewhere on the globe.

In North America, a more snow-covered Russia means that colder air will have an easier time harvesting in Siberia and departing for our continent's heartland. Early in the calendar year, the air coming from Siberia can be cold enough to bring snow to even more southern reaches of the United States if the pattern sets up correctly.

The Extent of Snow Cover

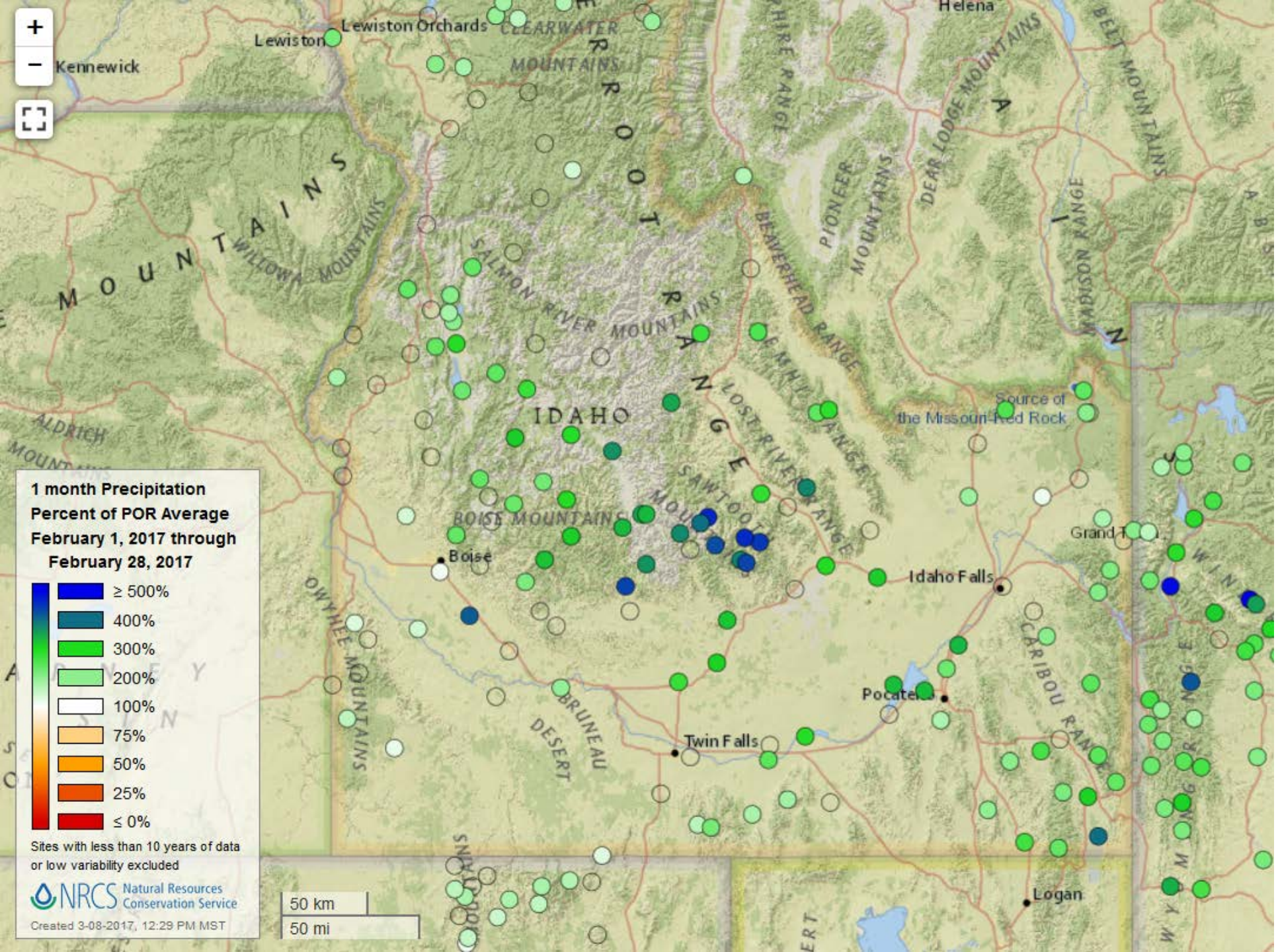
Snow is covering the ground across most of Russia, including all of Siberia – likely the greatest extent of snow cover since 1998. Below is the current snow cover in northern Asia as of Oct. 31.

Some locations, including Sakha in east-central Russia, are seeing their snowiest winter on record, with most of the snow season yet to come. Nearly 10 feet of snow fell in some places in Siberia in just three days, according to the Government of Sakha.



Record High SNOTEL October Precipitation

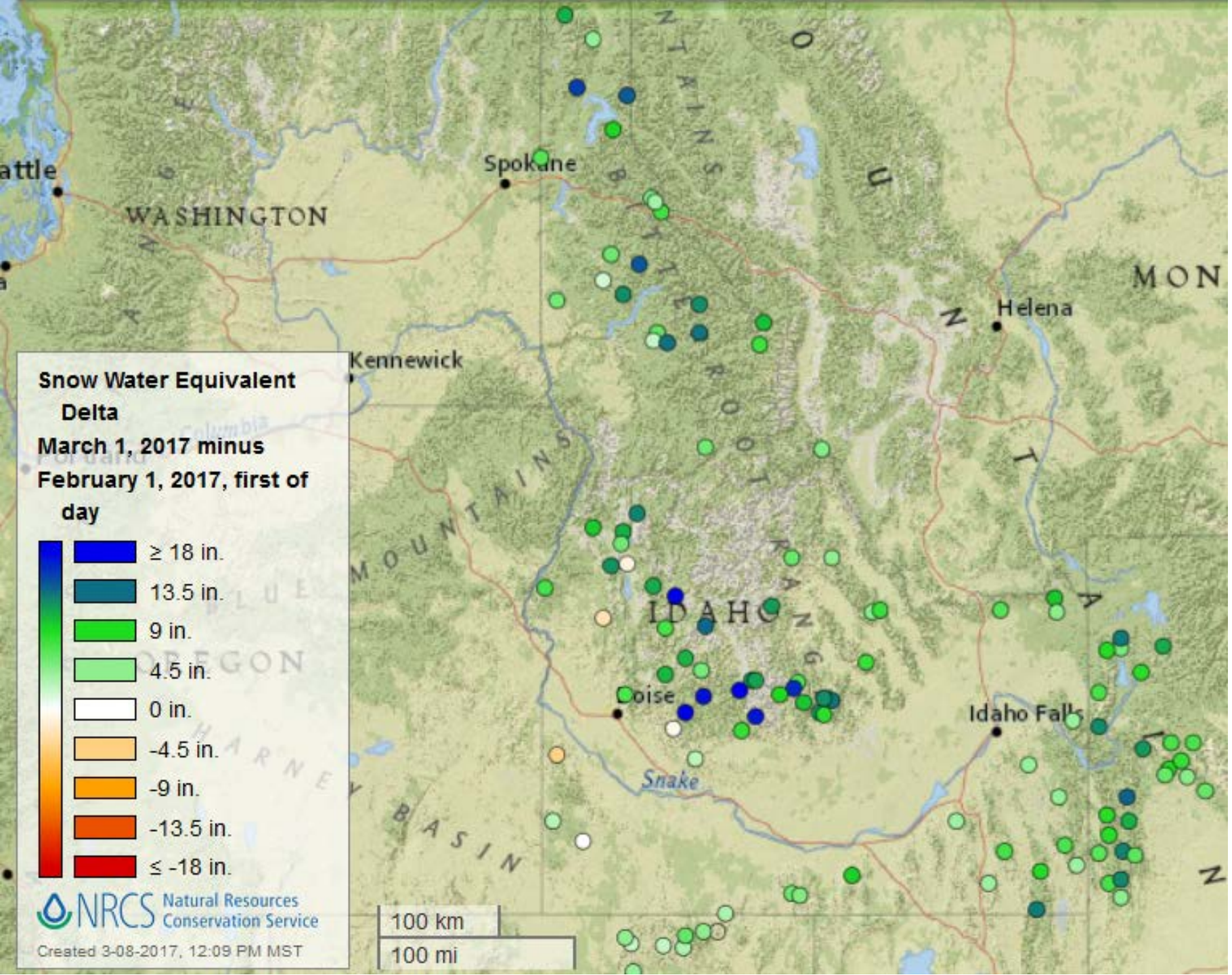
primed the soils



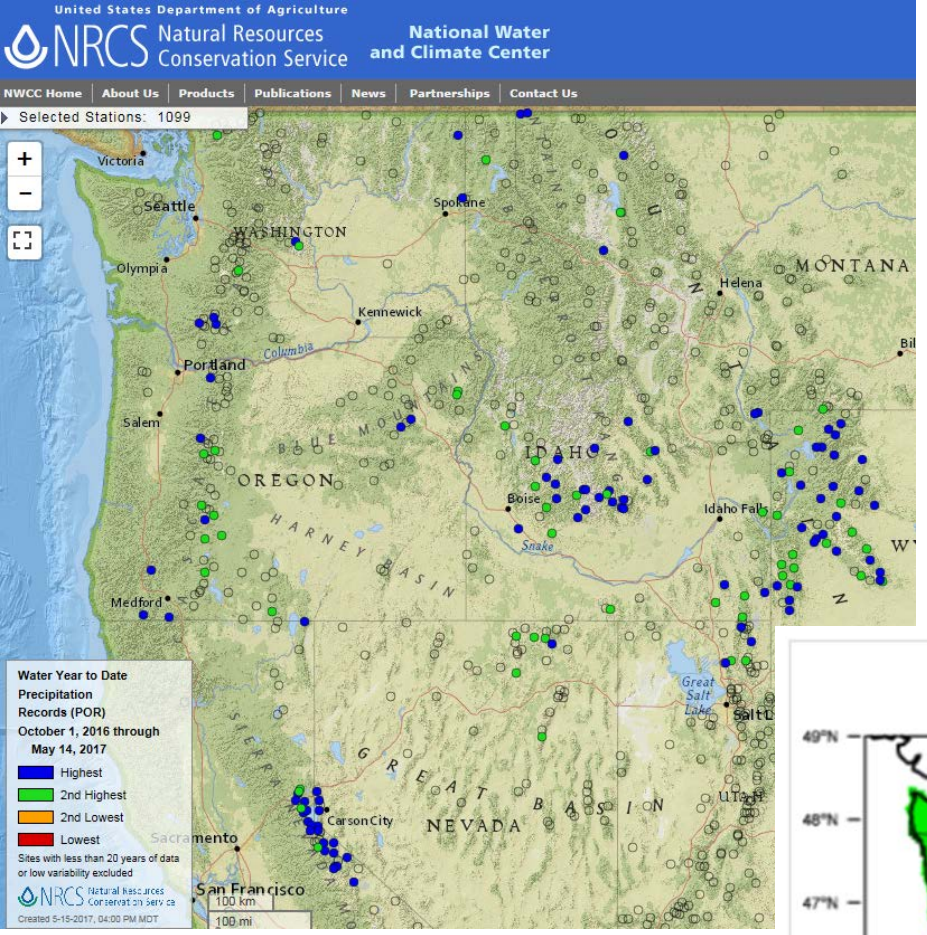
February Precipitation Record High

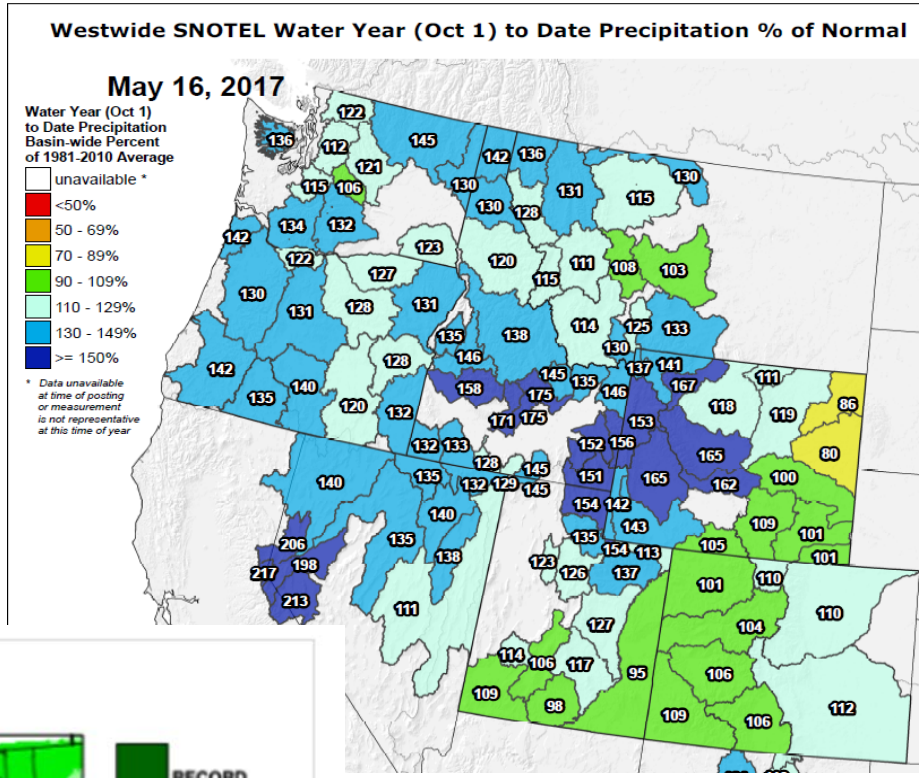
Scale is >500%

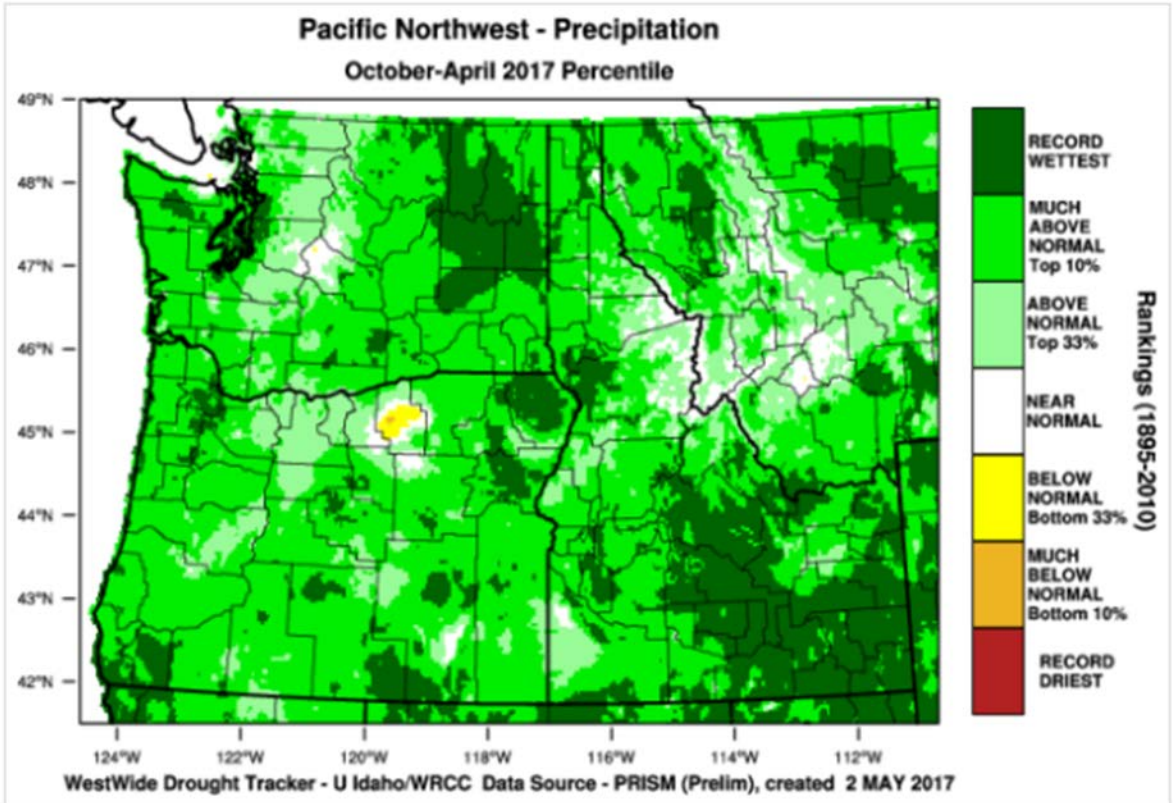
This changed the water supply outlook for this year



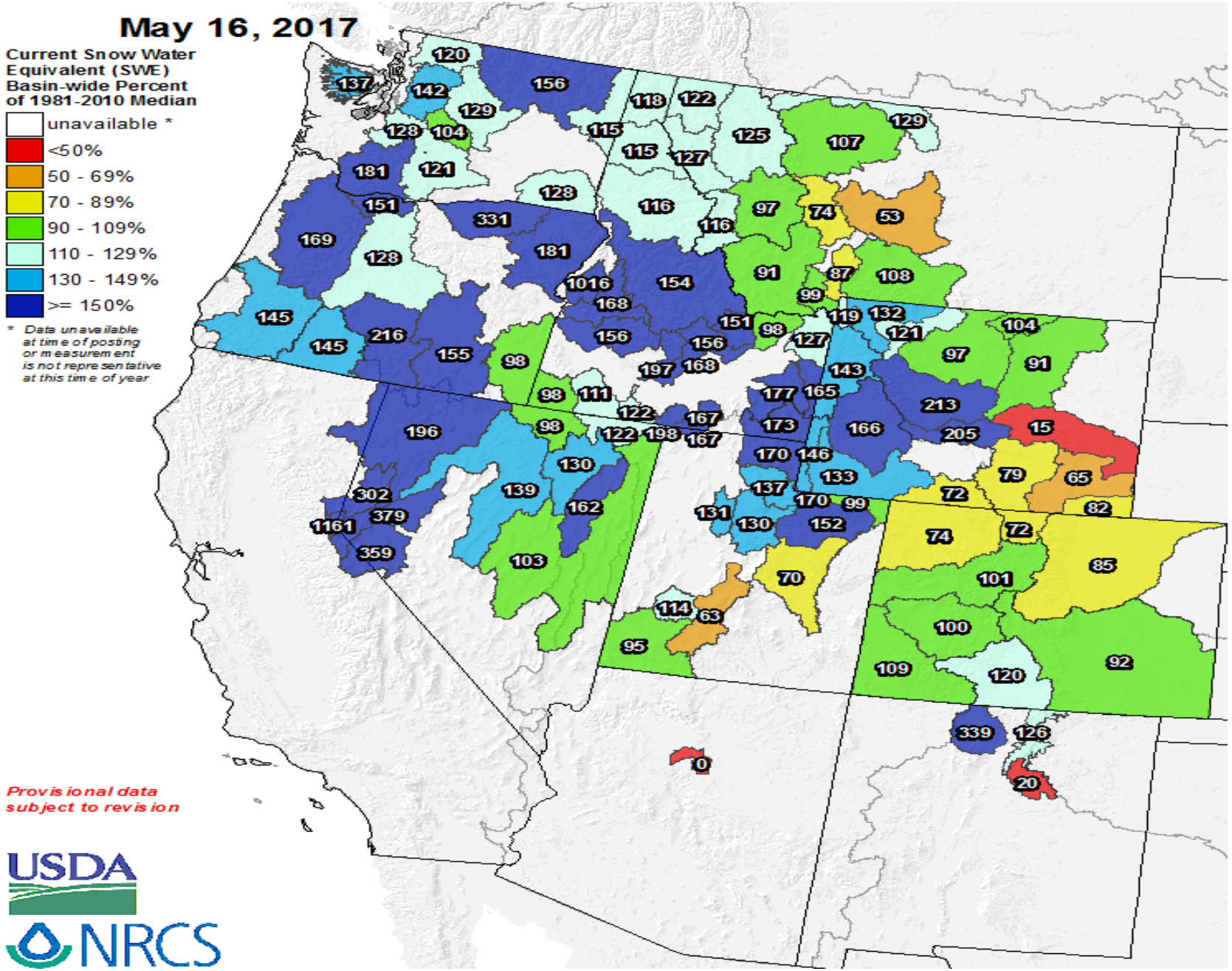
February Snow Water Equivalent (SWE) Change


United States Department of Agriculture
NRCS Natural Resources Conservation Service
National Water and Climate Center
NWCC Home | About Us | Products | Publications | News | Partnerships | Contact Us
Selected Stations: 1099
Water Year to Date Precipitation Records (POR)
October 1, 2016 through May 14, 2017
Highest
2nd Highest
2nd Lowest
Lowest
Sites with less than 20 years of data or low variability excluded
Created 5-15-2017, 04:00 PM MDT
Victoria
Seattle
Spokane
WASHINGTON
Olympia
Kennewick
Portland
Columbia
Salem
OREGON
Medford
Boise
Idaho Falls
Snake
IDAHO
MONTANA
Helena
Great Salt Lake
Salt L
Carson City
NEVADA
Sacramento
San Francisco
100 km
100 mi


Westwide SNOTEL Water Year (Oct 1) to Date Precipitation % of Normal
May 16, 2017
Water Year (Oct 1) to Date Precipitation Basin-wide Percent of 1981-2010 Average
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


Pacific Northwest - Precipitation
October-April 2017 Percentile
49°N
48°N
47°N
46°N
45°N
44°N
43°N
42°N
124°W
122°W
120°W
118°W
116°W
114°W
112°W
RECORD WETTEST
MUCH ABOVE NORMAL Top 10%
ABOVE NORMAL Top 33%
NEAR NORMAL
BELOW NORMAL Bottom 33%
MUCH BELOW NORMAL Bottom 10%
RECORD DRIEST
Rankings (1895-2010)
WestWide Drought Tracker - U Idaho/WRCC Data Source - PRISM (Prelim), created 2 MAY 2017

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



Distribution of Landfalling Atmospheric Rivers on the U.S. West Coast
(From 1 Oct 2016 to 31 March 2017)

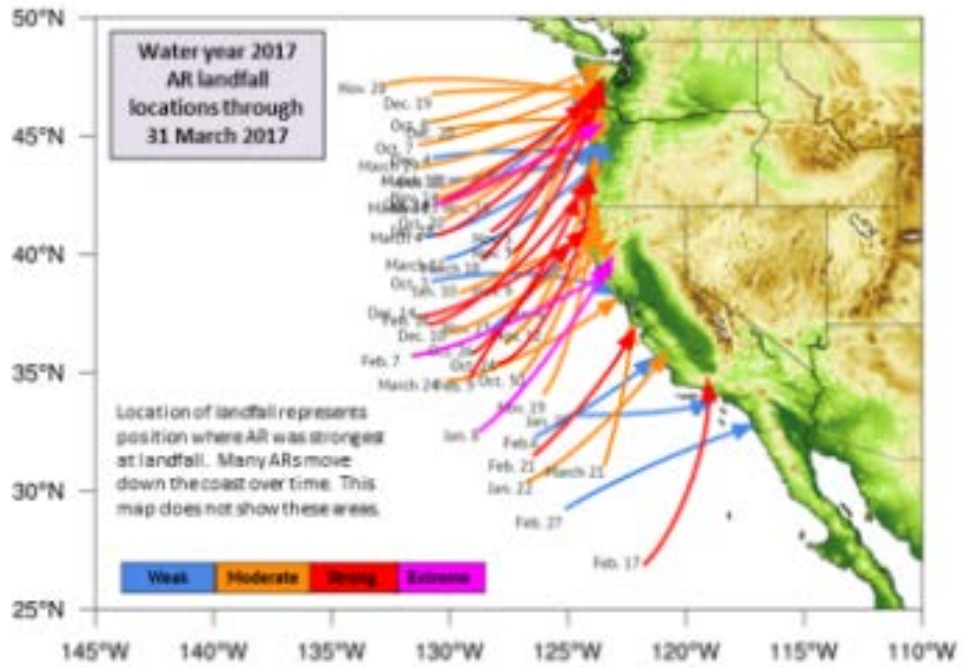
AR Strength	AR Count*
Weak	11
Moderate	20
Strong	12
Extreme	3

Ralph/CW3E AR Strength Scale

- Weak: IVT=250–500 kg m^{-1} s^{-1}
- Moderate: IVT=500–750 kg m^{-1} s^{-1}
- Strong: IVT=750–1000 kg m^{-1} s^{-1}
- Extreme: IVT>1000 kg m^{-1} s^{-1}

*Radiosondes at Bodega Bay, CA indicated the 10–11 Jan AR was strong (noted as moderate based on GFS analysis data) and 7–8 Feb AR was extreme (noted as strong)

- 45 Atmospheric Rivers have made landfall on the West Coast thus far during the 2017 water year (1 Oct. – 31 March 2017)
- This is much greater than normal
- 1/3 of the landfalling ARs have been "strong" or "extreme"



Center for Western Weather and Water Extremes
SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

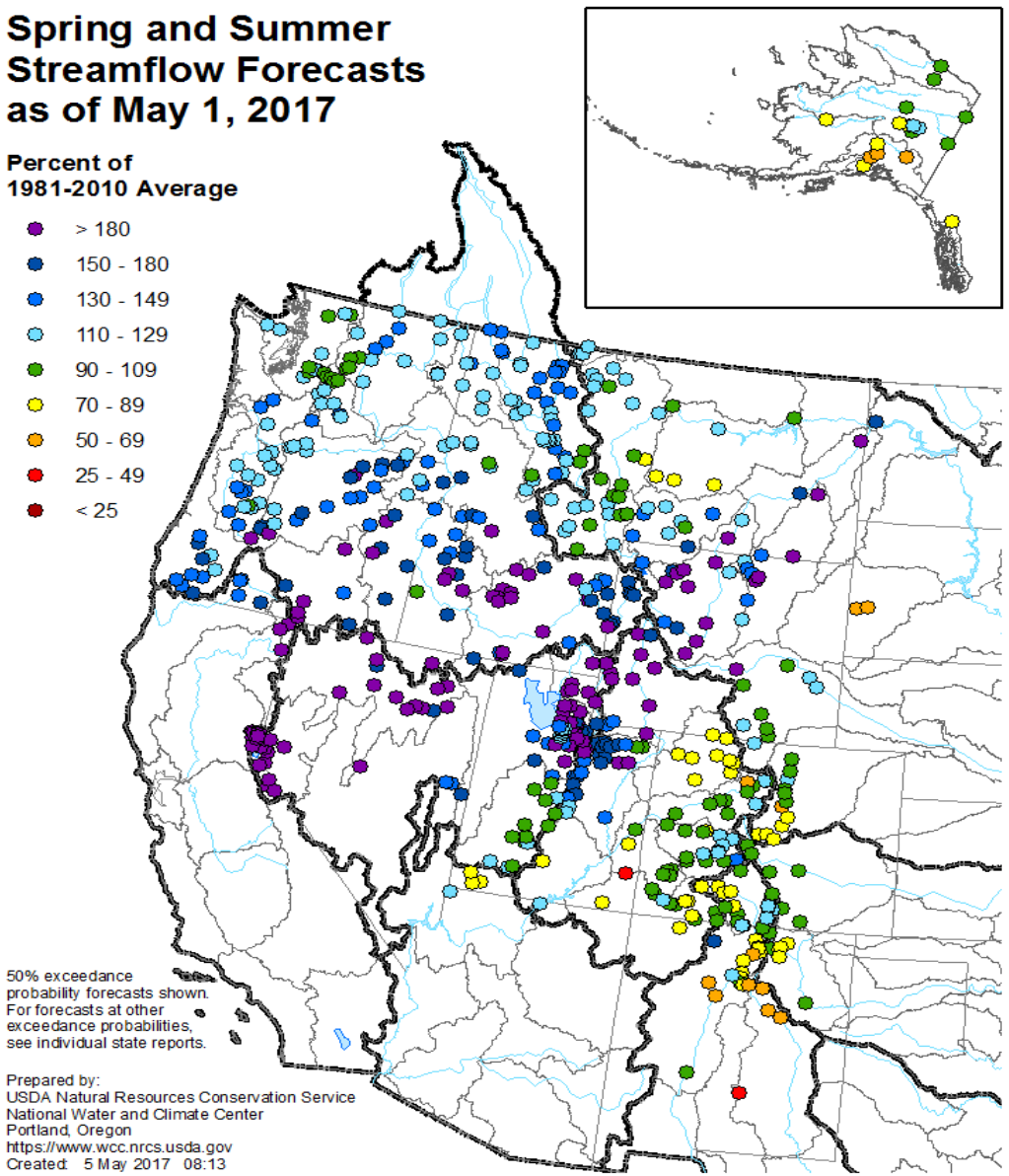
By F.M. Ralph, B. Kawzenuk, C. Hecht, J. Kalansky

