Water Outlook for 2018 & More…

Recap of 2017 winter & runoff season and amount needed in 2018 for adequate irrigation supplies

May 19, 2017 Teton Valley

Treasure Valley Irrigation Conference
(Idaho & Oregon)

Thursday, December 14, 2017

USDA

Ron Abramovich
Water Supply Specialist
United States Department of Agriculture

Natural Resources Conservation Service

We'll summarize the *'memorable'* winter of 2017 and runoff that set the stage for the 2018 water supply season along with the following to help you decide if we will have a winter and runoff season like last year:

- 2015/2016 strong El Nino set the stage for the winter of 2016/2017
- Record high fall precipitation primed soils followed by cold valley temperatures
- Atmospheric rivers, February precipitation and rain on snow runoff event
- 2017 snow and streamflow summary
- Reservoir projections for 2018 to determine the amount of runoff needed for adequate irrigation supplies
- Don't believe the first weather forecast you hear, but when they are all favoring similar scenarios…
- Idaho water users are in good shape for 2018 with minimum streamflow volumes needed to provide adequate irrigation supplies in 2018

This talk will be posted on the Idaho Snow Survey web page in the 2018 water year talks directory :
http://www.id.nrcs.usda.gov/snow/

- Water Supply Presentations by Year

In the 2018 directory:
https://www.wcc.nrcs.usda.gov/ftpref/states/id/webftp/talks/

Idaho Snow Survey Program

USDA **Natural Resources Conservation Service**
Idaho
United States Department of Agriculture

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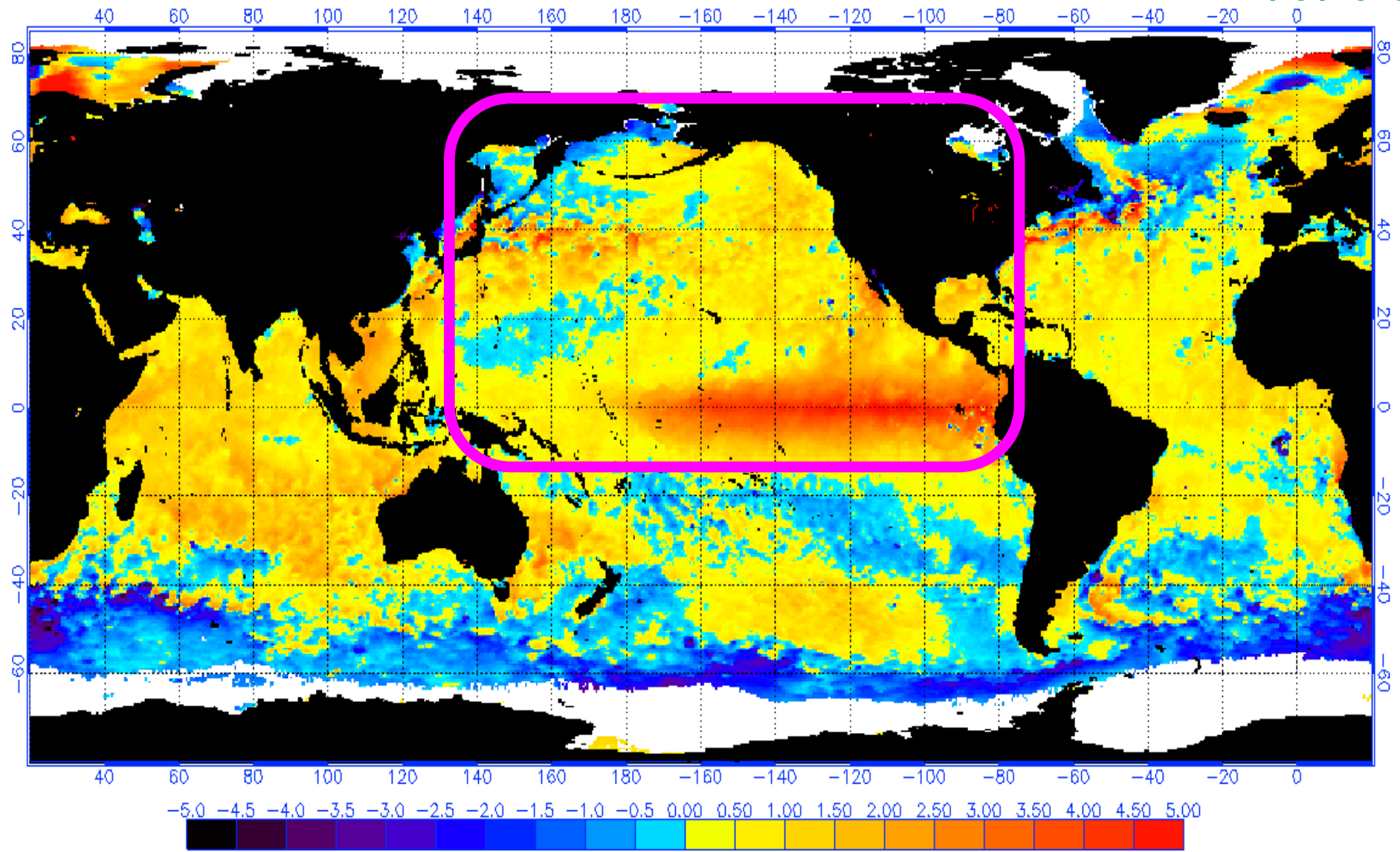
Weather patterns – winter 2015/2016 – strongest El Nino signal in years
– warmer waters in north Pacific fading away