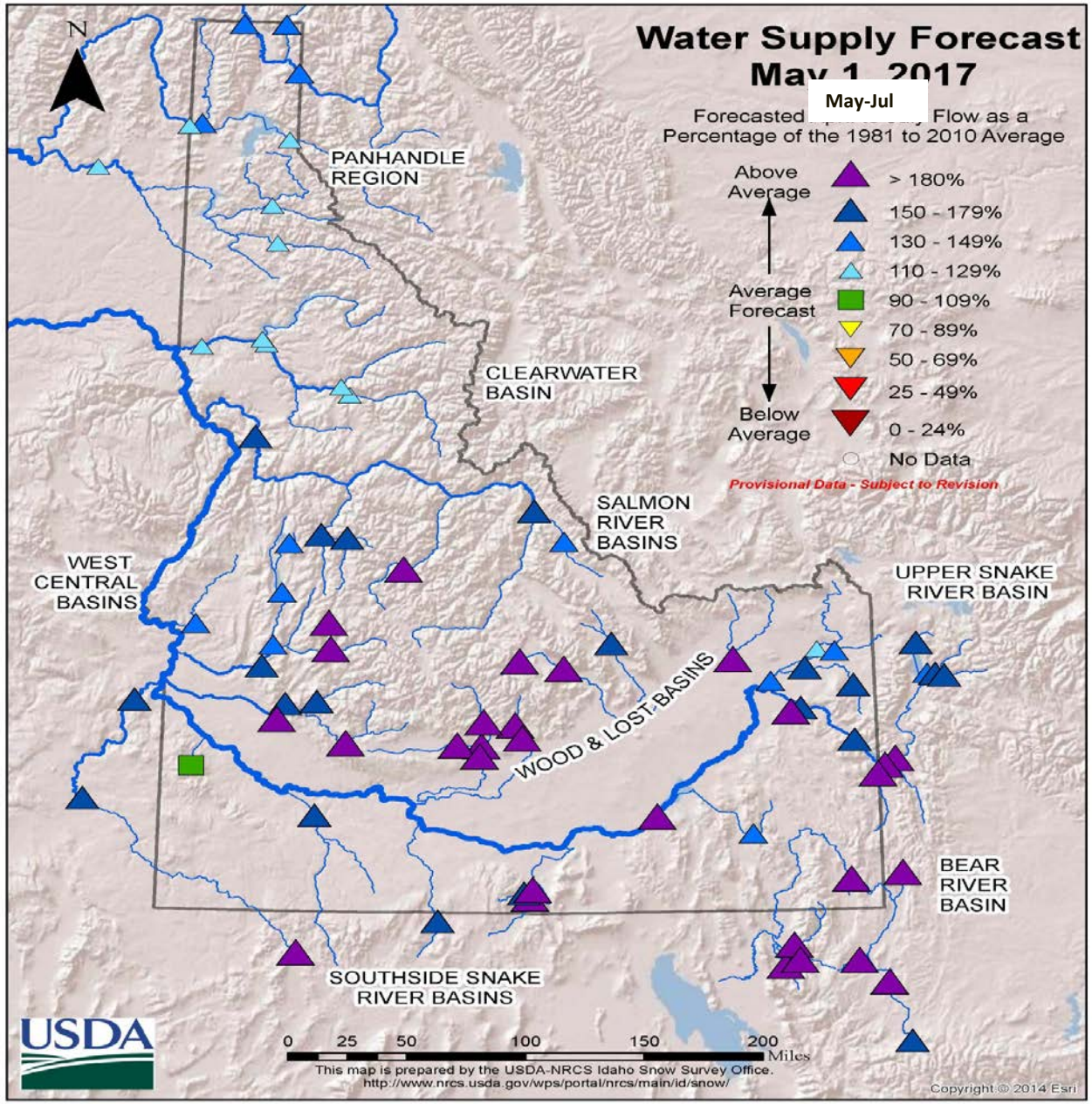
Experimental

WA OR & MT info: No flood or drought concerns for the moment.

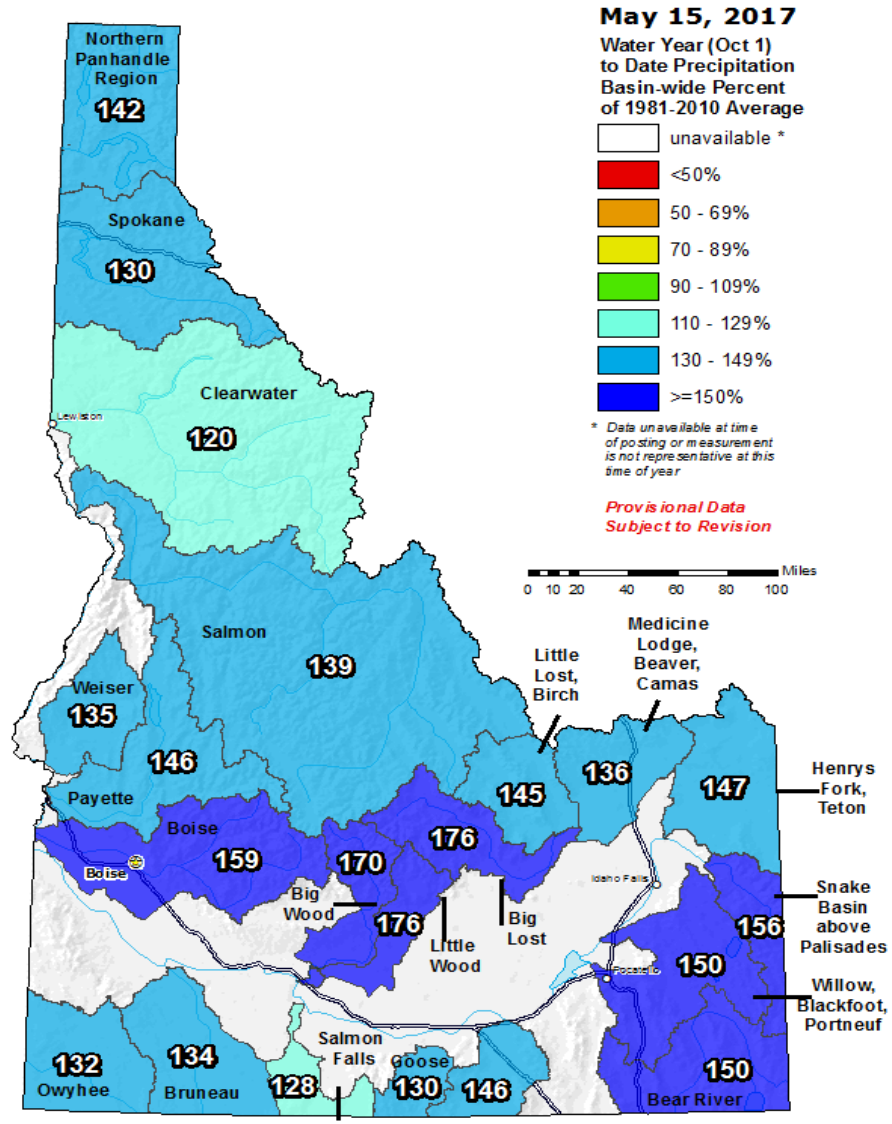
- Oregon best water supply outlook since 2011.
- Many reservoirs spilling at the end of April and that hasn't happened since 2006.
- Since February, monthly streamflow well above average throughout Oregon.
- Columbia River was flooding in places, picture taken March 30th near Troutdale

Water Supply Forecasts





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

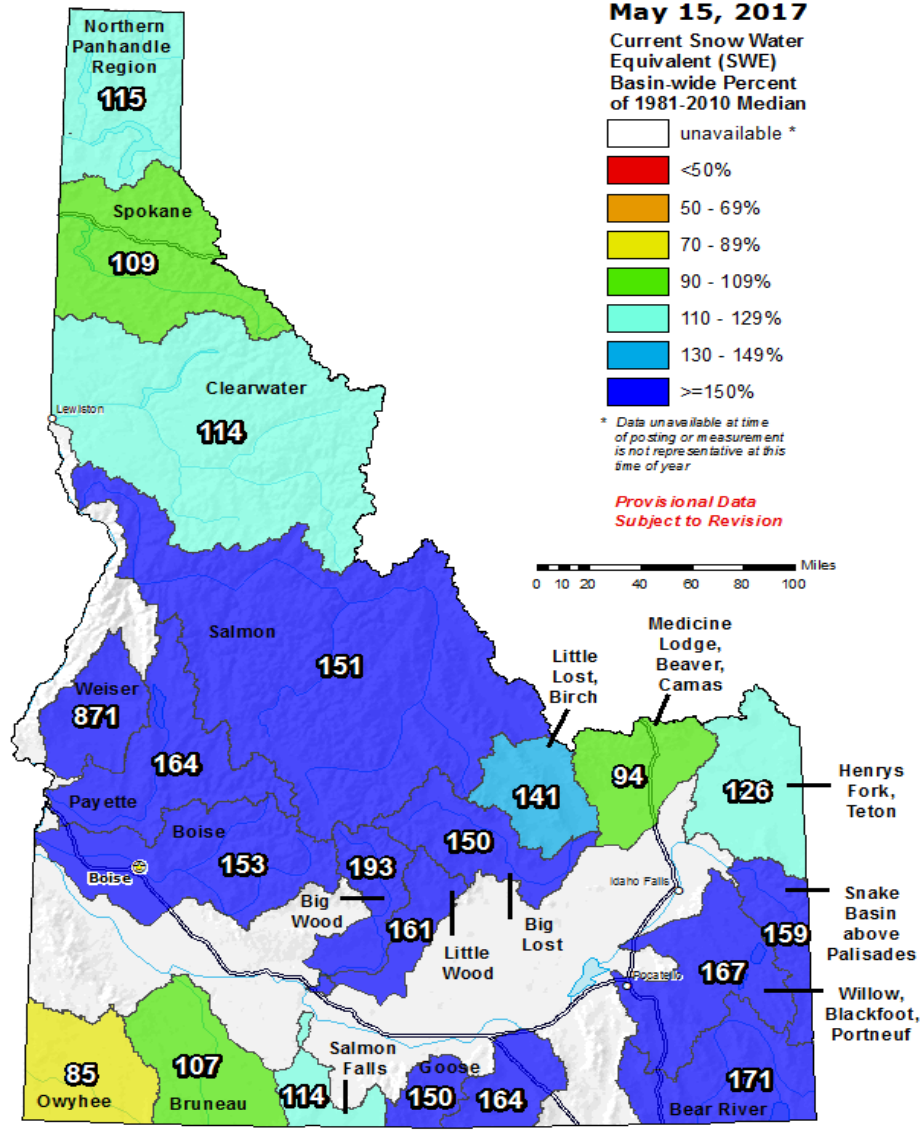


USDA NRCS

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



USDA NRCS

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 SURFACE WATER SUPPLY INDEX (SWSI) May 1, 2017

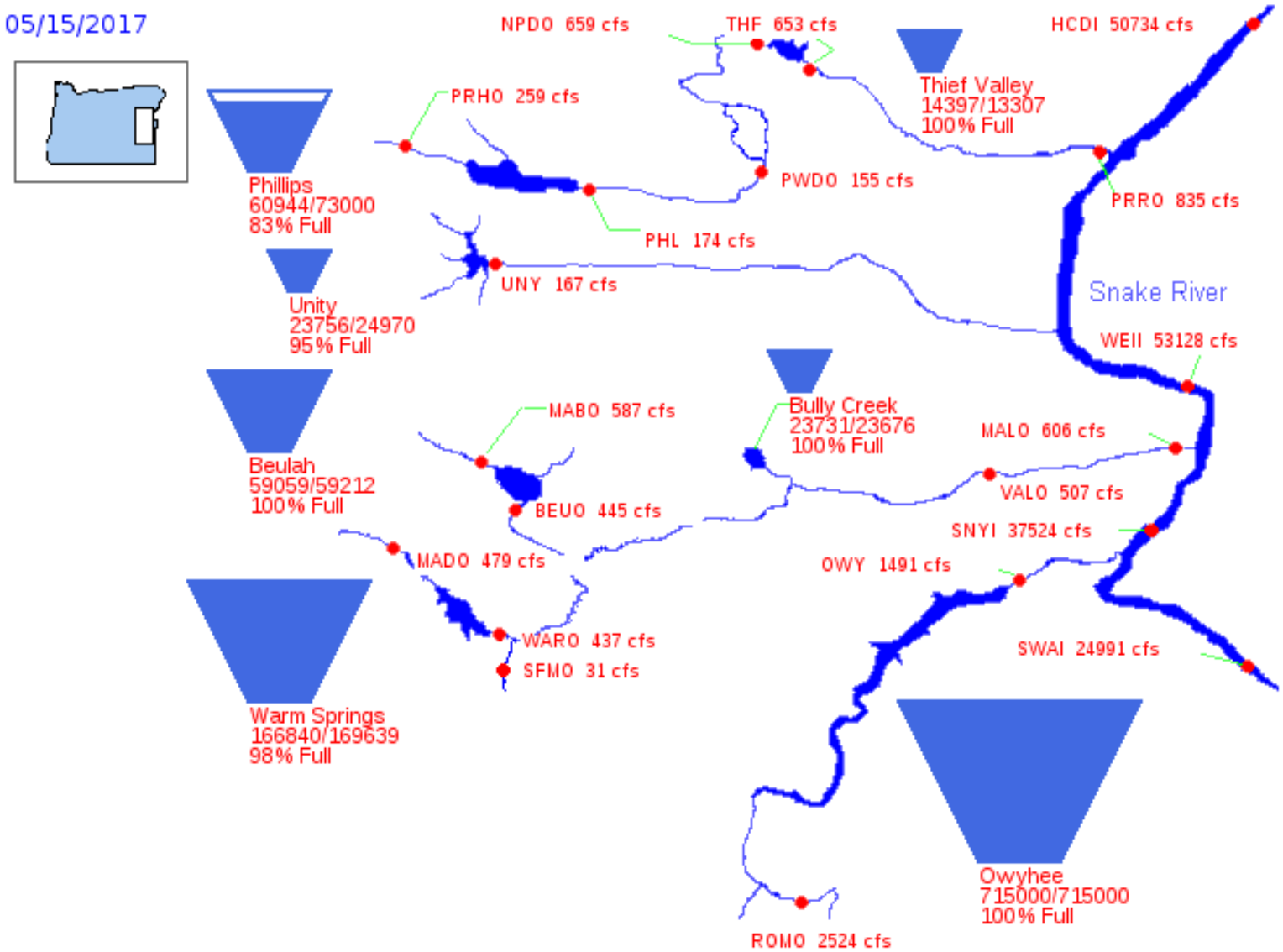
BASIN or REGION	*SWSI Value*	*Most Recent Year With Similar SWSI Value*	*Agricultural Water Supply Shortage May Occur When SWSI is Less Than*
Spokane	2.0	1991	NA
Clearwater	0.9	2012	NA
Salmon	3.0	1996	NA
Weiser	2.3	1996	NA
Payette	3.6	1983	NA
Boise	3.9	1983	-2.0
Big Wood	3.8	1983	0.3
Little Wood	3.8	1995	-1.5
Big Lost	3.6	1983	0.8
Little Lost	3.6	1995	1.5
Teton	3.2	1983	-3.9
Henrys Fork	3.6	1998	-1.7
Snake (Heise)	3.6	1983 / 2011	-1.7
Oakley	3.8	1998	0.1
Salmon Falls	3.8	1986	-0.8
Bruneau	3.2	1995	NA
Owyhee	3.2	2006	-1.5
Bear River	2.7	1997	-3.9

The SWSI is a very useful and powerful index that combines reservoir storage and projected streamflow (snow, fall precip, soil moisture) to help users monitor:

- **Ag shortages**
- **Water Surplus**
- **Farm GDP**
- **Cloud seeding**
- **Flood control**
- **Droughts**
- **Aquifer recharge**

Just need to correlate with what you are trying to monitor

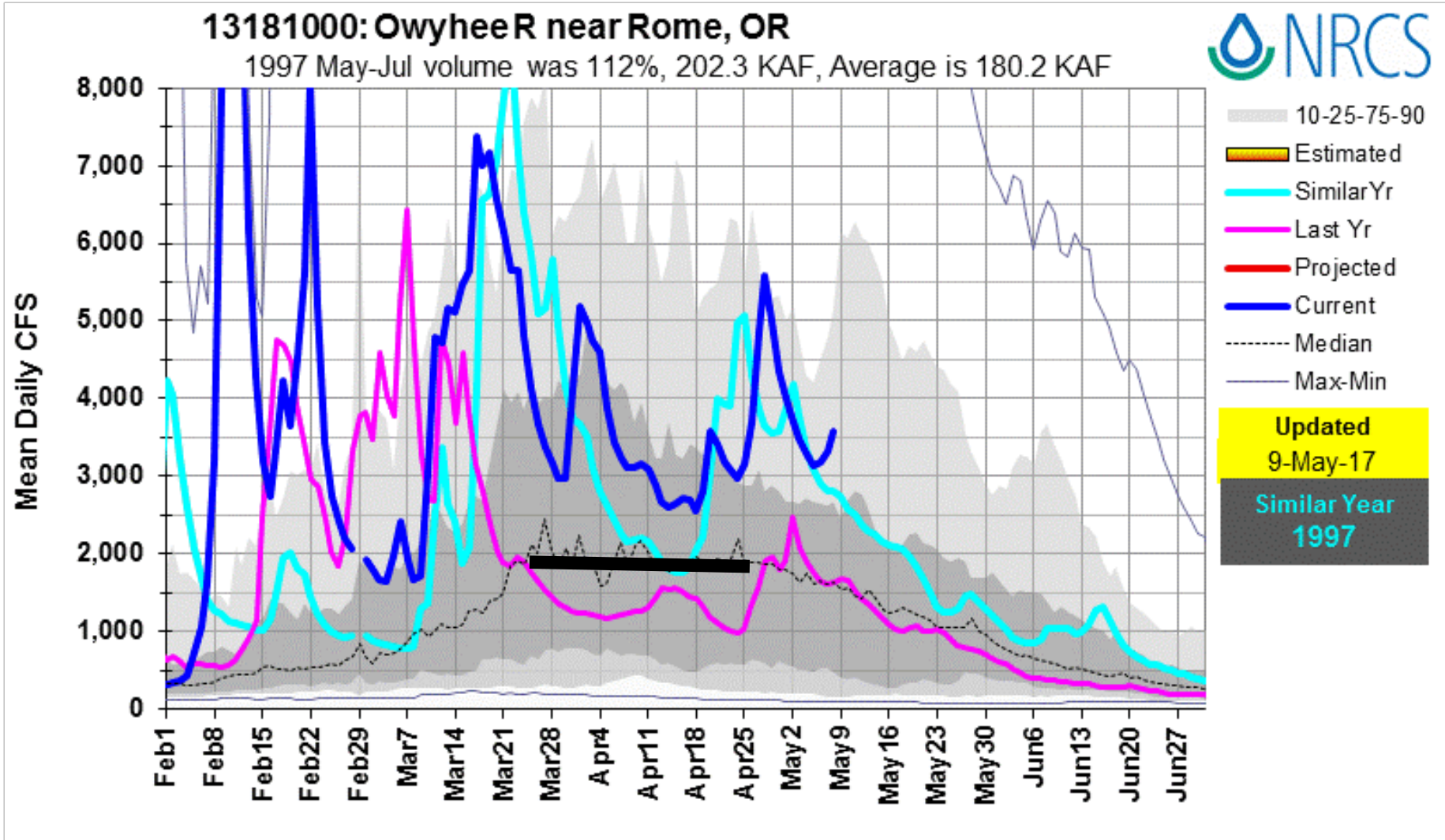
US Bureau of Reclamation, Pacific Northwest Region
Major Storage Reservoirs in Southeastern Oregon

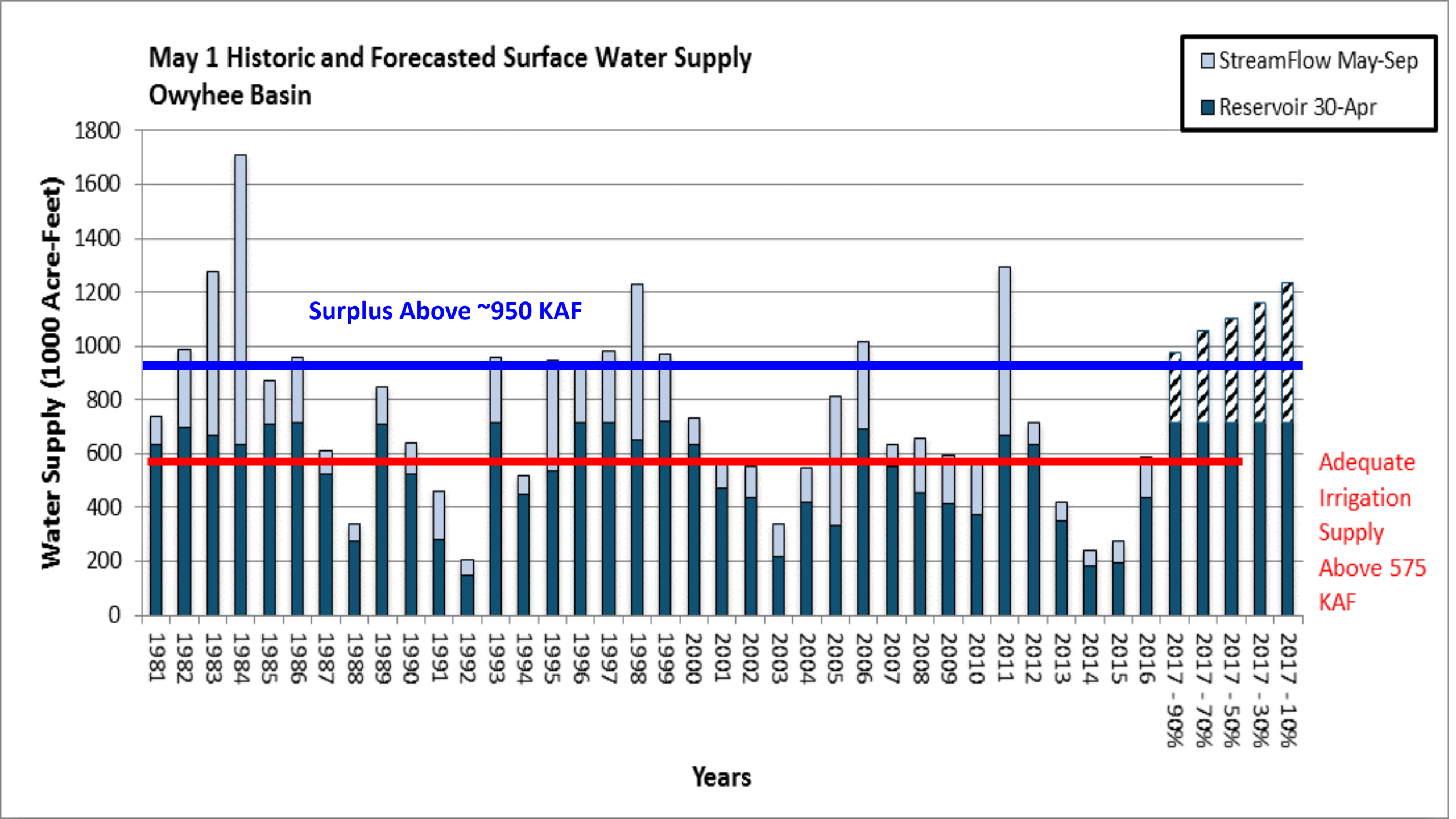


Most of snow has melted in the Owyhee Basin

Flow has been above long term median since Feb 1.

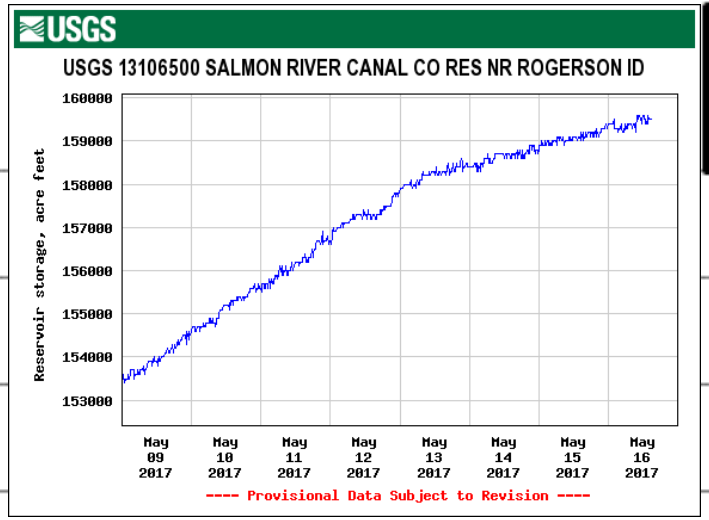
Watch for similar flow trends in other basins.




May 1 Historic and Forecasted Surface Water Supply
Owyhee Basin
StreamFlow May-Sep
Reservoir 30-Apr
Water Supply (1000 Acre-Feet)
1800
1600
1400
1200
1000
800
600
400
200
0
Surplus Above ~950 KAF
Adequate Irrigation Supply Above 575 KAF
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
2013
2014
2015
2016
2017 - 90%
2017 - 70%
2017 - 50%
2017 - 30%
2017 - 10%
Years

May 1 Historic and Forecasted Surface Water Supply
Salmon Falls Creek Basin

Full Reservoir 181,000 acre-feet



Reservoir releases being made for irrigation & flood control from Salmon Falls & Oakley reservoirs.

Surplus Supply Above 180 KAF

StreamFlow May-Sep
Reservoir 30-Apr

Water Supply (1000 Acre-Feet)

400
350
300
250
200
150
100
50
0

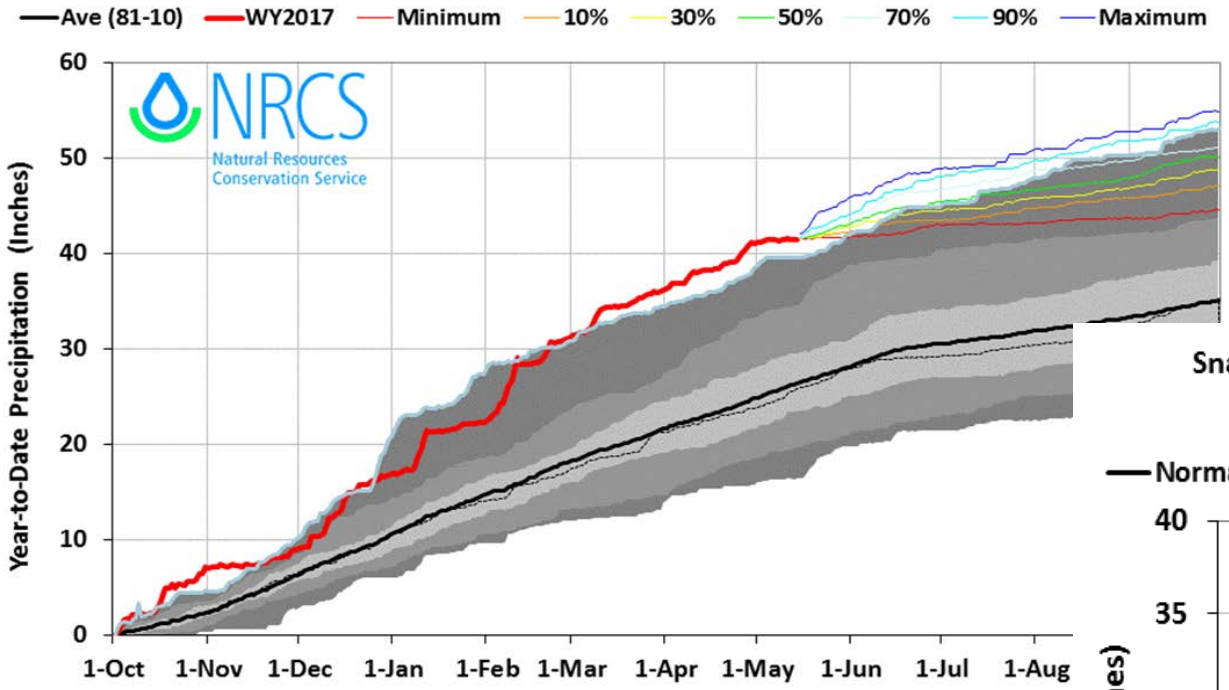
1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 - 90% 2017 - 70% 2017 - 50% 2017 - 30% 2017 - 10%

Years

Adequate Irrigation Supply Above 100 KAF

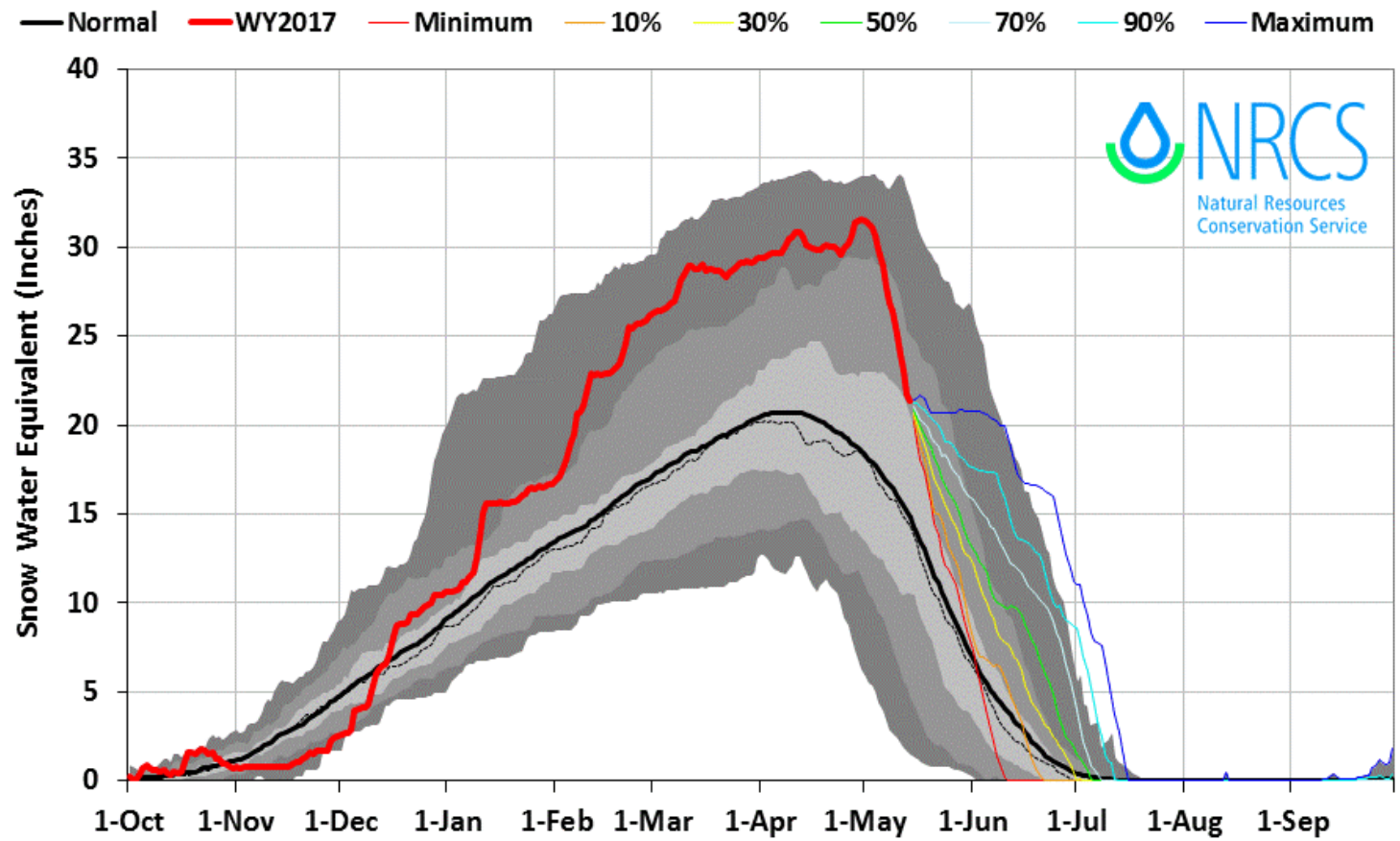
Snake Basin above Palisades 2017 Precipitation with Non-Exceedence Projections (18 sites)

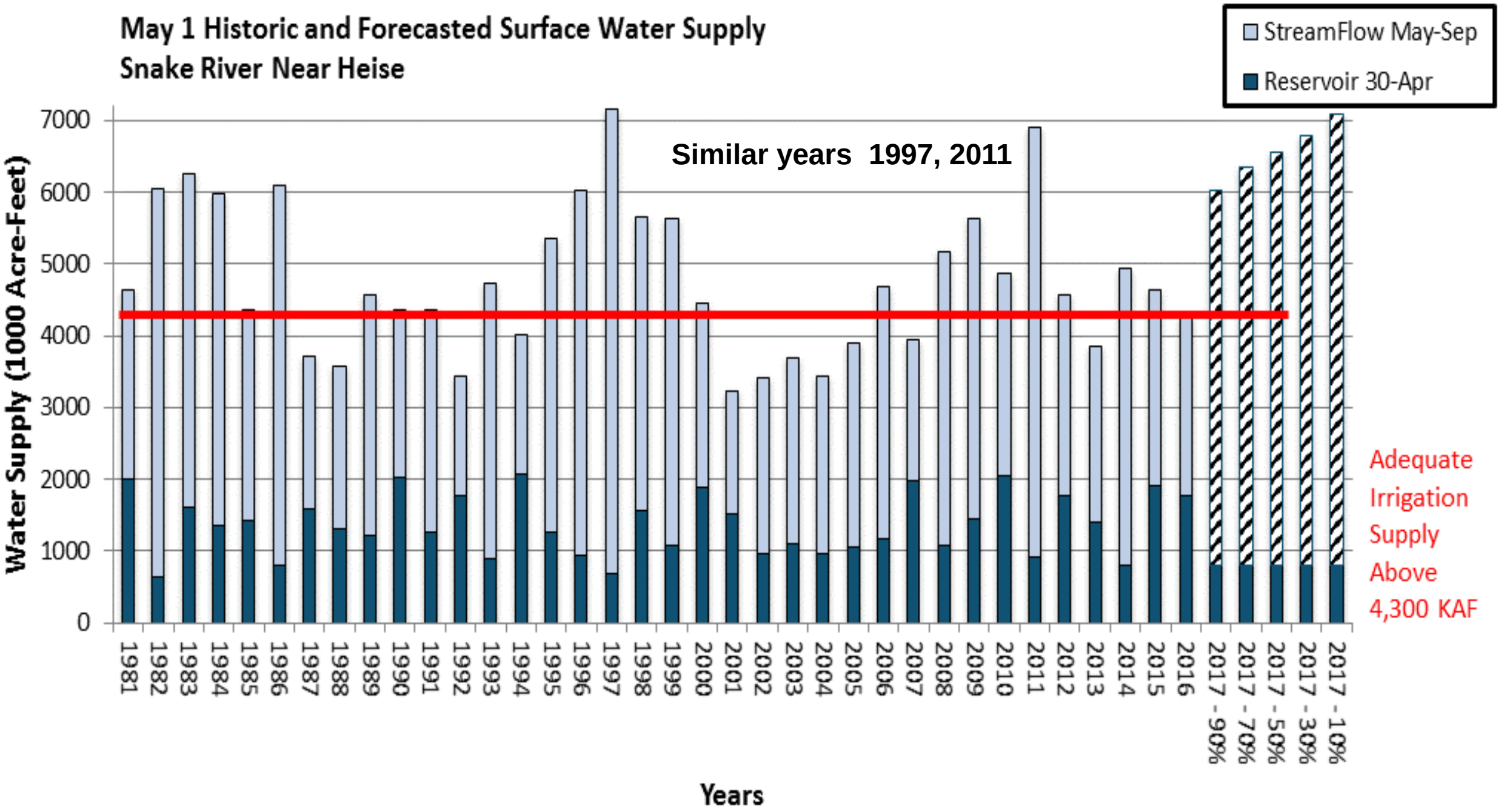
Based on Provisional SNOTEL data as of May 14, 2017

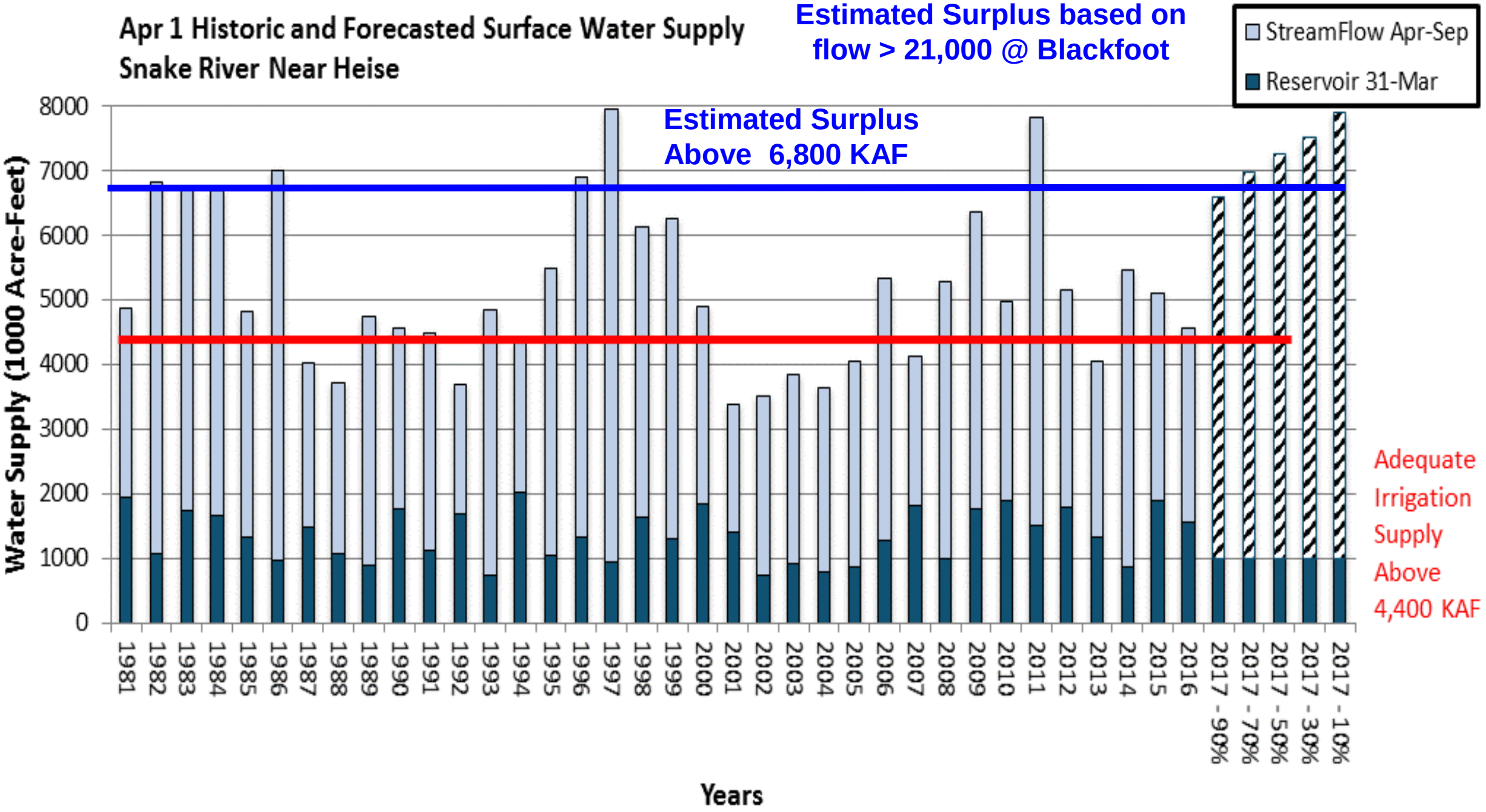


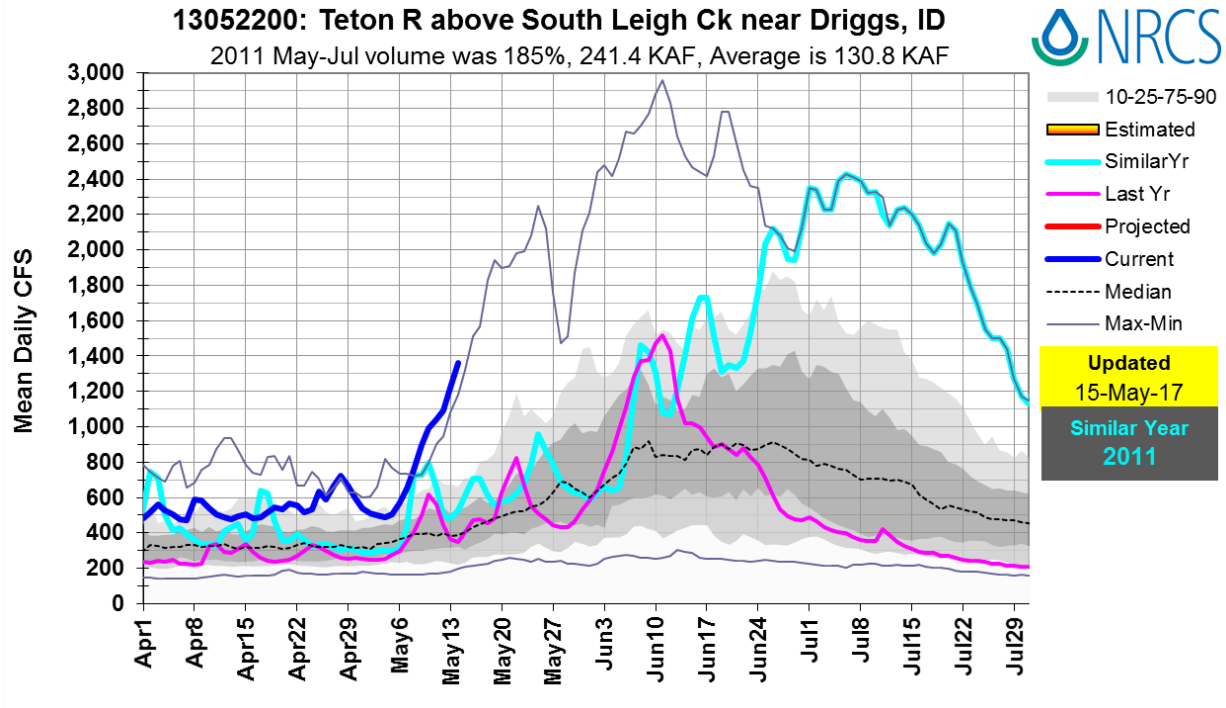
Snake Basin above Palisades 2017 Snow Water with Non-Exceedence Projections (18 sites)

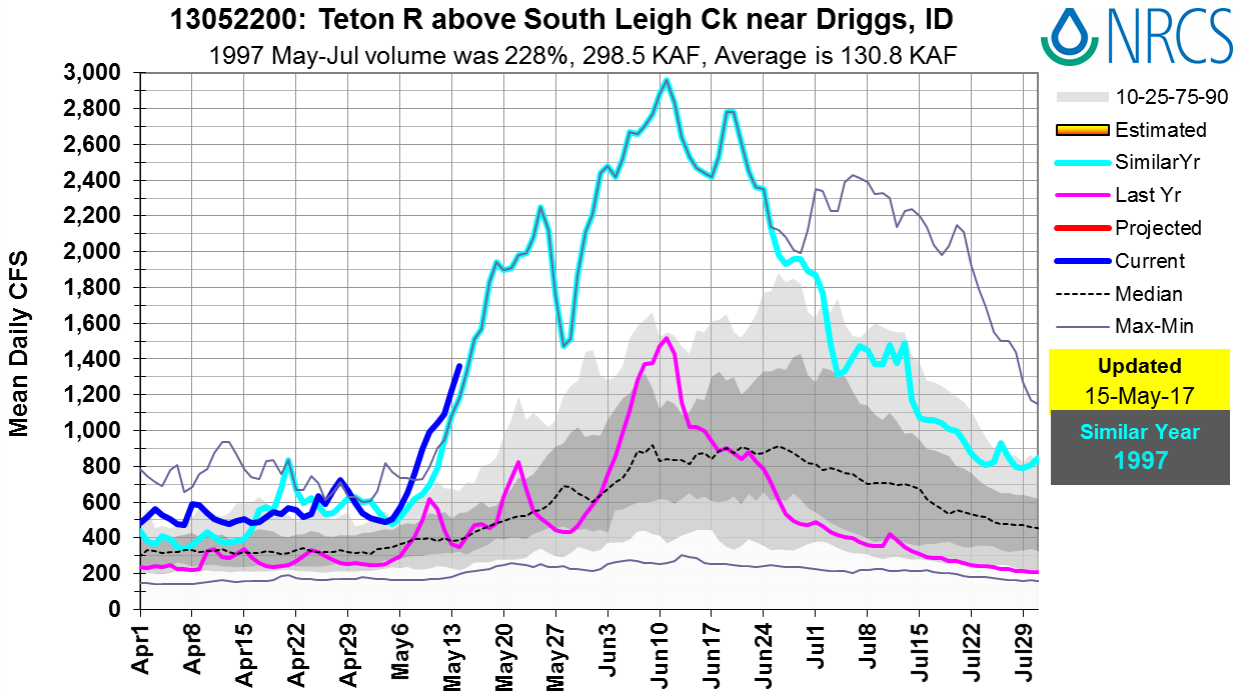
Based on Provisional SNOTEL data as of May 14, 2017

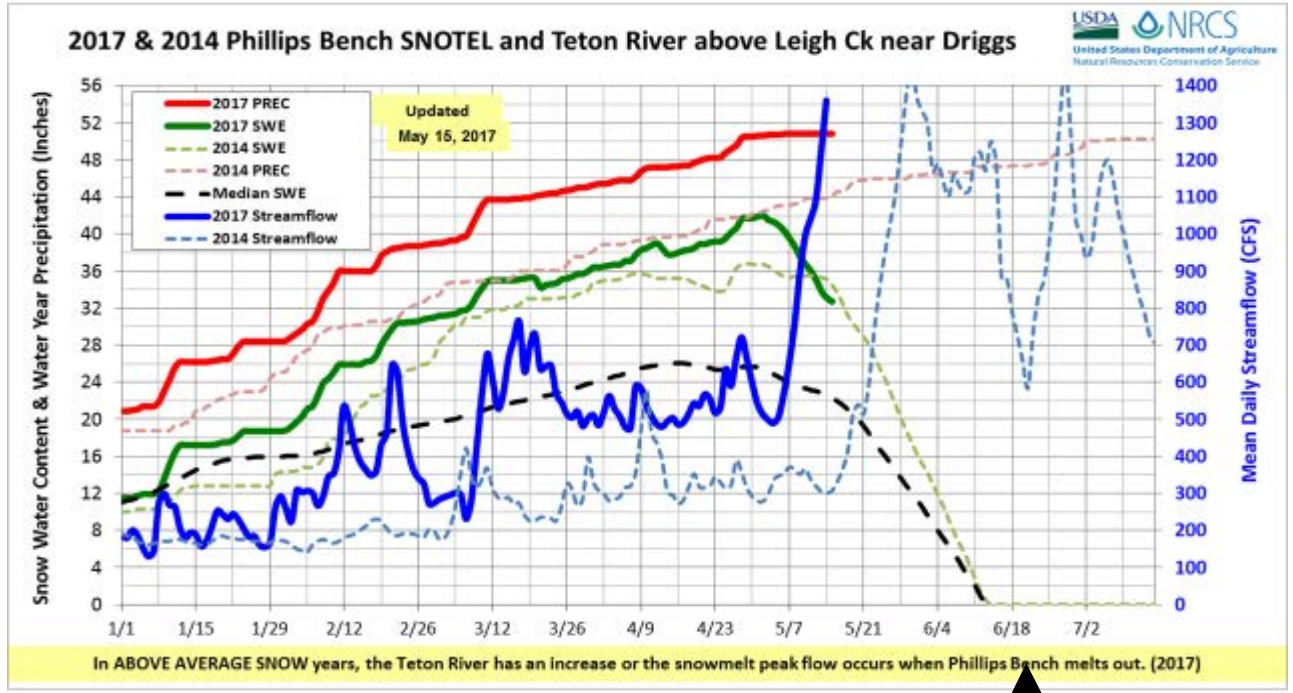


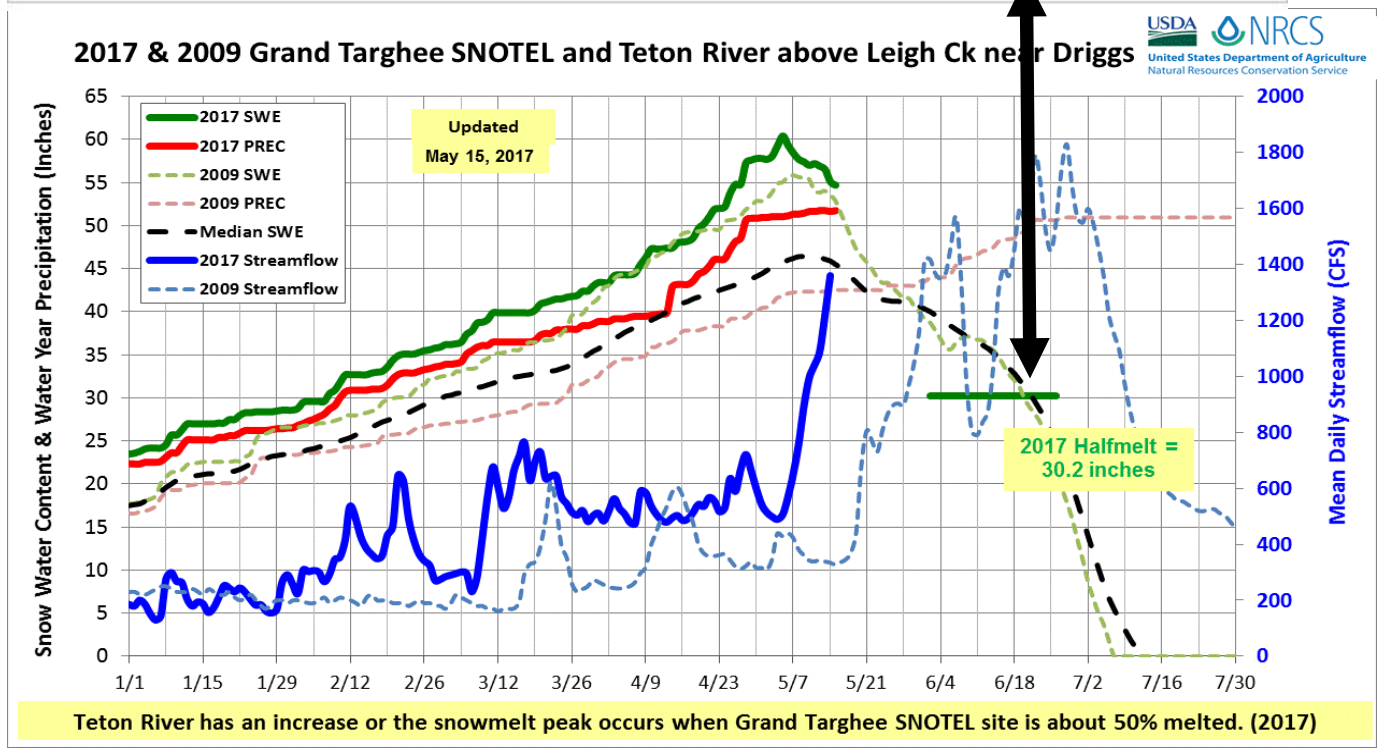

May 1 Historic and Forecasted Surface Water Supply
Snake River Near Heise
StreamFlow May-Sep
Reservoir 30-Apr
Similar years 1997, 2011
Water Supply (1000 Acre-Feet)
7000
6000
5000
4000
3000
2000
1000
0
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017 - 90%
2017 - 70%
2017 - 50%
2017 - 30%
2017 - 10%
Years
Adequate Irrigation Supply Above 4,300 KAF