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 12/3/2015
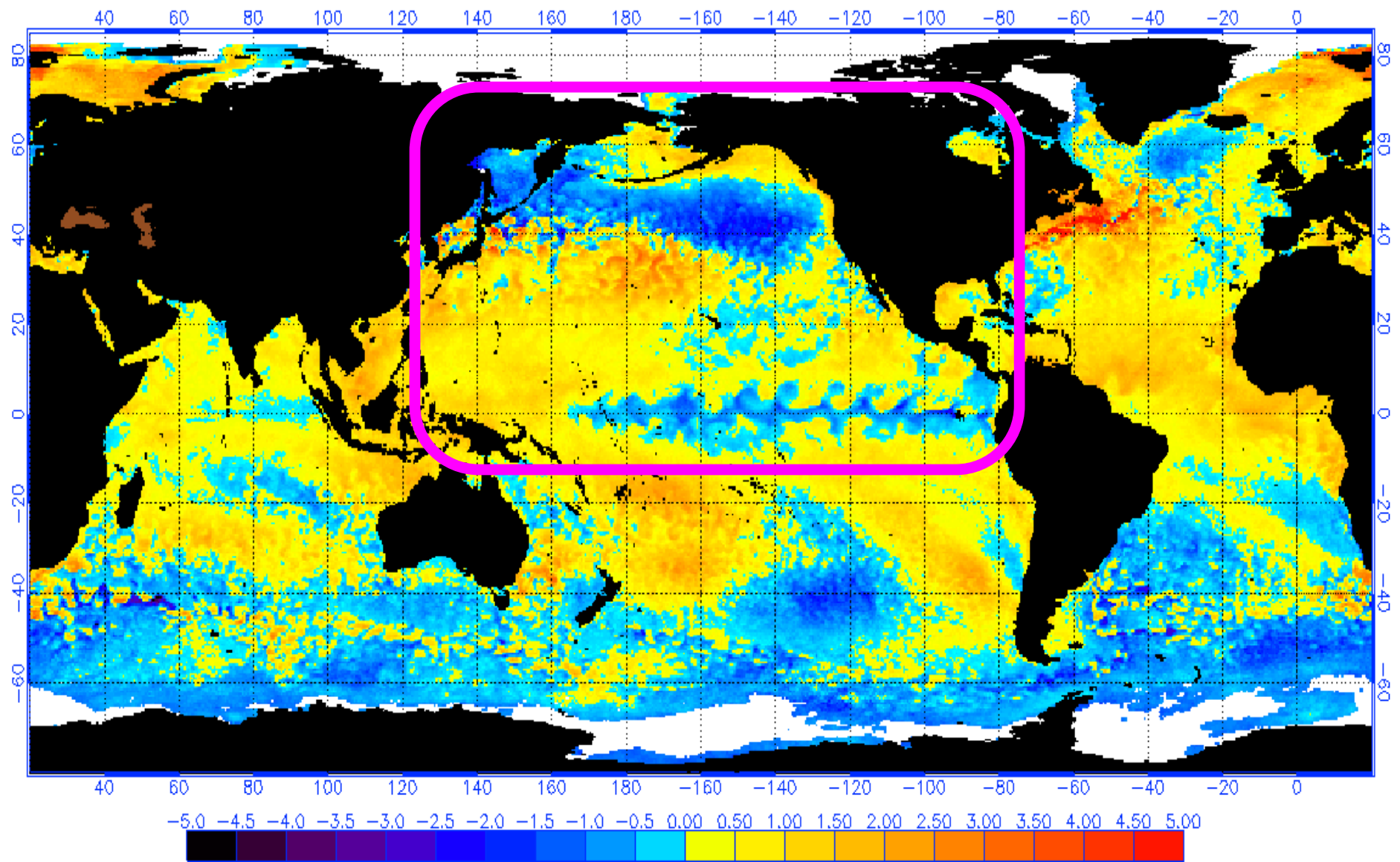(white regions indicate sea-ice)