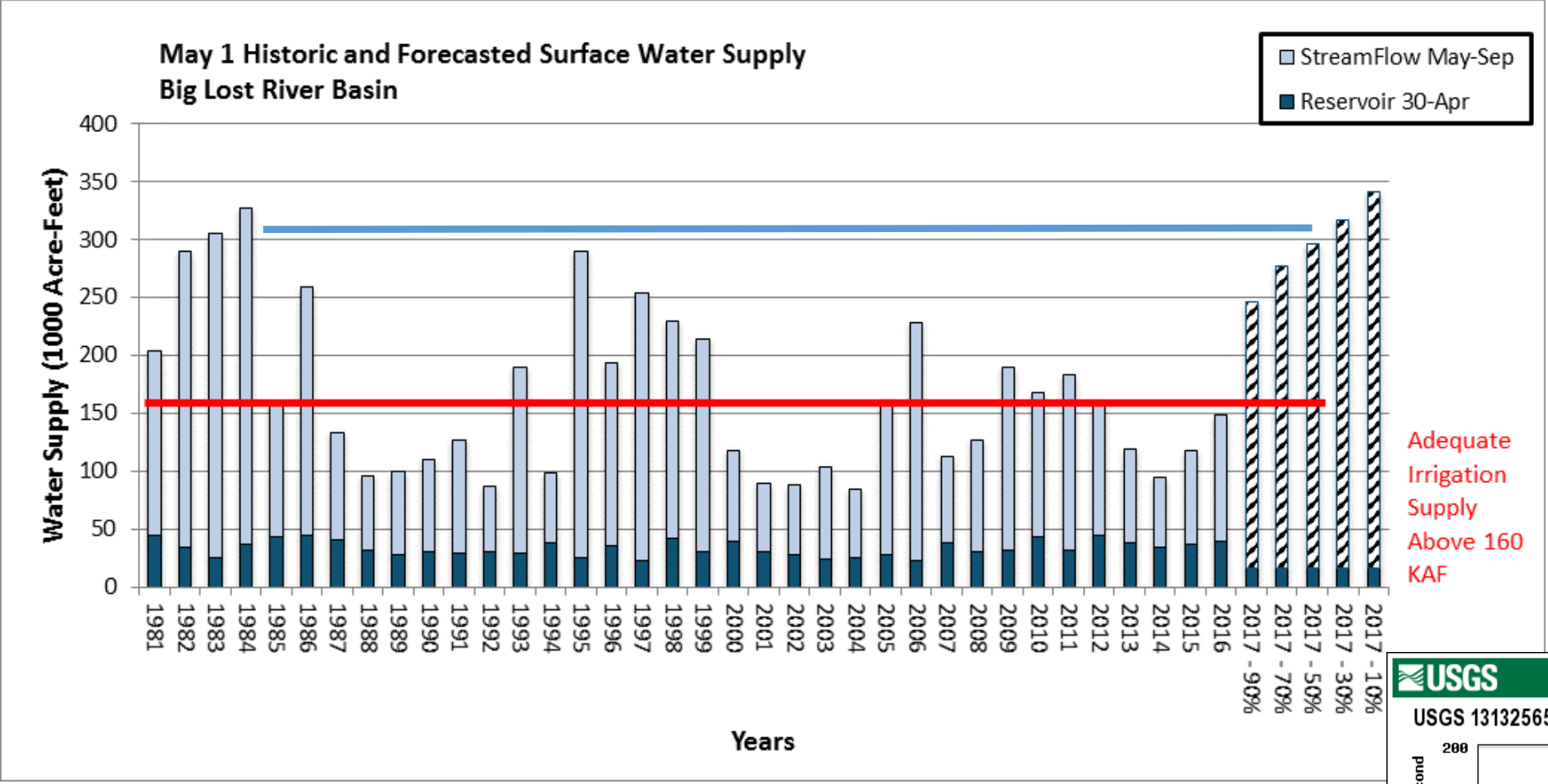

Apr 1 Historic and Forecasted Surface Water Supply
Snake River Near Heise
Estimated Surplus based on flow > 21,000 @ Blackfoot
StreamFlow Apr-Sep
Reservoir 31-Mar
Estimated Surplus Above 6,800 KAF
Adequate Irrigation Supply Above 4,400 KAF
Water Supply (1000 Acre-Feet)
0
1000
2000
3000
4000
5000
6000
7000
8000
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
2013
2014
2015
2016
2017 - 90%
2017 - 70%
2017 - 50%
2017 - 30%
2017 - 10%
Years


13052200: Teton R above South Leigh Ck near Driggs, ID
2011 May-Jul volume was 185%, 241.4 KAF, Average is 130.8 KAF
Mean Daily CFS
3,000
2,800
2,600
2,400
2,200
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Apr1
Apr8
Apr15
Apr22
Apr29
May6
May13
May20
May27
Jun3
Jun10
Jun17
Jun24
Jul1
Jul8
Jul15
Jul22
Jul29
NRCS
10-25-75-90
Estimated
SimilarYr
Last Yr
Projected
Current
Median
Max-Min
Updated
15-May-17
Similar Year
2011


13052200: Teton R above South Leigh Ck near Driggs, ID
1997 May-Jul volume was 228%, 298.5 KAF, Average is 130.8 KAF
Mean Daily CFS
3,000
2,800
2,600
2,400
2,200
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Apr1
Apr8
Apr15
Apr22
Apr29
May6
May13
May20
May27
Jun3
Jun10
Jun17
Jun24
Jul1
Jul8
Jul15
Jul22
Jul29
NRCS
10-25-75-90
Estimated
SimilarYr
Last Yr
Projected
Current
Median
Max-Min
Updated
15-May-17
Similar Year
1997


2017 & 2014 Phillips Bench SNOTEL and Teton River above Leigh Ck near Driggs
USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service
2017 PREC
2017 SWE
2014 SWE
2014 PREC
Median SWE
2017 Streamflow
2014 Streamflow
Updated
May 15, 2017
Snow Water Content & Water Year Precipitation (Inches)
Mean Daily Streamflow (CFS)
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400
1/1 1/15 1/29 2/12 2/26 3/12 3/26 4/9 4/23 5/7 5/21 6/4 6/18 7/2
In ABOVE AVERAGE SNOW years, the Teton River has an increase or the snowmelt peak flow occurs when Phillips Bench melts out. (2017)

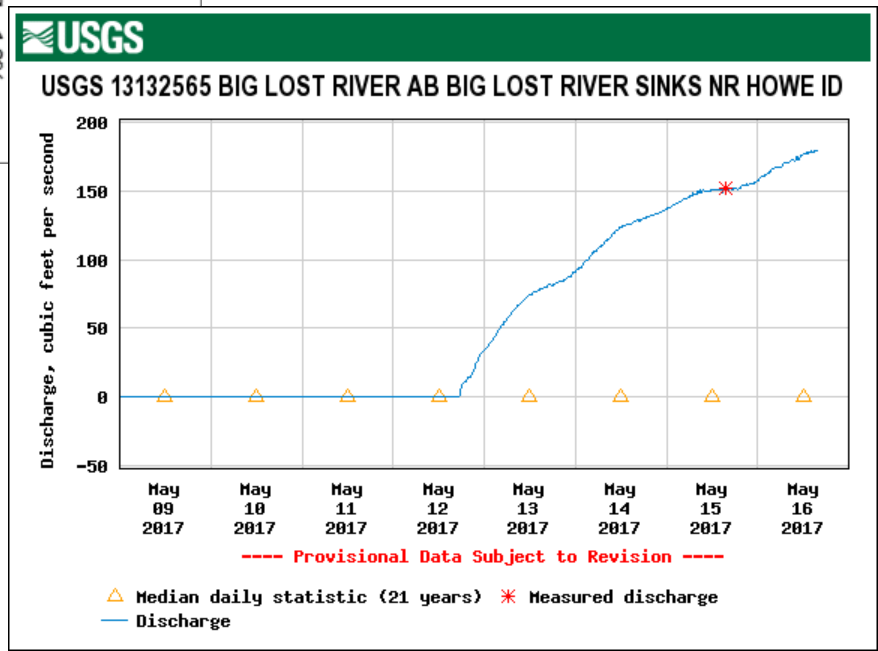

2017 & 2009 Grand Targhee SNOTEL and Teton River above Leigh Ck near Driggs
USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service
2017 SWE
2017 PREC
2009 SWE
2009 PREC
Median SWE
2017 Streamflow
2009 Streamflow
Updated
May 15, 2017
2017 Halfmelt =
30.2 inches
Snow Water Content & Water Year Precipitation (Inches)
Mean Daily Streamflow (CFS)
0 5 10 15 20 25 30 35 40 45 50 55 60 65
0 200 400 600 800 1000 1200 1400 1600 1800 2000
1/1 1/15 1/29 2/12 2/26 3/12 3/26 4/9 4/23 5/7 5/21 6/4 6/18 7/2 7/16 7/30
Teton River has an increase or the snowmelt peak occurs when Grand Targhee SNOTEL site is about 50% melted. (2017)

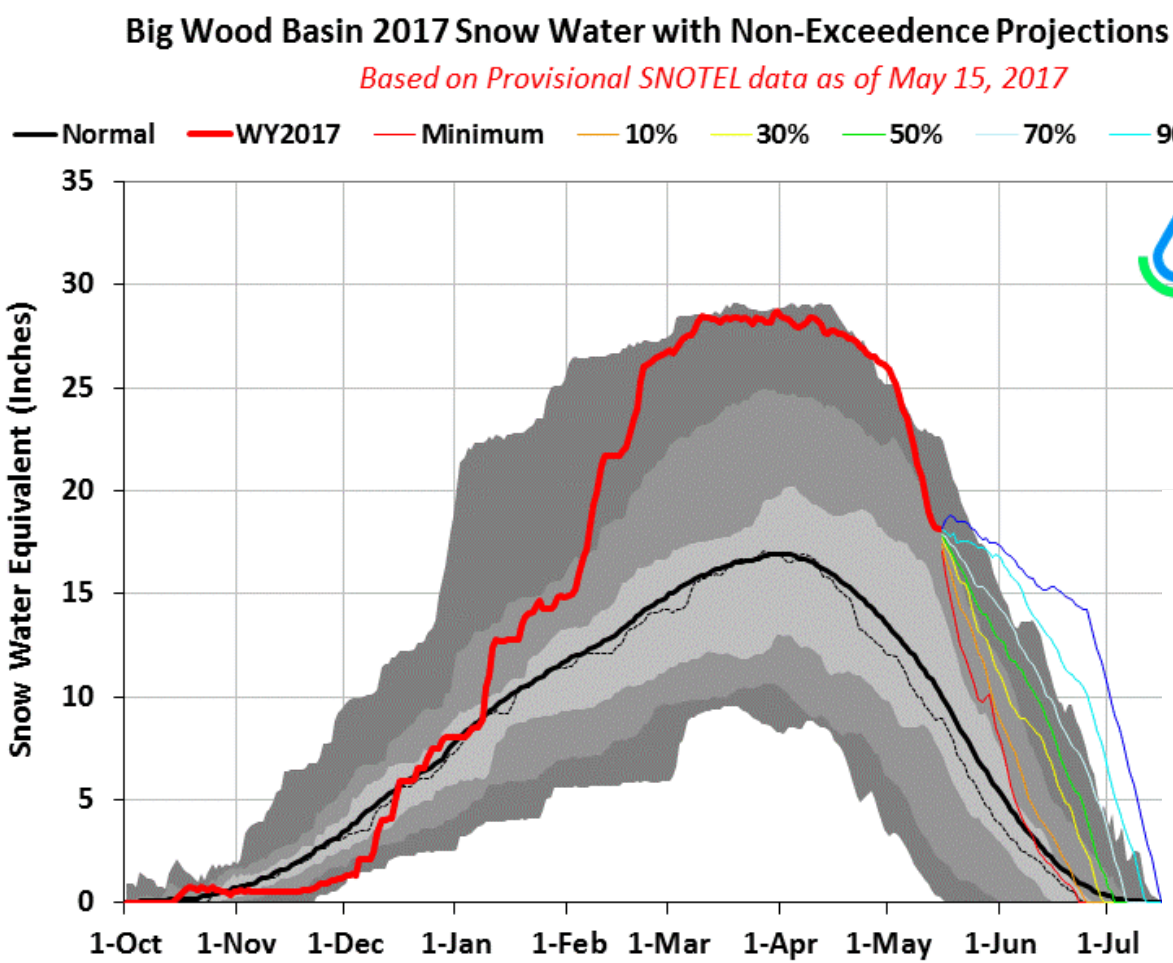


Best Water Supply Since 1997 or 1995

Flow is reaching the sinks

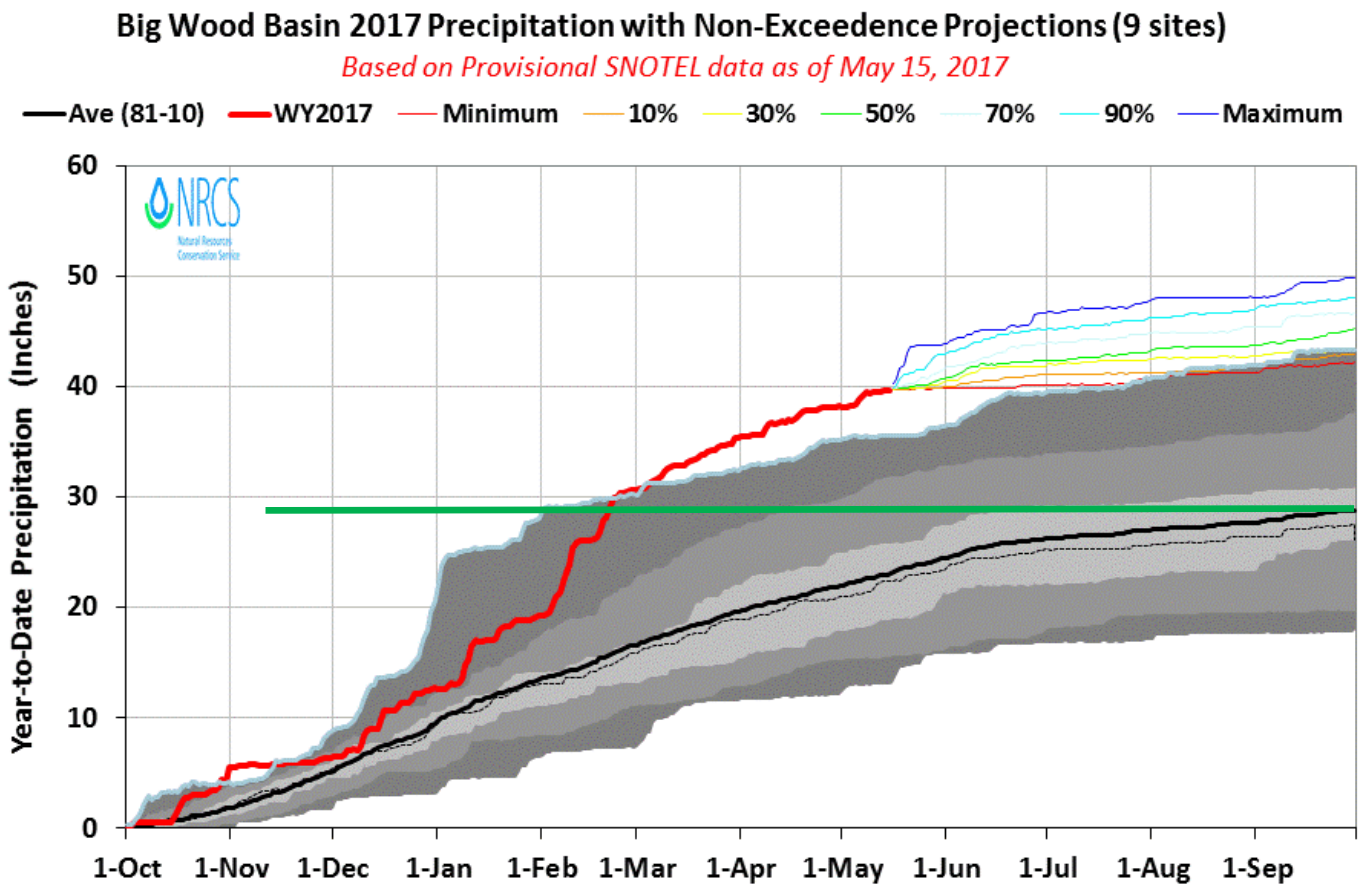
Snowmelt peak streamflow still to come

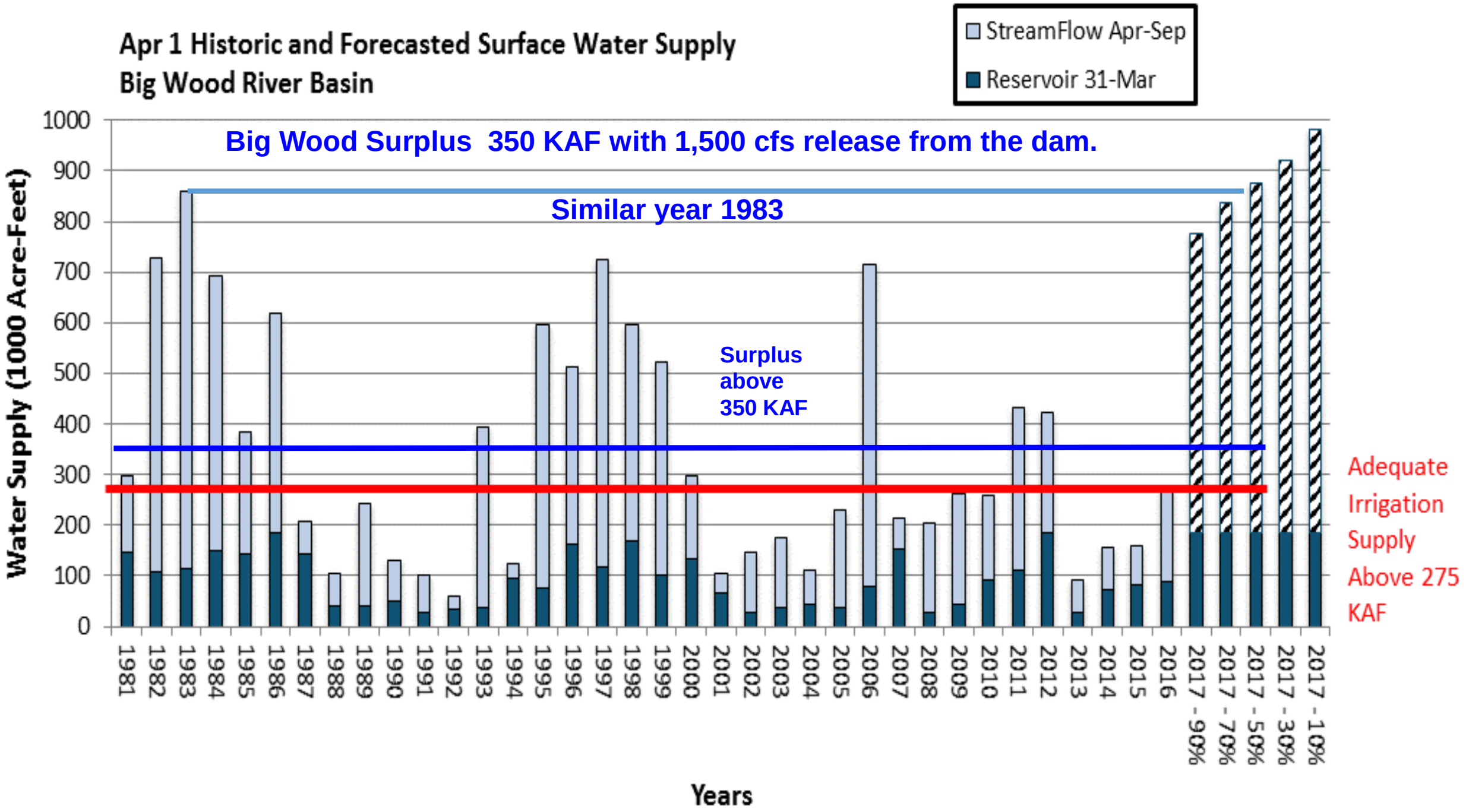


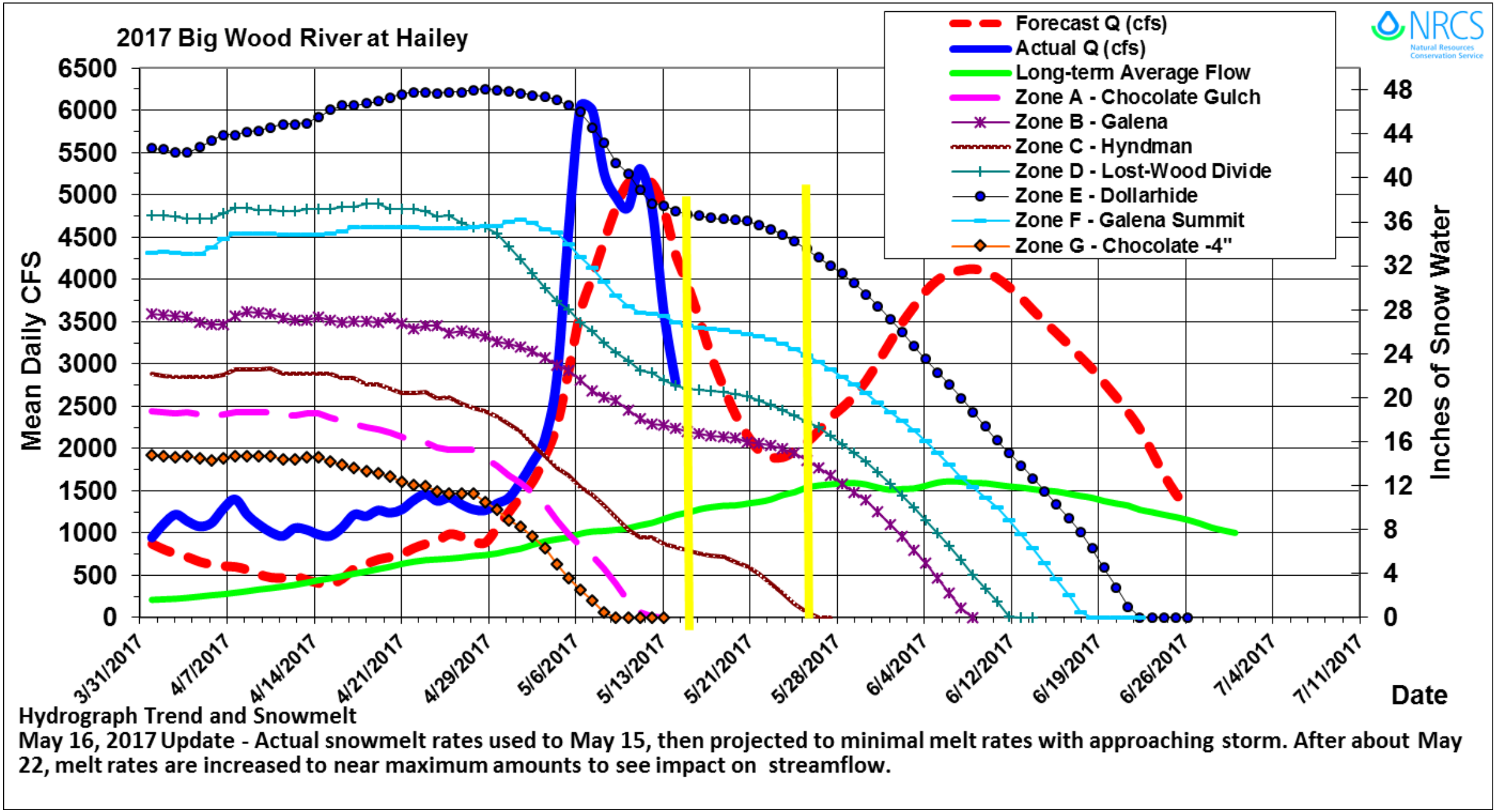


Doubled the snowpack in February

Received a year's worth of precipitation by end of February




Apr 1 Historic and Forecasted Surface Water Supply
Big Wood River Basin
StreamFlow Apr-Sep
Reservoir 31-Mar
Big Wood Surplus 350 KAF with 1,500 cfs release from the dam.
Similar year 1983
Surplus above 350 KAF
Adequate Irrigation Supply Above 275 KAF
Water Supply (1000 Acre-Feet)
Years
0
100
200
300
400
500
600
700
800
900
1000
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
2013
2014
2015
2016
2017 - 90%
2017 - 70%
2017 - 50%
2017 - 30%
2017 - 10%

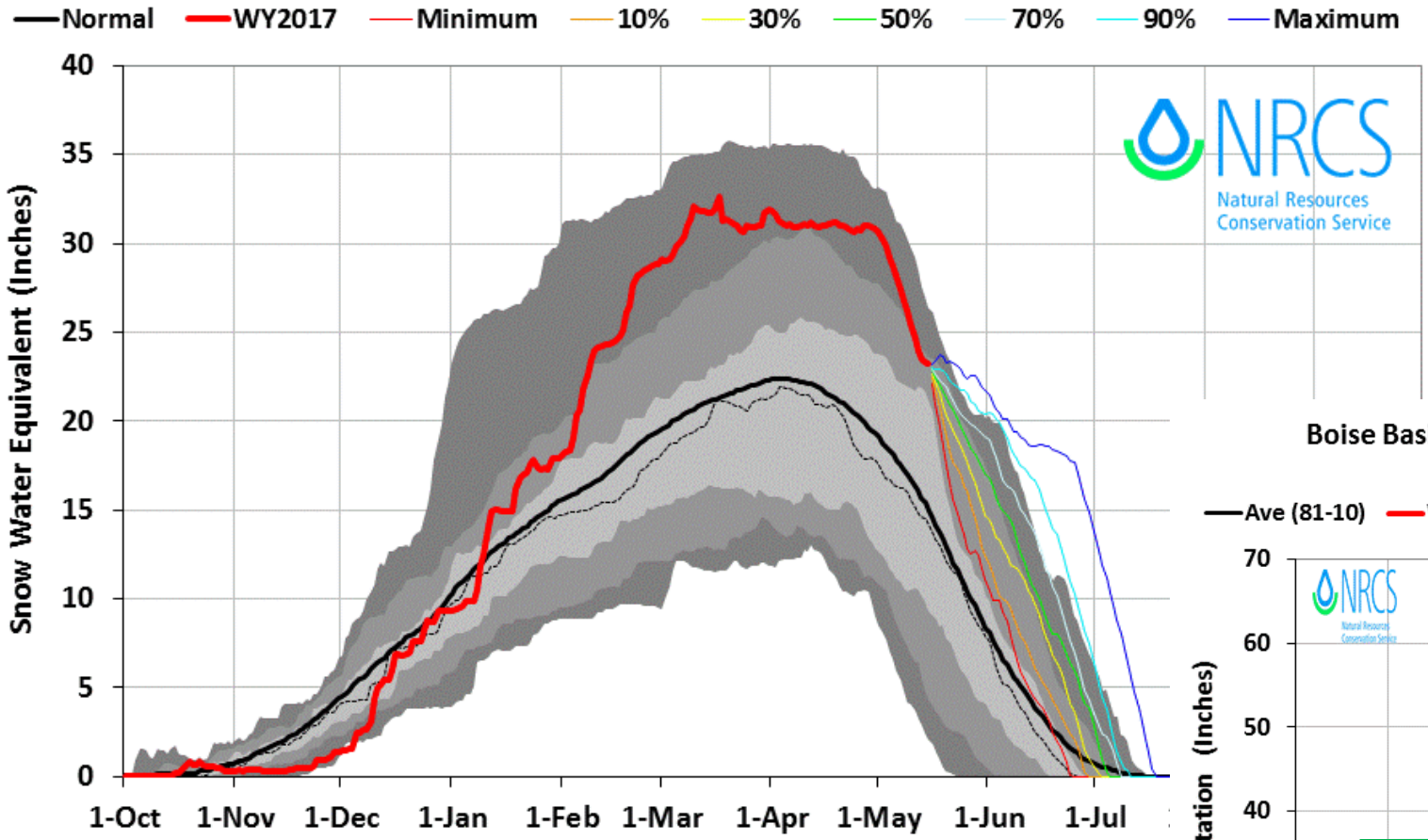


Hydrograph Trend and Snowmelt

May 16, 2017 Update - Actual snowmelt rates used to May 15, then projected to minimal melt rates with approaching storm. After about May 22, melt rates are increased to near maximum amounts to see impact on streamflow.

Boise Basin 2017 Snow Water with Non-Exceedence Projections (10 sites)

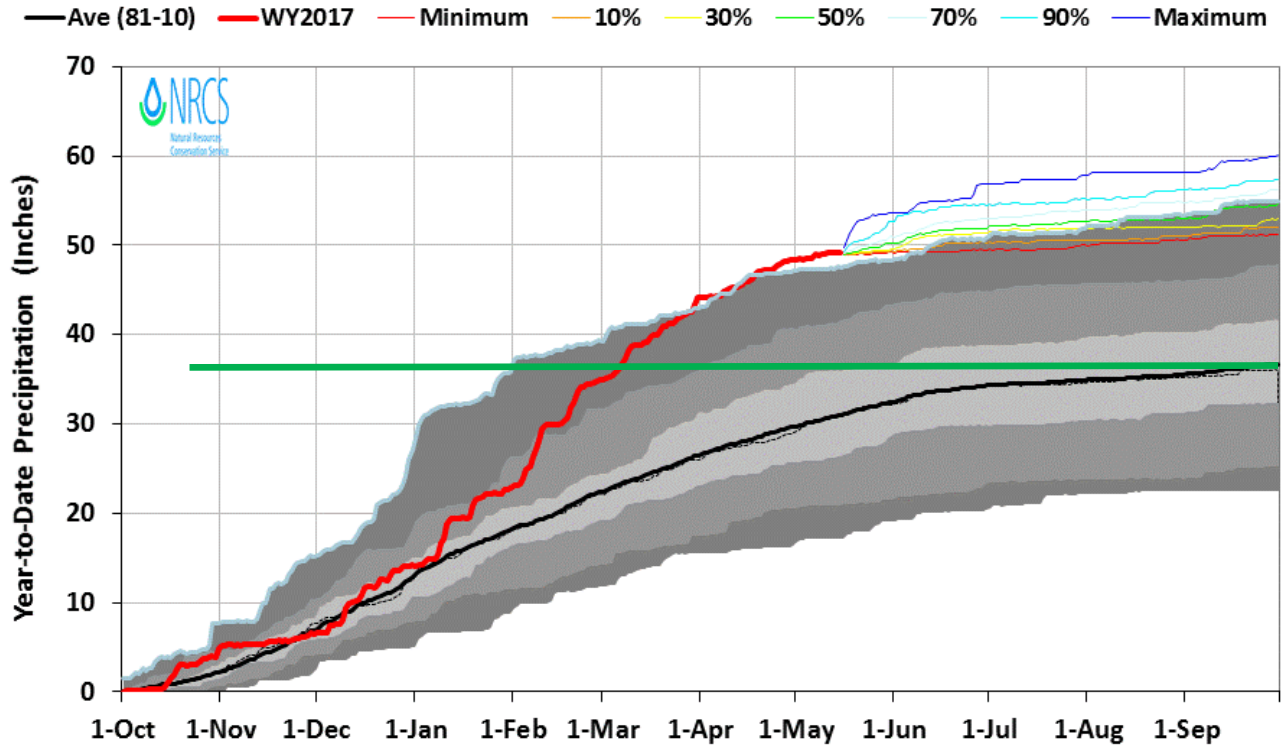
Based on Provisional SNOTEL data as of May 15, 2017

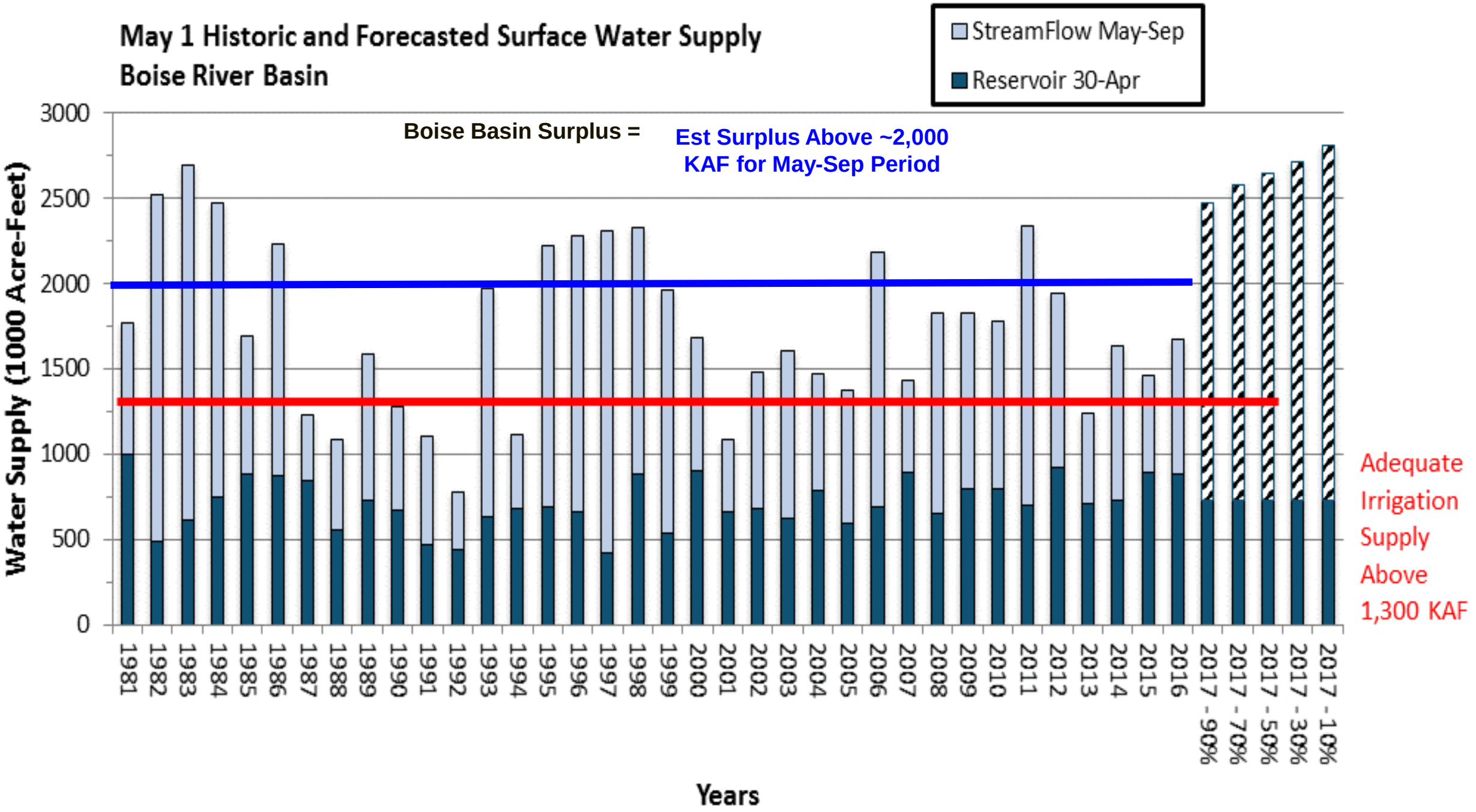


Since March 1, the snow has been the 8th highest since 1961

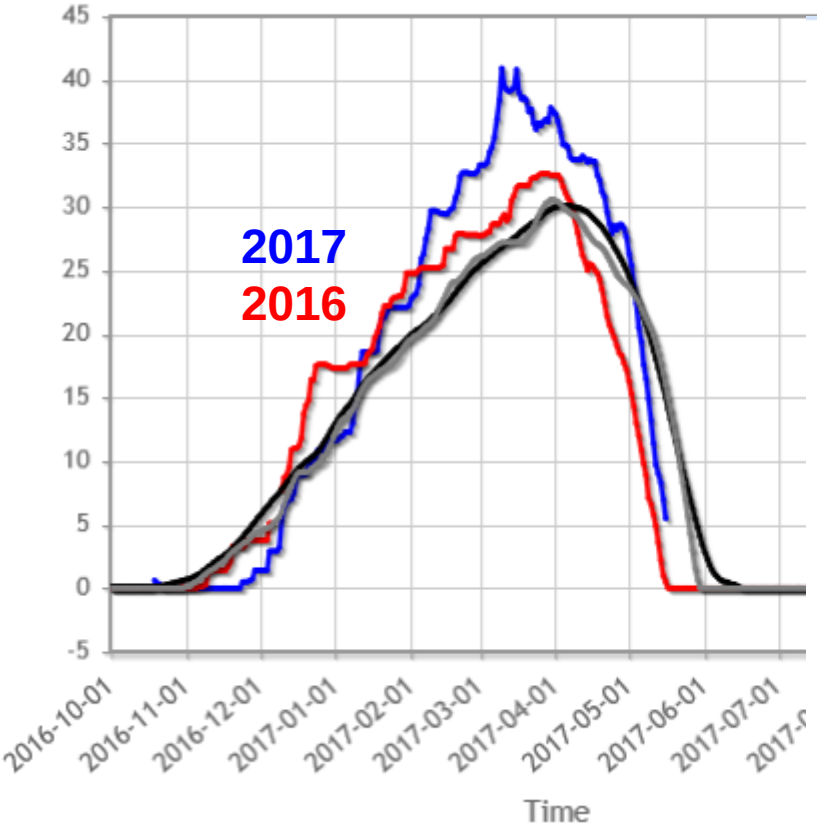
Boise Basin 2017 Precipitation with Non-Exceedence Projections (10 sites)

Based on Provisional SNOTEL data as of May 15, 2017

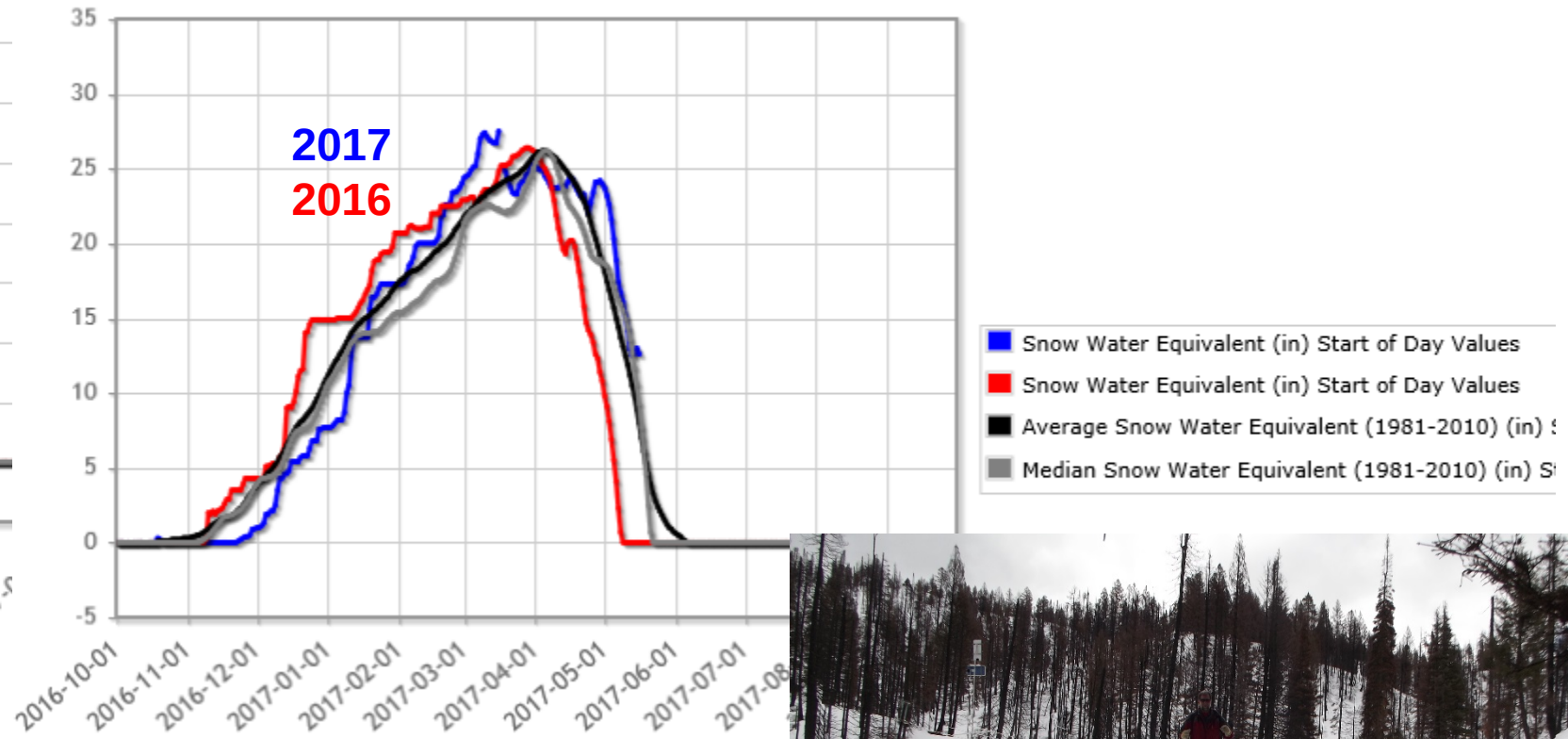



May 1 Historic and Forecasted Surface Water Supply
Boise River Basin
StreamFlow May-Sep
Reservoir 30-Apr
Boise Basin Surplus =
Est Surplus Above ~2,000
KAF for May-Sep Period
Water Supply (1000 Acre-Feet)
3000
2500
2000
1500
1000
500
0
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017 - 90%
2017 - 70%
2017 - 50%
2017 - 30%
2017 - 10%
Years
Adequate
Irrigation
Supply
Above
1,300 KAF

Mores Creek Summit (637) Idaho SNOTEL Site - 6100 ftReporting Frequency: Daily; Date Range: 2016



Bogus Basin (978) Idaho SNOTEL Site - 6340 ftReporting Frequency: Daily; Date Range: 2016-10-01 to



Mores Creek Summit April 29, 2017

NRCS Partnership with Idaho Water Resource Board

Primary Goal:

GIS watershed analysis to assist in determining data collection needs, data voids and need for mid-elevation snow measuring stations with the hope to improve streamflow forecasts.

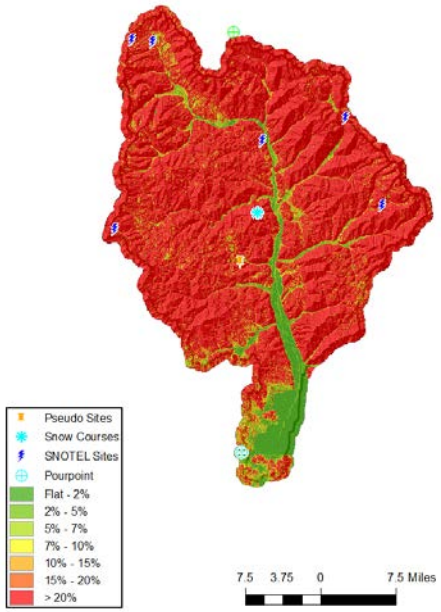
IWRB – NRCS agreement signed

Working on IASCD agreement to start the analysis.

Partnerships! We can not do this alone…

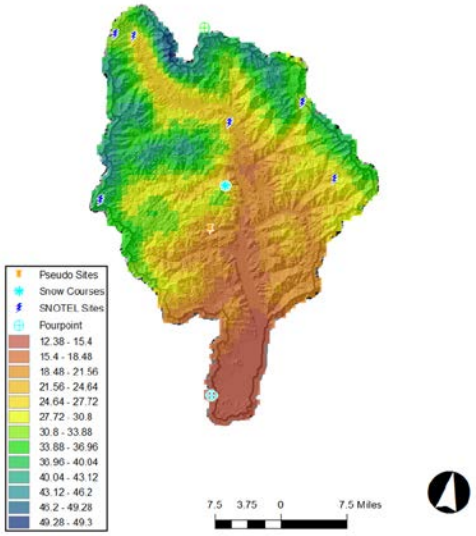
BIG WOOD BAGIS TEST #1

SLOPE



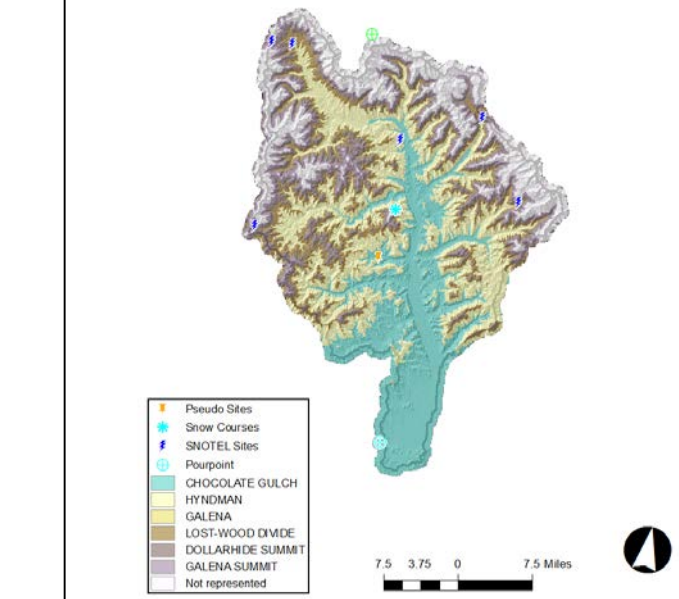
BIG WOOD BAGIS TEST #1

PRECIPITATION ZONES



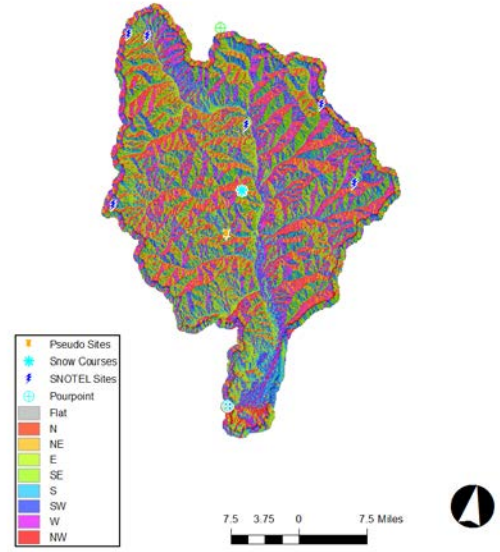
BIG WOOD BAGIS TEST #1

SNOTEL ELEVATION ZONES



BIG WOOD BAGIS TEST #1

ASPECT



Idaho NRCS
Snow Survey
Staffing Status
May 2017

Snow Survey

Staff Directory

Program Manager and Staff Supervisor

Name	Position	Phone	Email
Shawn Nield	State Soil Scientist	208-378-5728	Shawn Nield

Office Staff

Office Staff

Name	Position	Phone	Email
Ron Abramovich	Water Supply Specialist	208-378-5741	Ron Abramovich
Vacant	Hydrologist		
Phil Morrisey	Data Collection Officer	208-685-6983	
Daniel Tappa	Hydrologist	208-378-5740	Daniel Tappa

Vacant since Oct
Vacant retired Dec 31

Field Staff

Name	Position	Phone	Email
John Wilford	Electronics Technician	208-685-6943w	John Wilford
Vacant	Hydrologist	208-685-6942w	
Vacant	Hydrologic Technician	208-685-6942w	

Start Date May 30
Vacant

Huge cornices at Cooper Basin near Banner Summit, in central Idaho,

and from the Owyhee basin to the Upper Snake will keep feeding the streams into summer.

May 15, 2017

Questions / Comments / Corrections

NOAA's National Weather Service

2017 Extreme Winter in Pacific Northwest

Northwest Power and Conservation Council

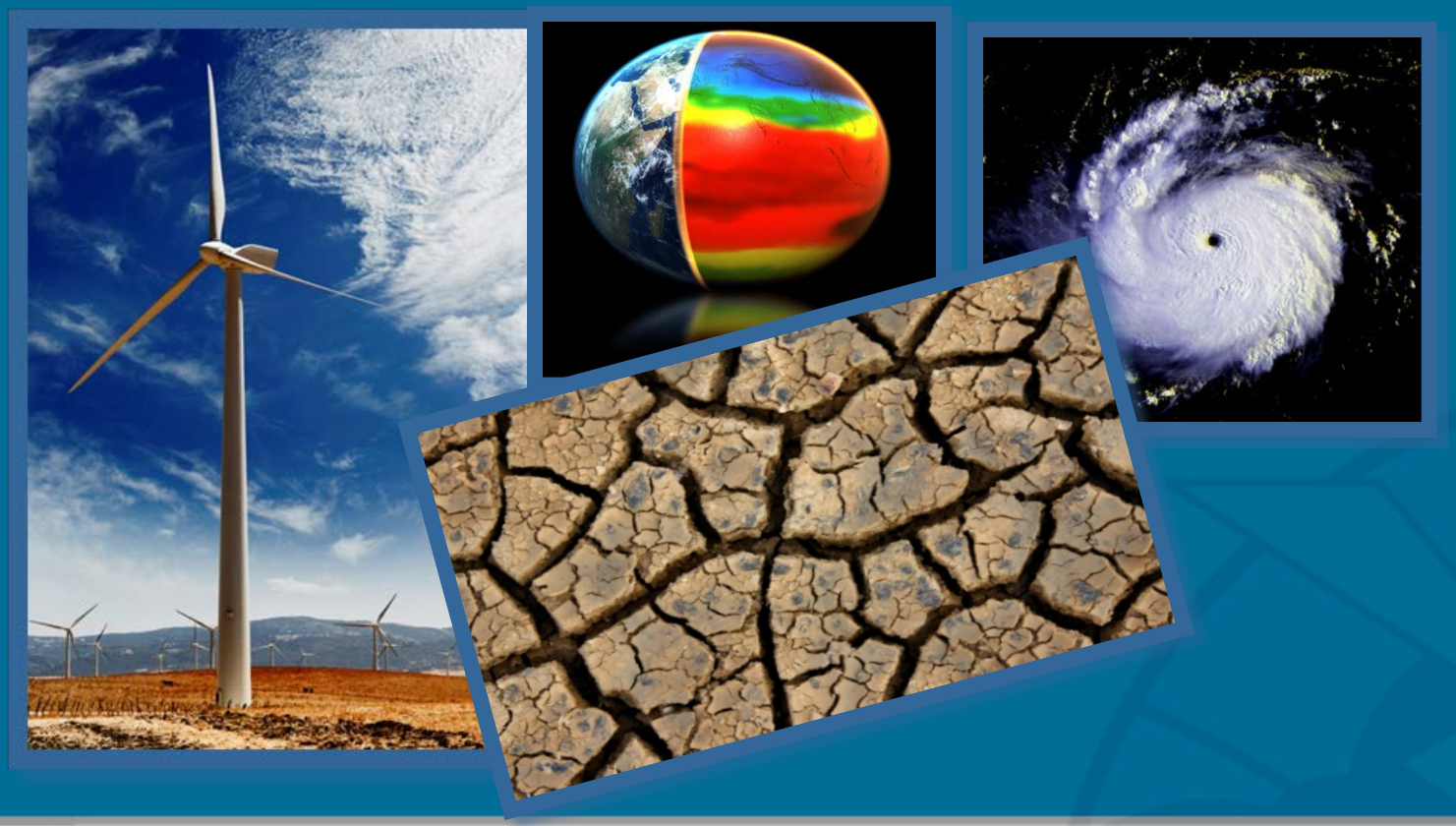
Boise, Idaho, May 17th 2017

Jay Breidenbach, Warning Coordination Meteorologist

Troy Lindquist, Sr Service Hydrologist

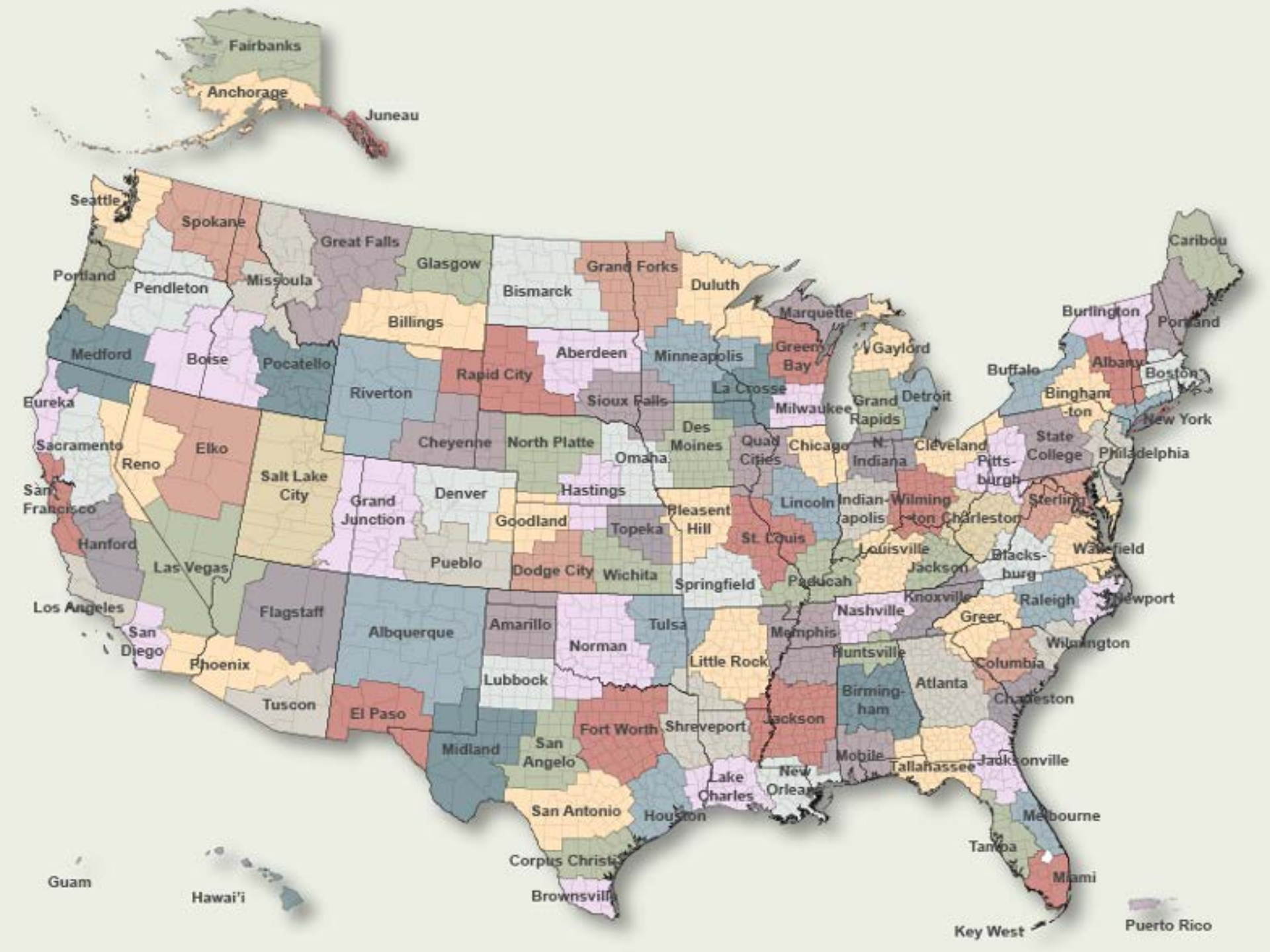
Weather Ready Nation

Vision: Society is prepared for and Responds to Weather-Dependent Events



Building a weather ready nation – NWS strategic plan

- *Improve weather water and climate decision support services for events that threaten lives and livelihoods*
- *Improve accuracy and lead times for high-impact events*
- *Better Communicate levels of confidence in our forecasts*
- *Help Improve community preparedness and response*


Fairbanks
Anchorage
Juneau
Seattle
Spokane
Great Falls
Glasgow
Grand Forks
Duluth
Caribou
Portland
Pendleton
Missoula
Bismarck
Marquette
Burlington
Portland
Billings
Medford
Boise
Pocatello
Aberdeen
Minneapolis
Green Bay
Gaylord
Buffalo
Albany
Boston
Rapid City
Riverton
La Crosse
Bingham-ton
Eureka
Sioux Falls
Milwaukee
Grand Rapids
Detroit
New York
Des Moines
State College
Sacramento
Elko
Cheyenne
North Platte
Omaha
Quad Cities
Chicago
N. Indiana
Cleveland
Pitts-burgh
Philadelphia
Reno
Salt Lake City
Grand Junction
Denver
Hastings
Lincoln
Indian-apolis
Wilming-ton
Charleston
Sterling
San Francisco
Goodland
Topeka
Pleasent Hill
St. Louis
Louisville
Jackson
Blacks-burg
Wakefield
Hanford
Las Vegas
Pueblo
Dodge City
Wichita
Springfield
Paducah
Knoxville
Raleigh
Newport
Los Angeles
Flagstaff
Albquerque
Amarillo
Tulsa
Nashville
Greer
San Diego
Norman
Memphis
Wilmington
Phoenix
Little Rock
Huntsville
Columbia
Lubbock
Atlanta
Charleston
Tuscon
El Paso
Birming-ham
Fort Worth
Shreveport
Jackson
Midland
San Angelo
Mobile
Tallahassee
Jacksonville
Lake Charles
New Orleans
Melbourne
San Antonio
Houston
Tampa
Corpus Christi
Miami
Guam
Hawai'i
Brownsville
Key West
Puerto Rico

Extreme Weather Events Pacific Northwest in 2016-2017

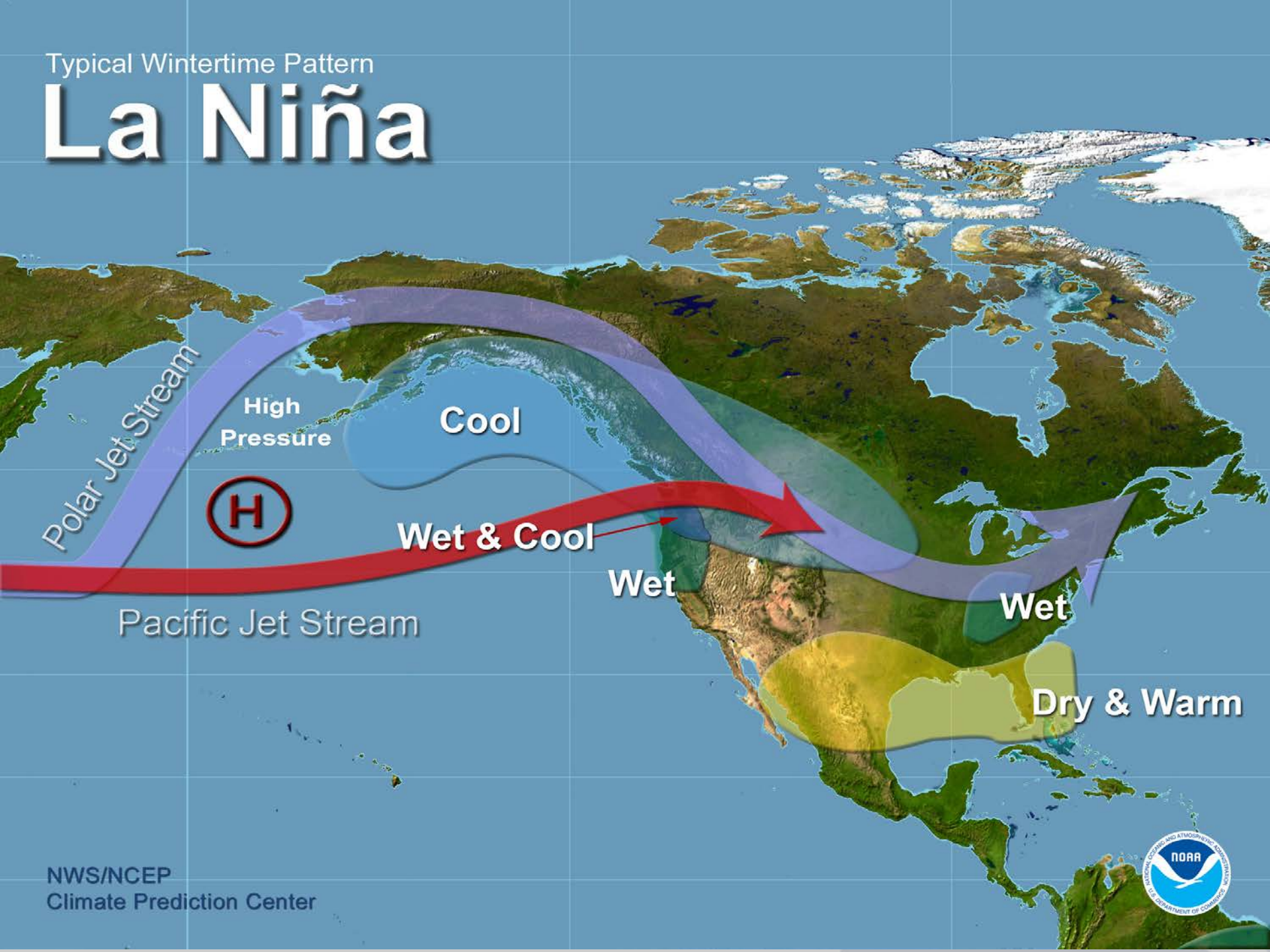
Pioneer Wild Fire (July – September 2016)

Severe Snow and Snow Load Event (December 2016- January 2017)

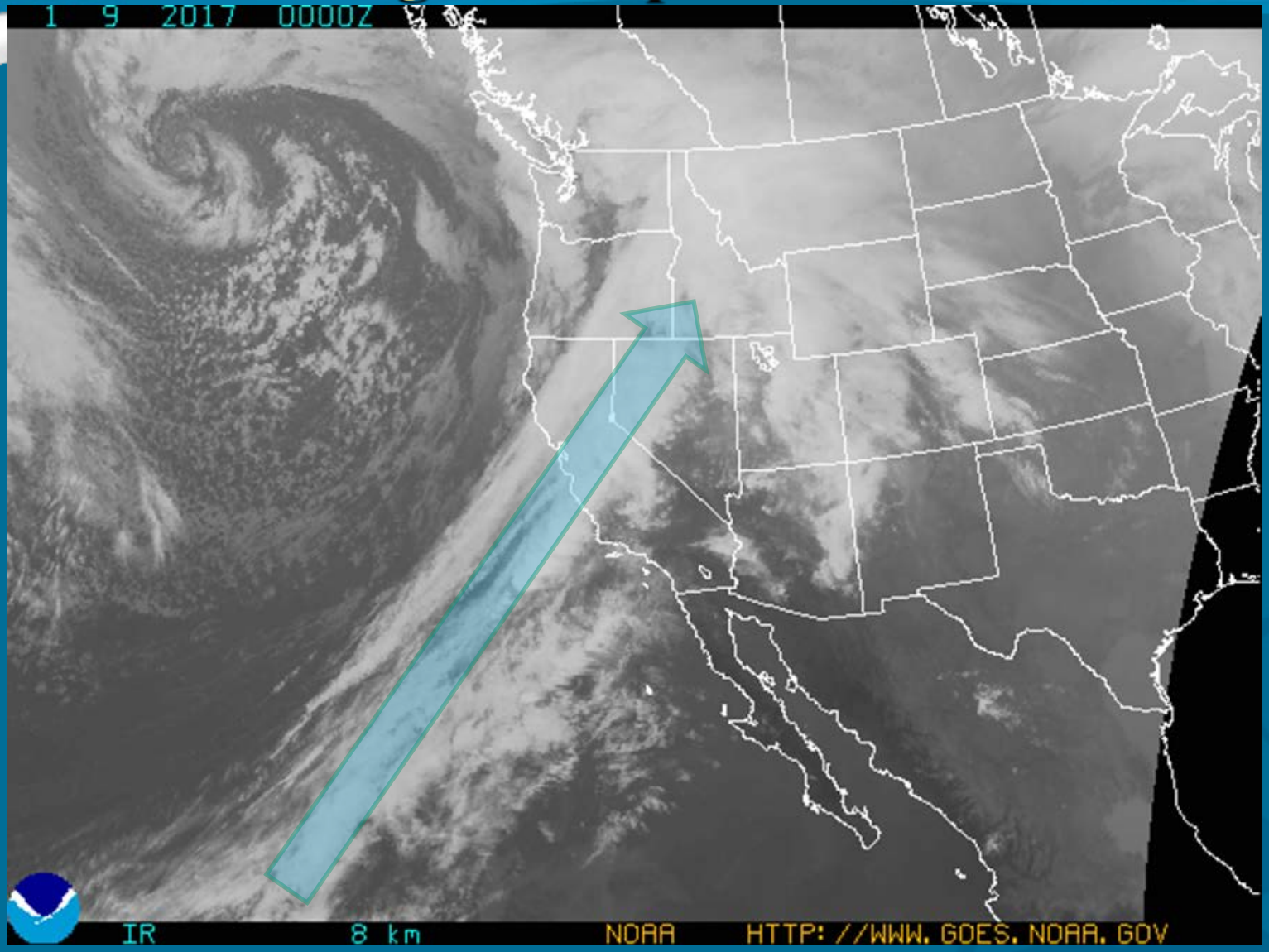
Collapsed antique store in Wieser, Idaho (Steven Penner photo via Washington Post)

The Partners Produce facility in Payette, Idaho, collapsed under the weight of snow. (Jason Brainerd/Rapid Aerial LLC via AP)

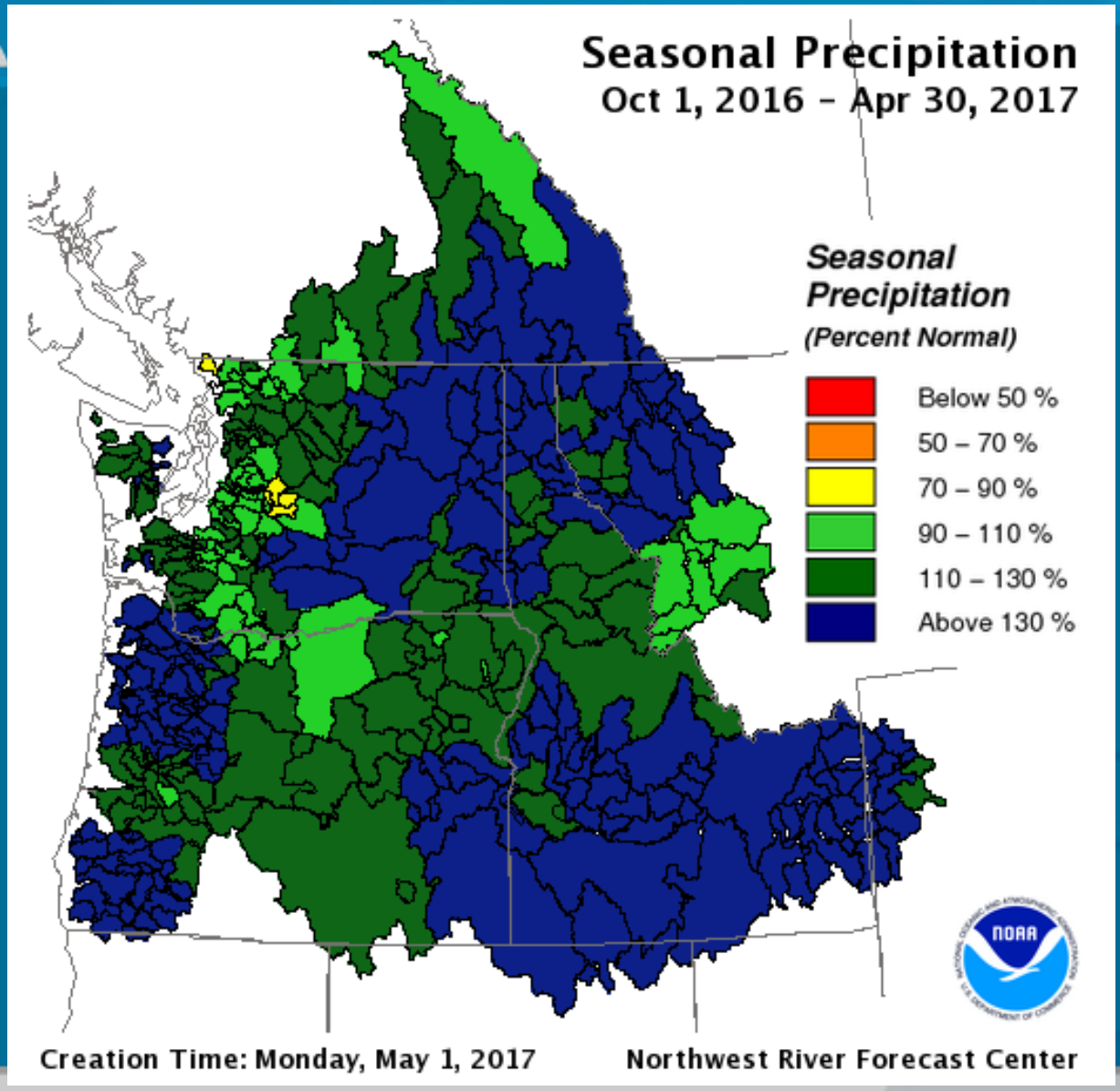
Snow Load Problems


Typical Wintertime Pattern
La Niña
Polar Jet Stream
High Pressure
H
Cool
Wet & Cool
Wet
Pacific Jet Stream
Wet
Dry & Warm
NWS/NCEP
Climate Prediction Center

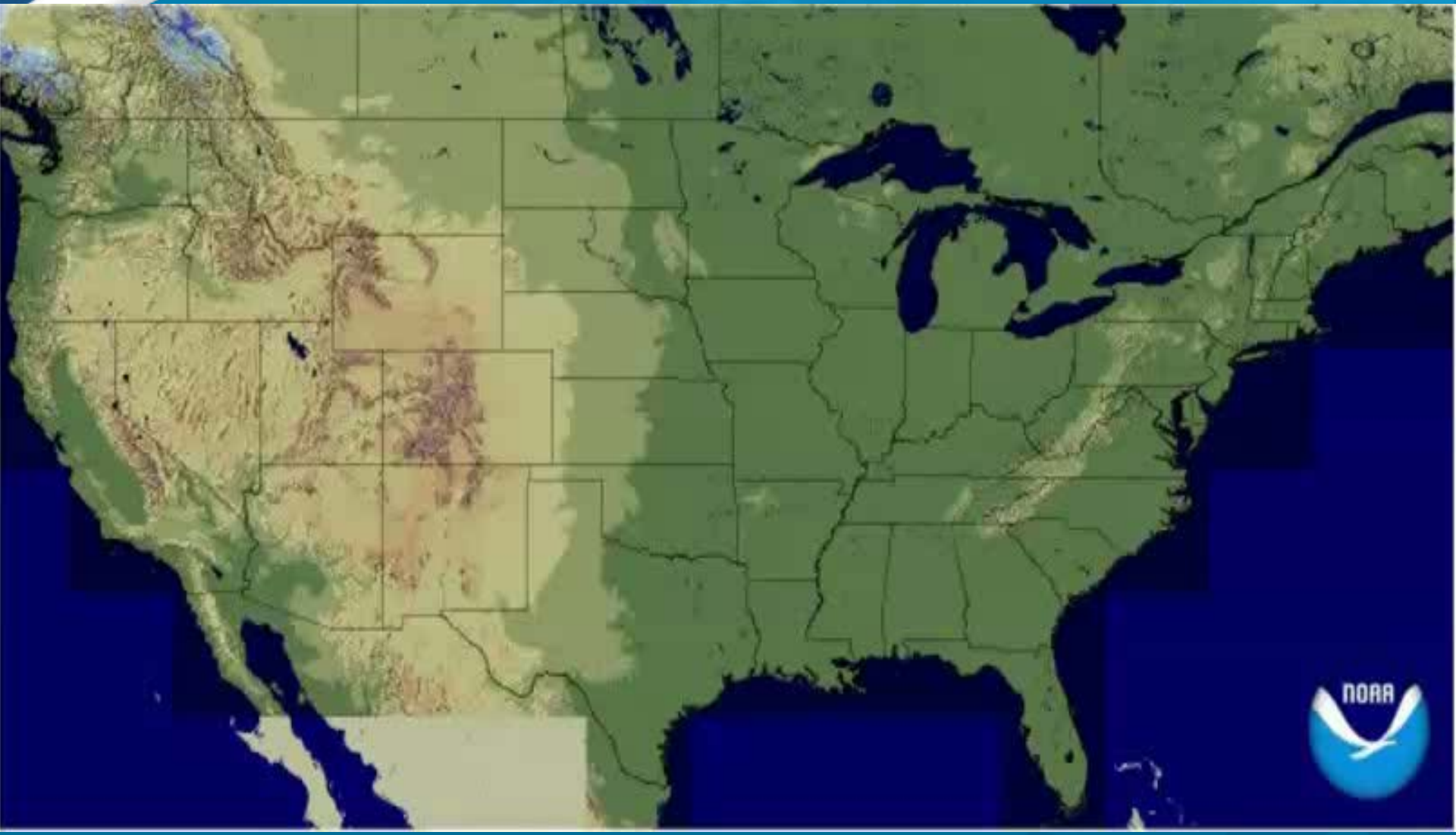
NOAA Infrared Satellite Imagery Showing Atmospheric River



Columbia Basin Precipitation

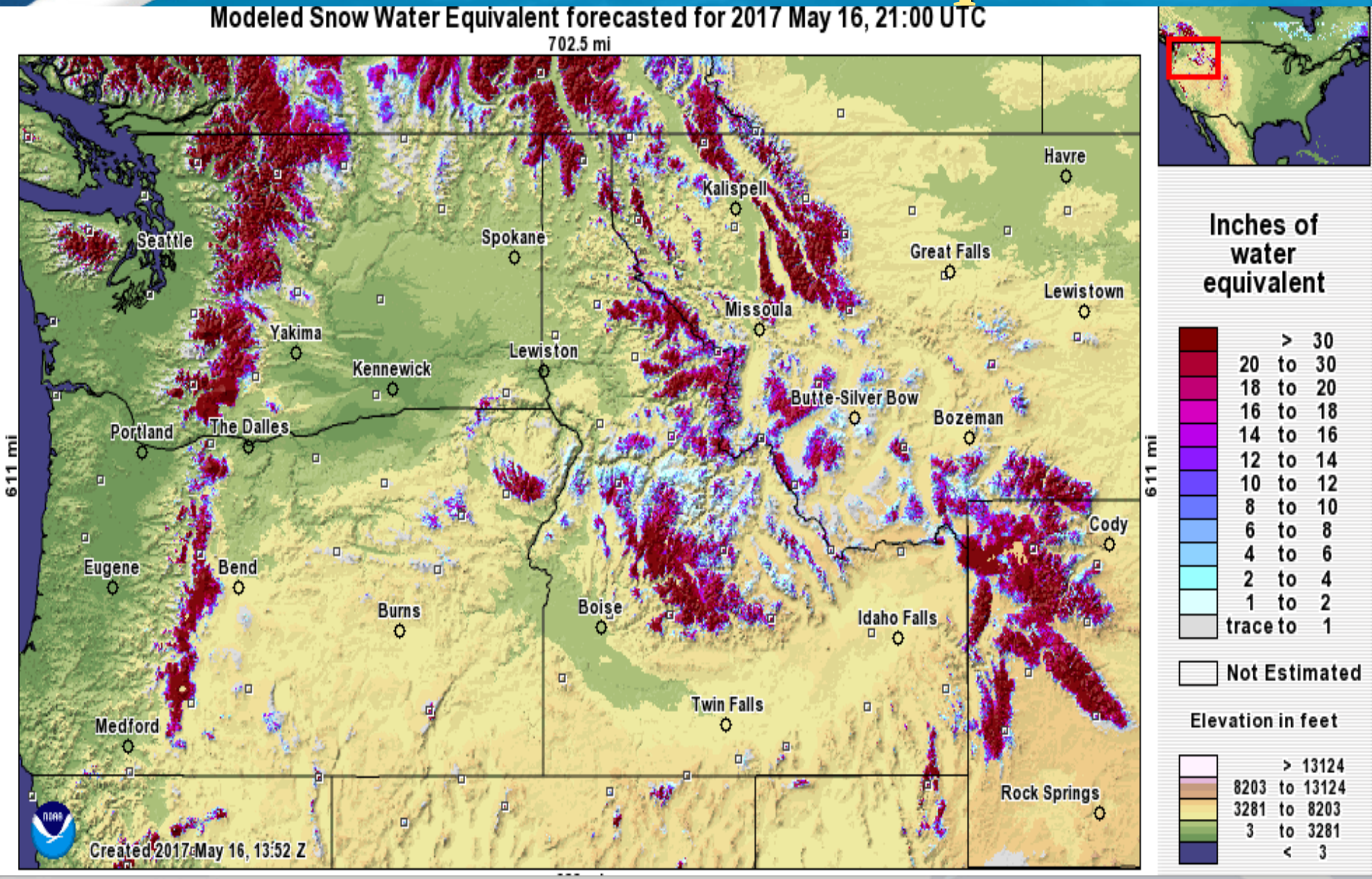


Snow Accumulation and Melt

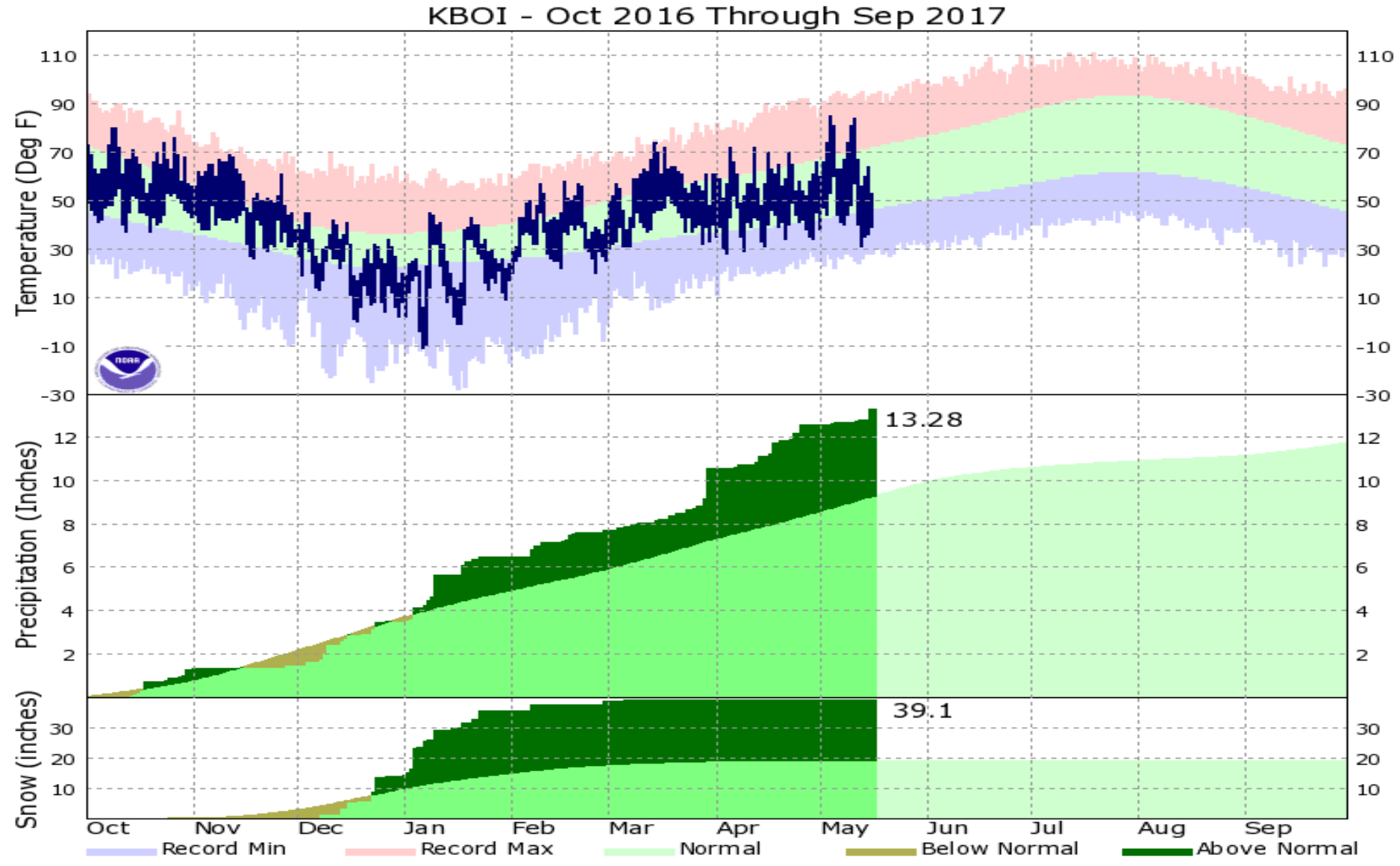


https://www.nohrsc.noaa.gov/nsa/js_animate.html?nsteps=227&year=2017&month=5&day=16&type=nsm_swe&region=National&ts=24&large=1

Current Snow Water Equivalent

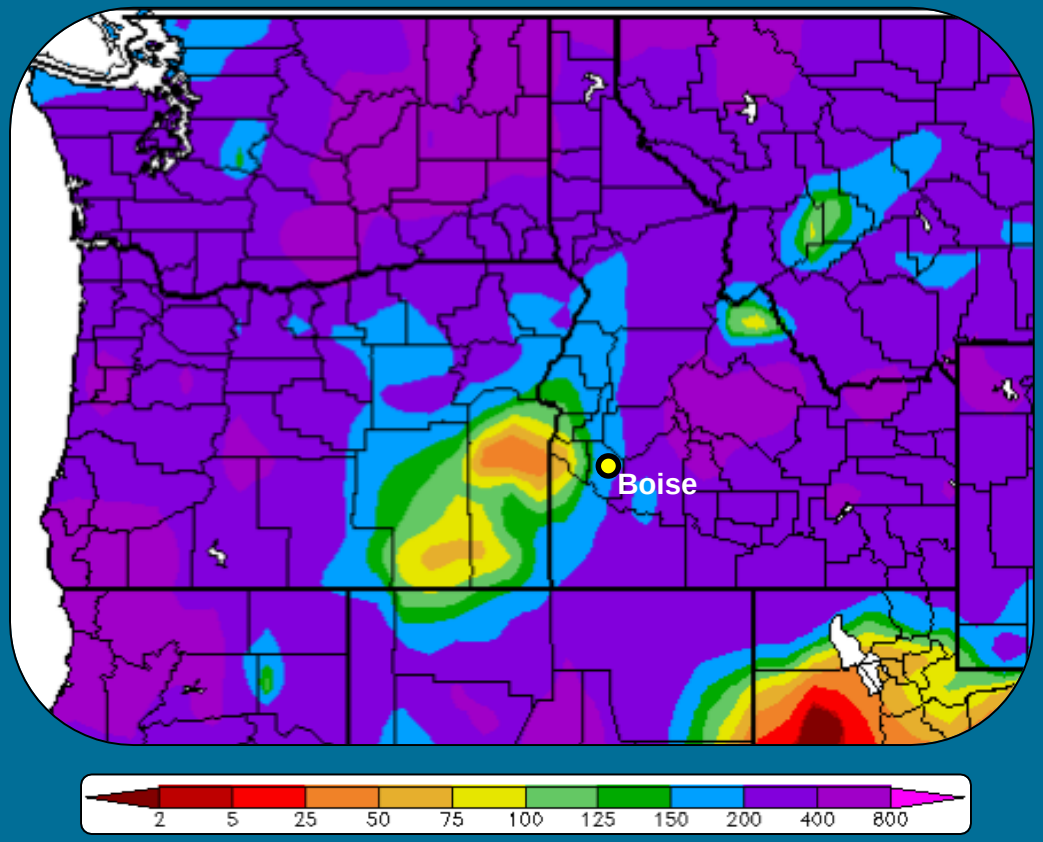


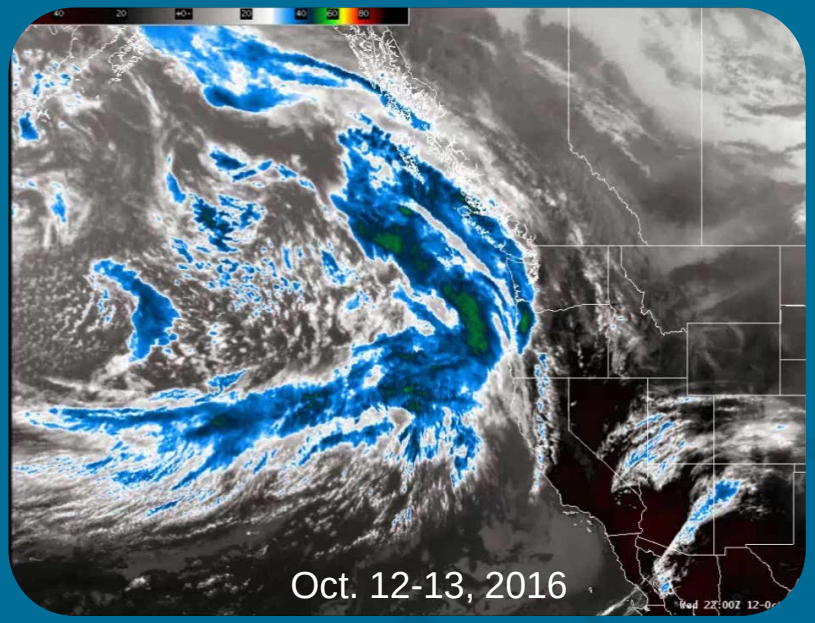
Water Year Temperature and Precipitation at Boise



Precipitation - Percent of Normal

October, 2016

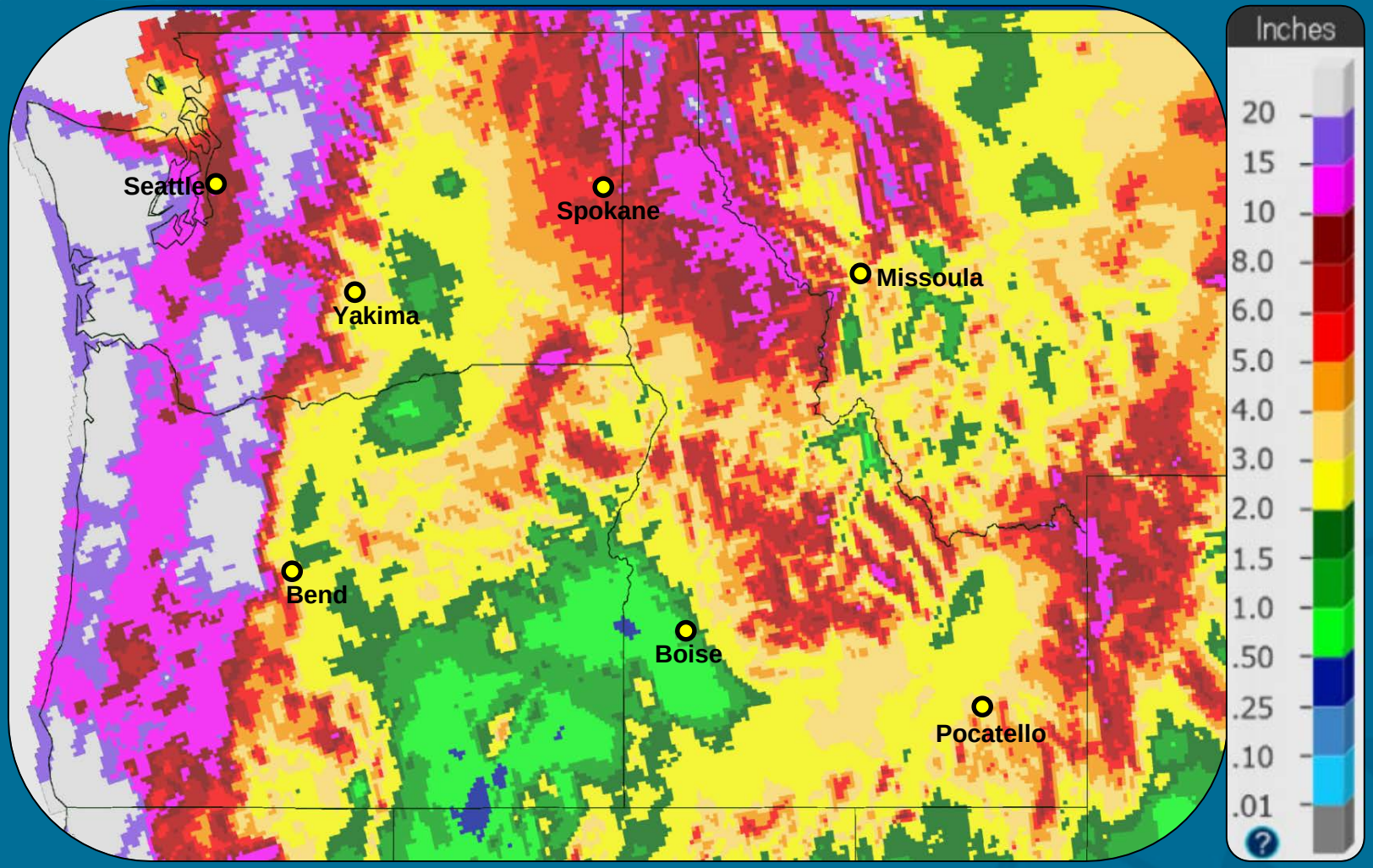




NWS BOISE

Precipitation - Observed

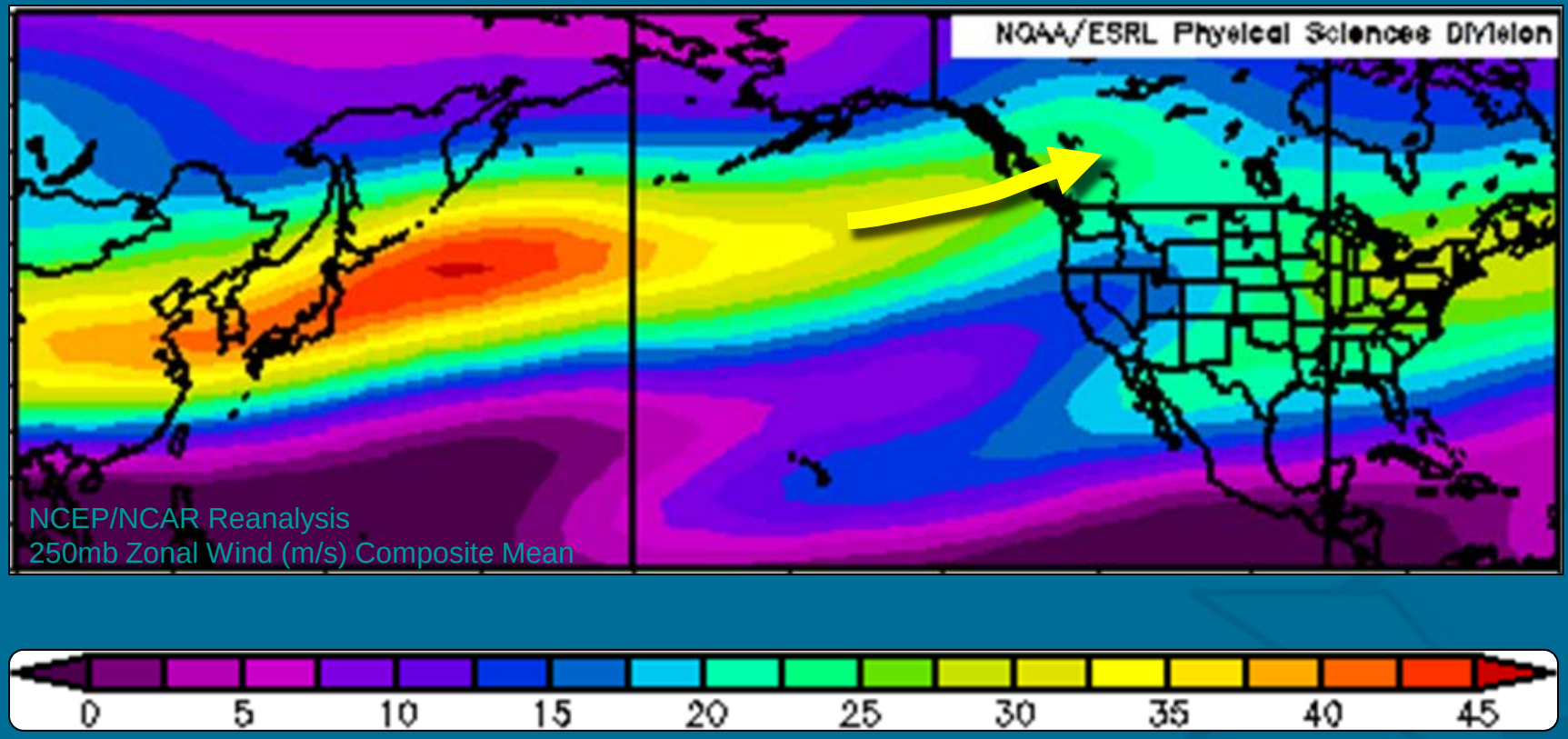
October, 2016



NWS BOISE

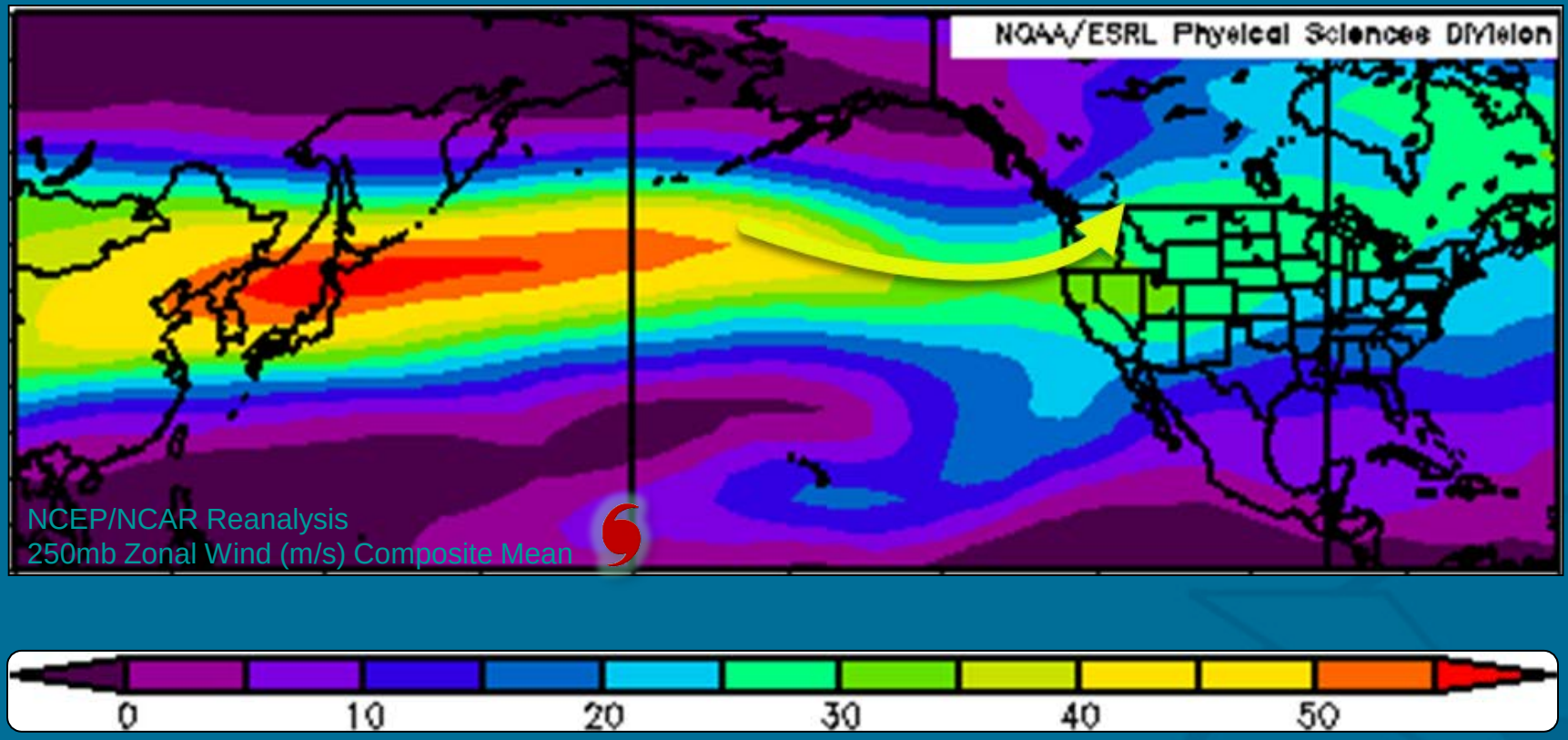
Typical October Jetstream

1981 - 2010

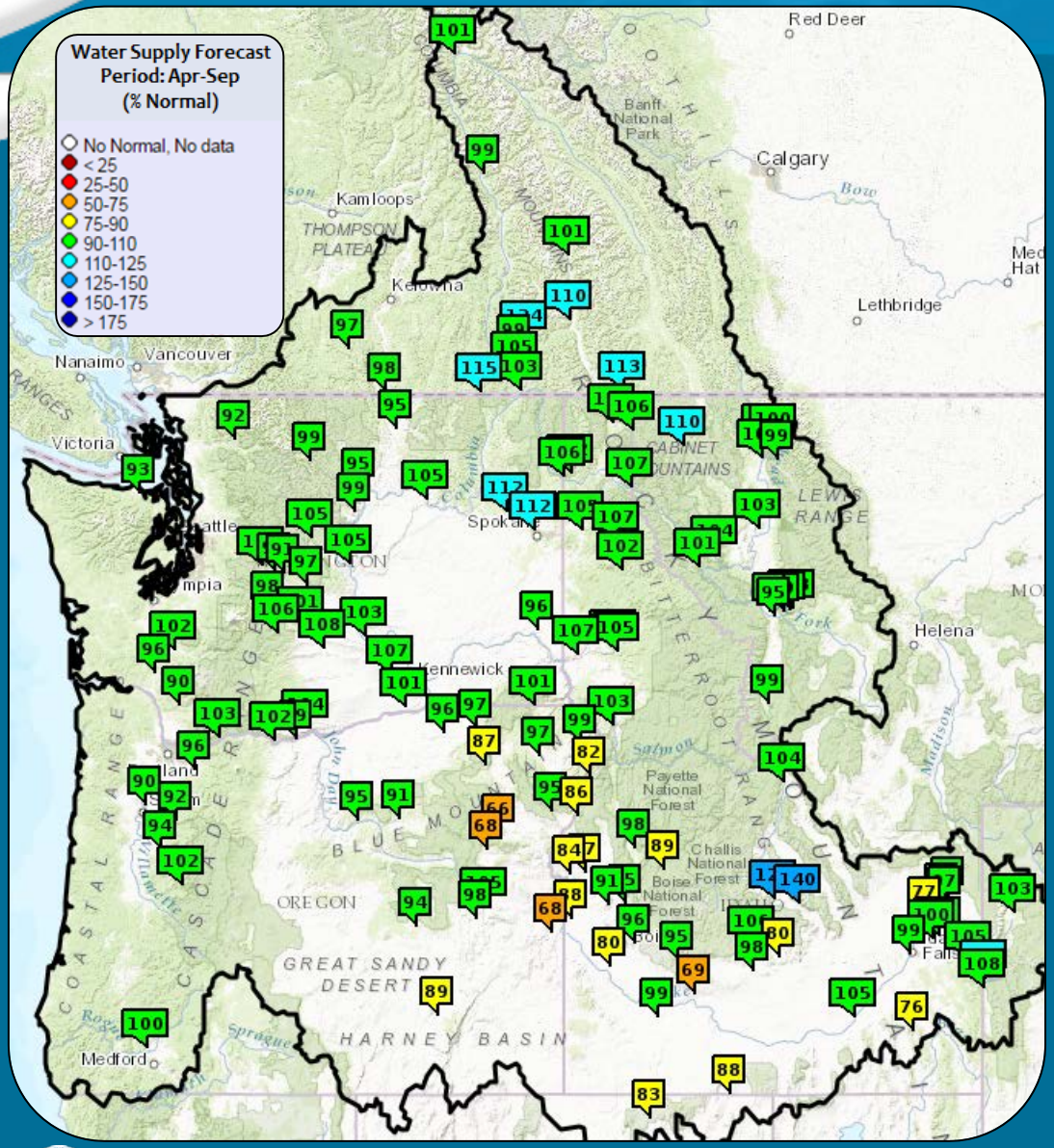


October Jetstream

2016



Water Supply Forecasts



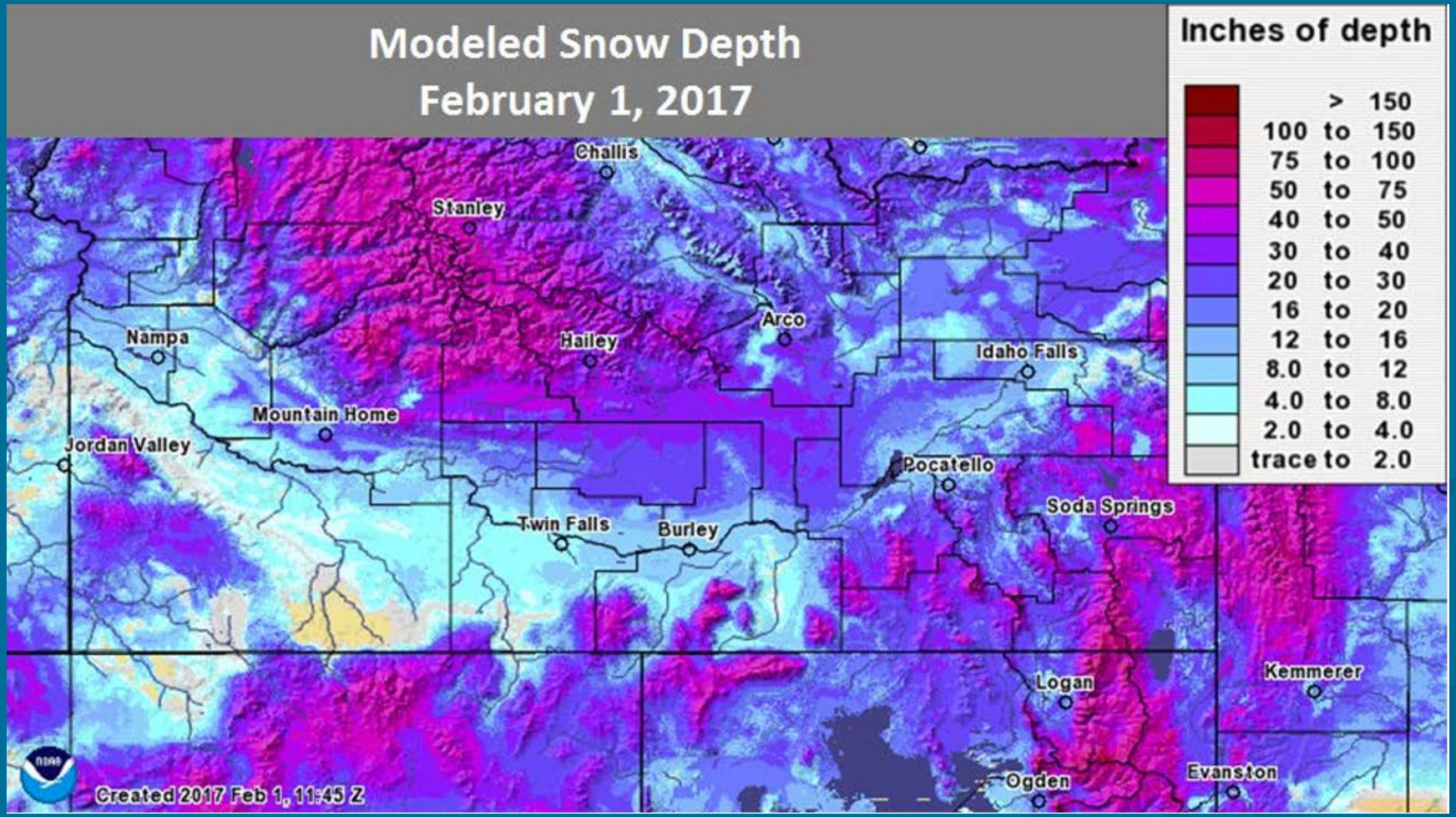
Columbia Basin

Apr - Sep 2017
Forecast Volumes

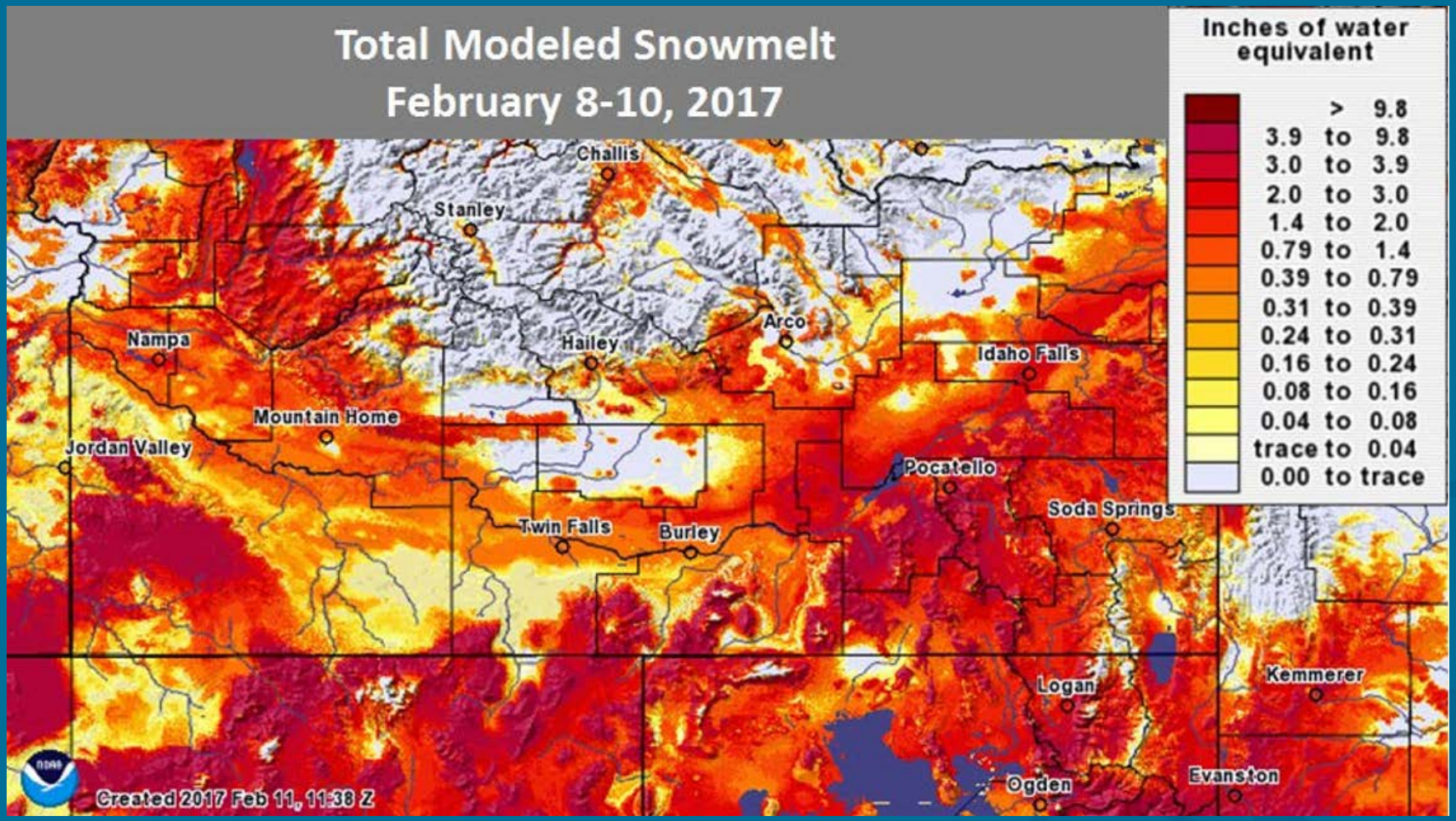
Issued: Nov. 9, 2016

NWS BOISE

Mid Winter Flooding



Mid Winter Flooding



Mid Winter Flooding

Raft River Flooding I-86 - February 2017

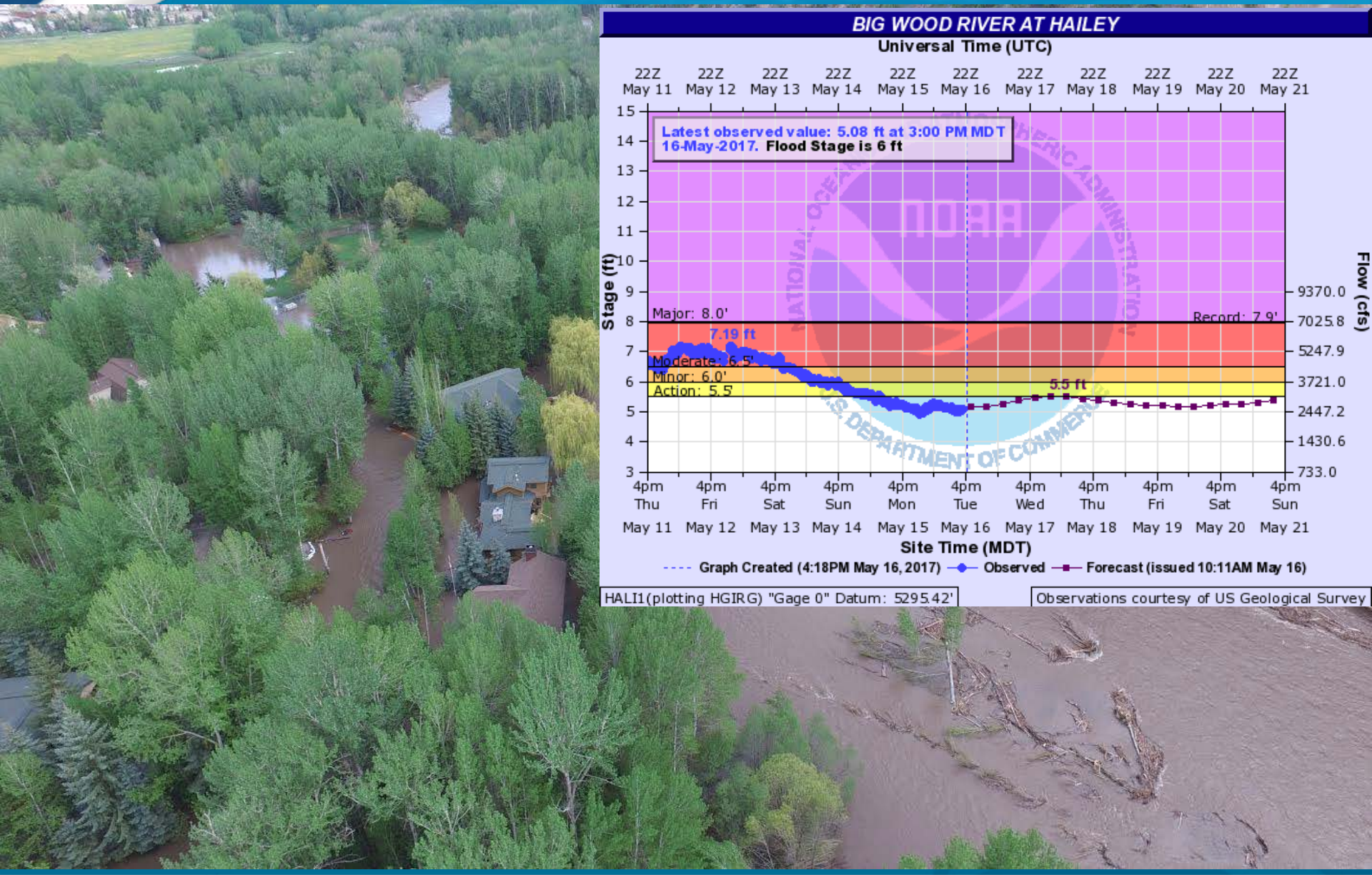
Mid Winter Flooding

Raft River Flooding - February 2017

Spring Flooding 2017

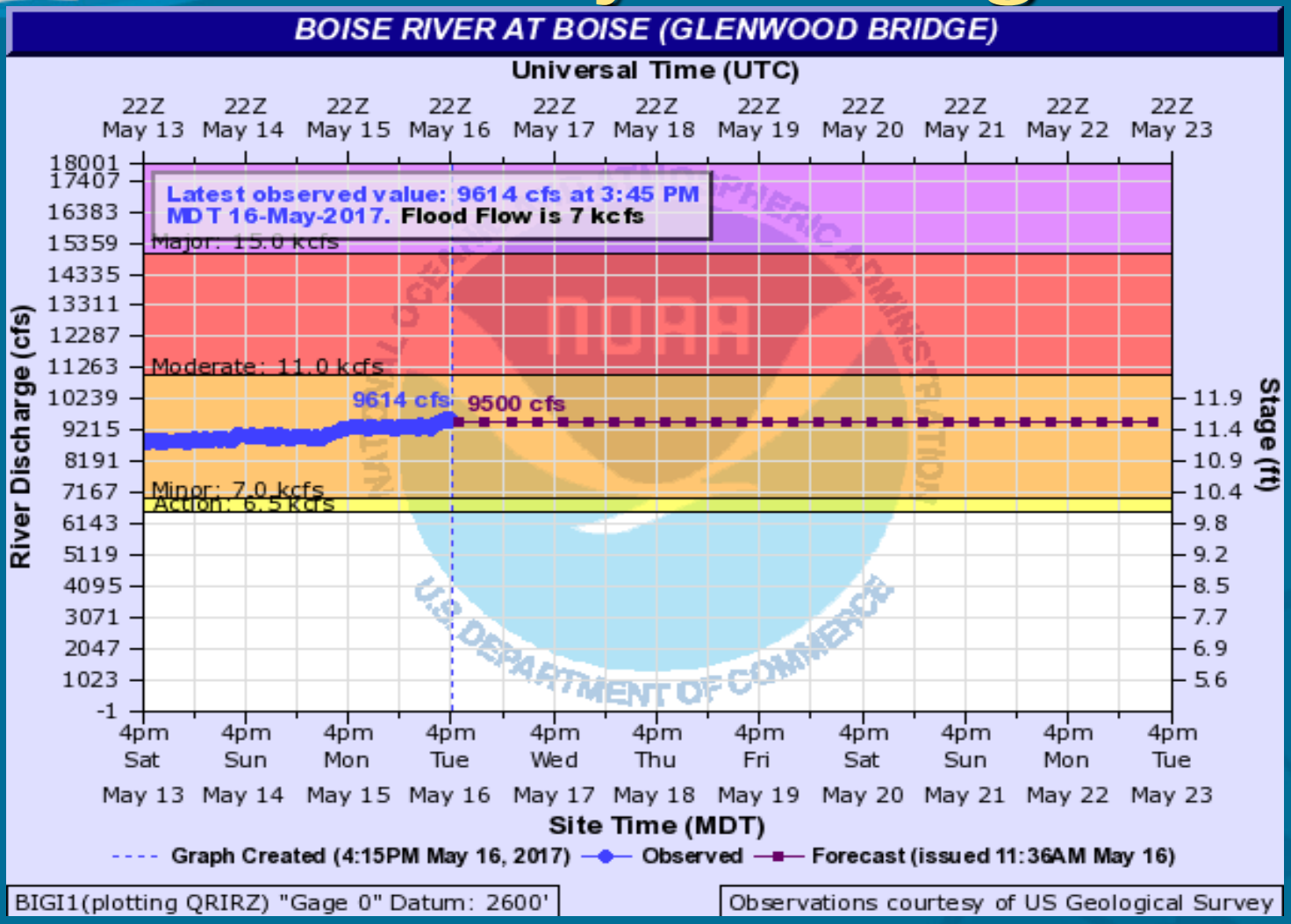
Big Wood River Near Hailey, ID May 2017

Spring Flooding 2017



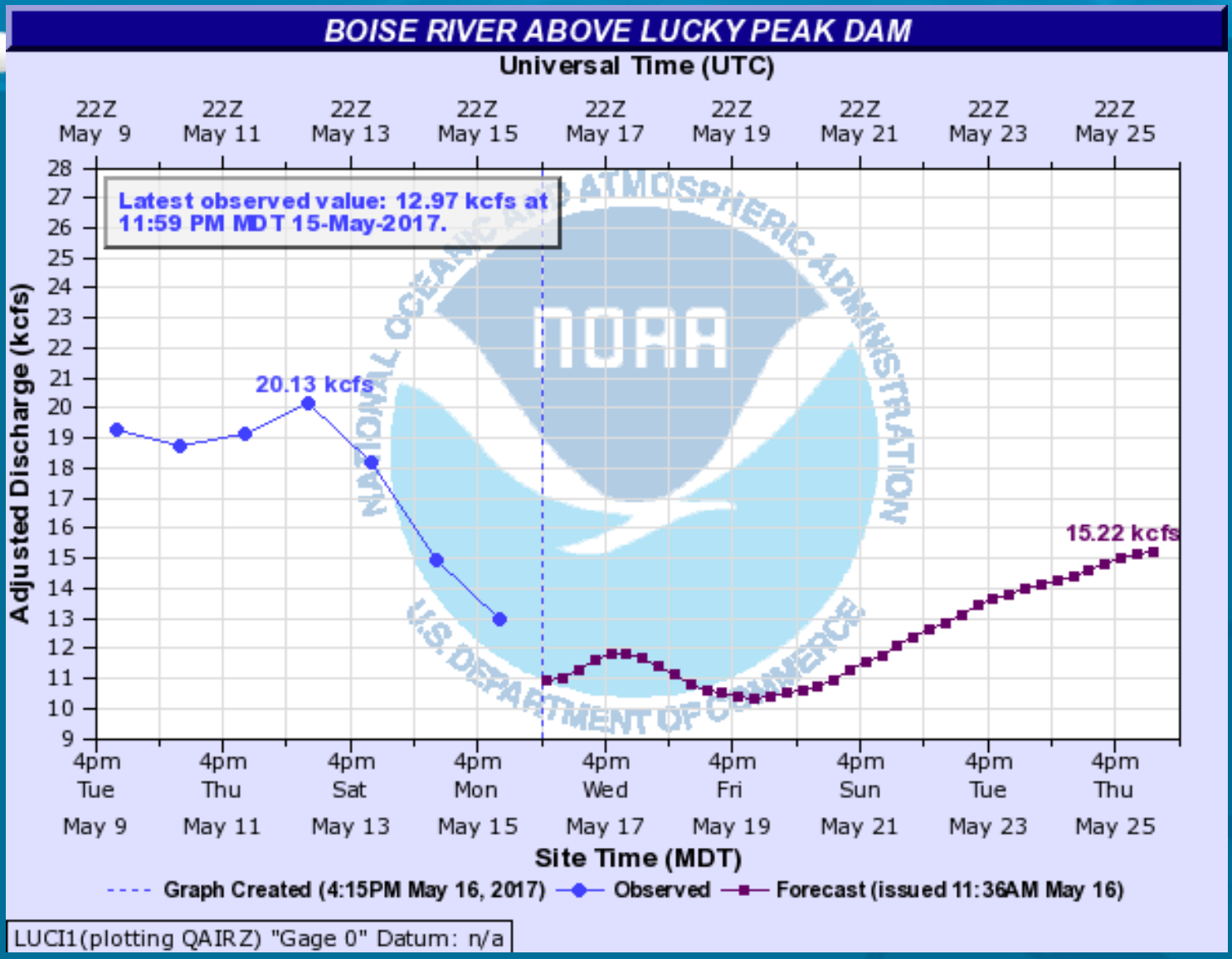
Big Wood River Near Hailey, ID May 2017

Boise River through Boise, Garden City and Eagle



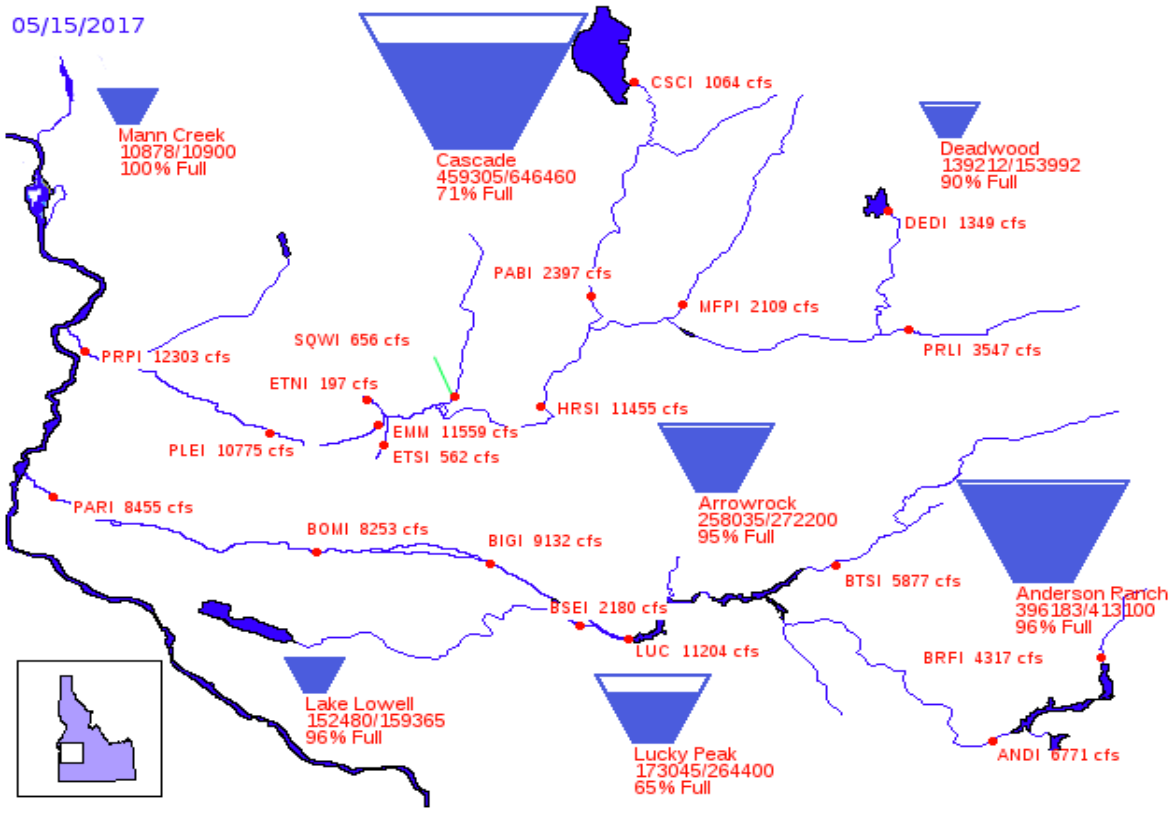
http://water.weather.gov/ahps2/inundation/index.php?gage=bigi1

Reservoir Inflow (Natural)



Water Volume Forecasts for Reservoir Management

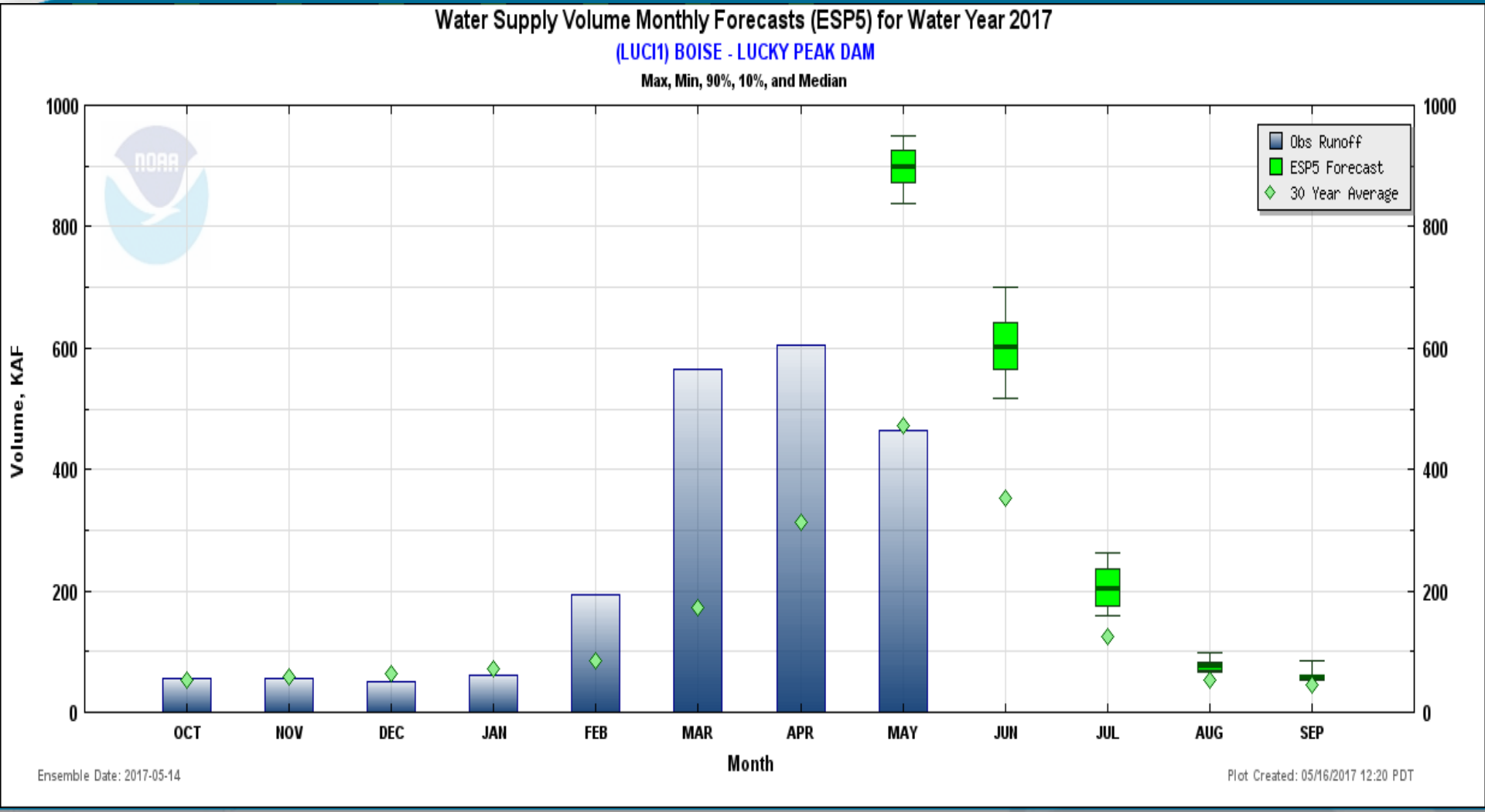
Bureau of Reclamation, Pacific Northwest Region
Major Storage Reservoirs in the Boise & Payette River Basins



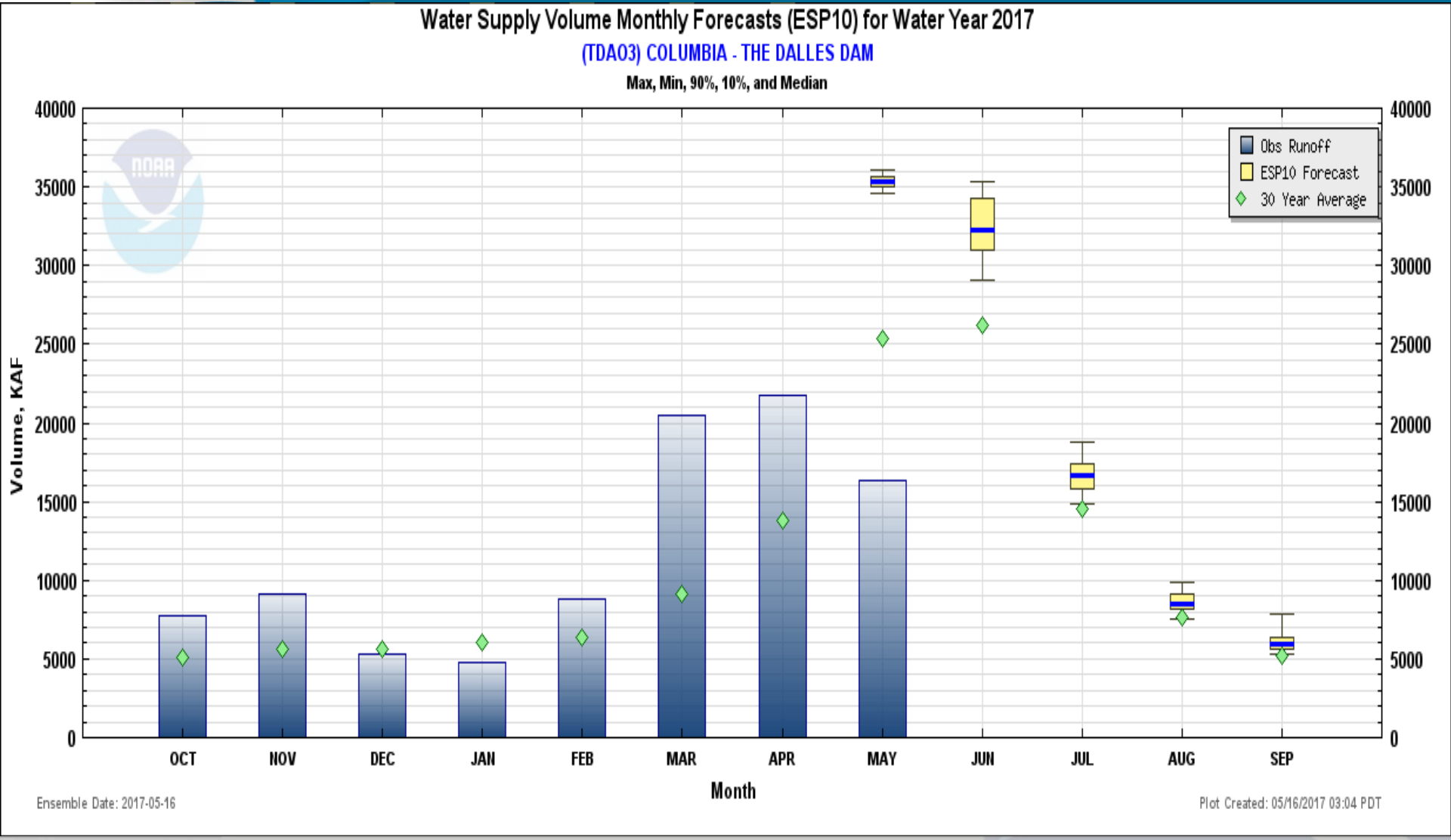
Total space available:	122437 AF
Total storage capacity:	949700 AF
Natural Flow:	12965 CFS

PROVISIONAL DATA - Subject to change

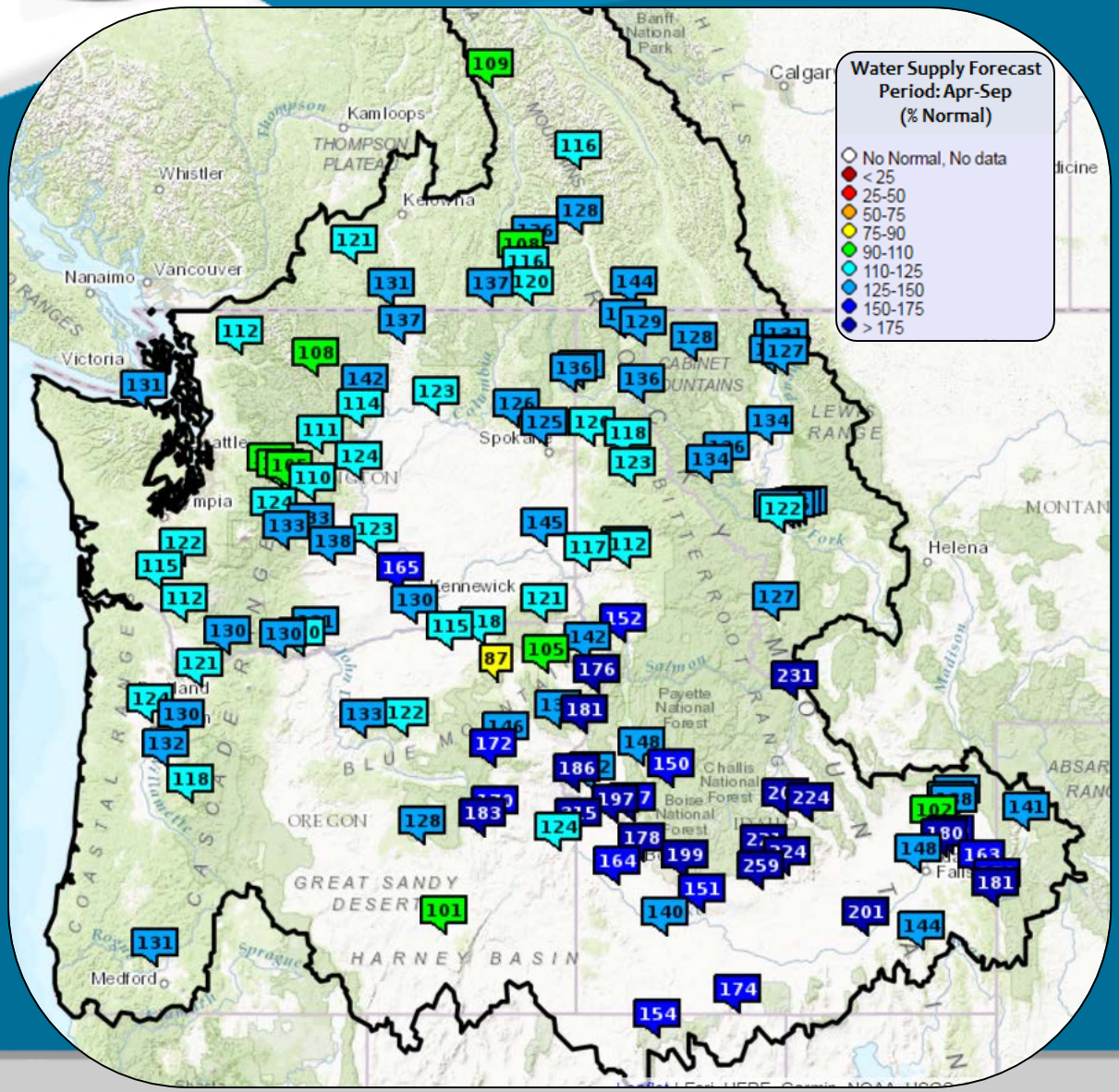
Water Volume Forecasts for Reservoir Management



Columbia River Volume Forecasts for the Dalles



Water Volume Forecasts



Columbia Basin

Apr – Sep 2017
Forecast Volumes

Issued: May 16, 2017