12/ 3 /2015

Weather patterns – winter 2016/2017 – slight La Nina ENSO signal
– cooler waters in north Pacific

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 12/5/2016
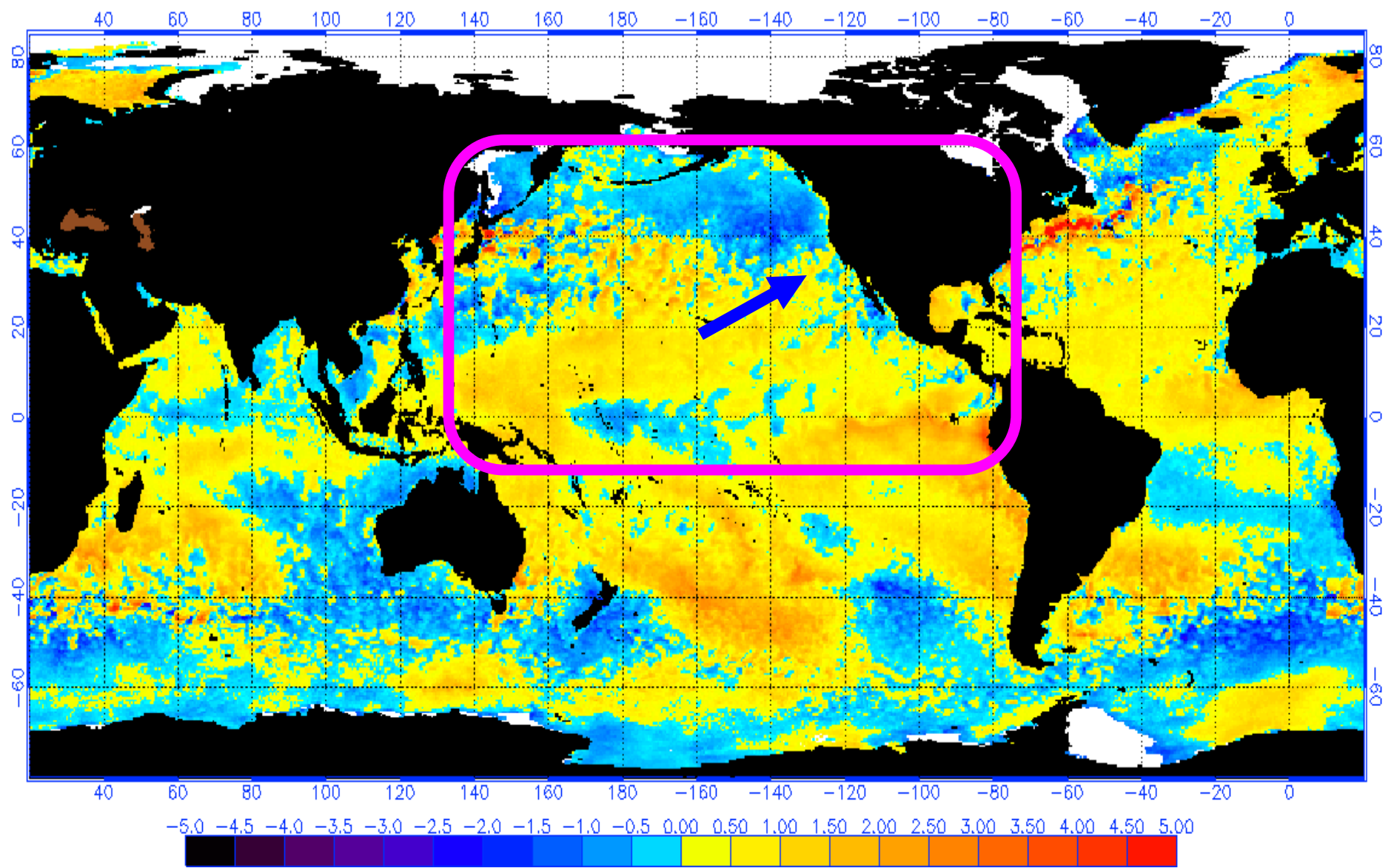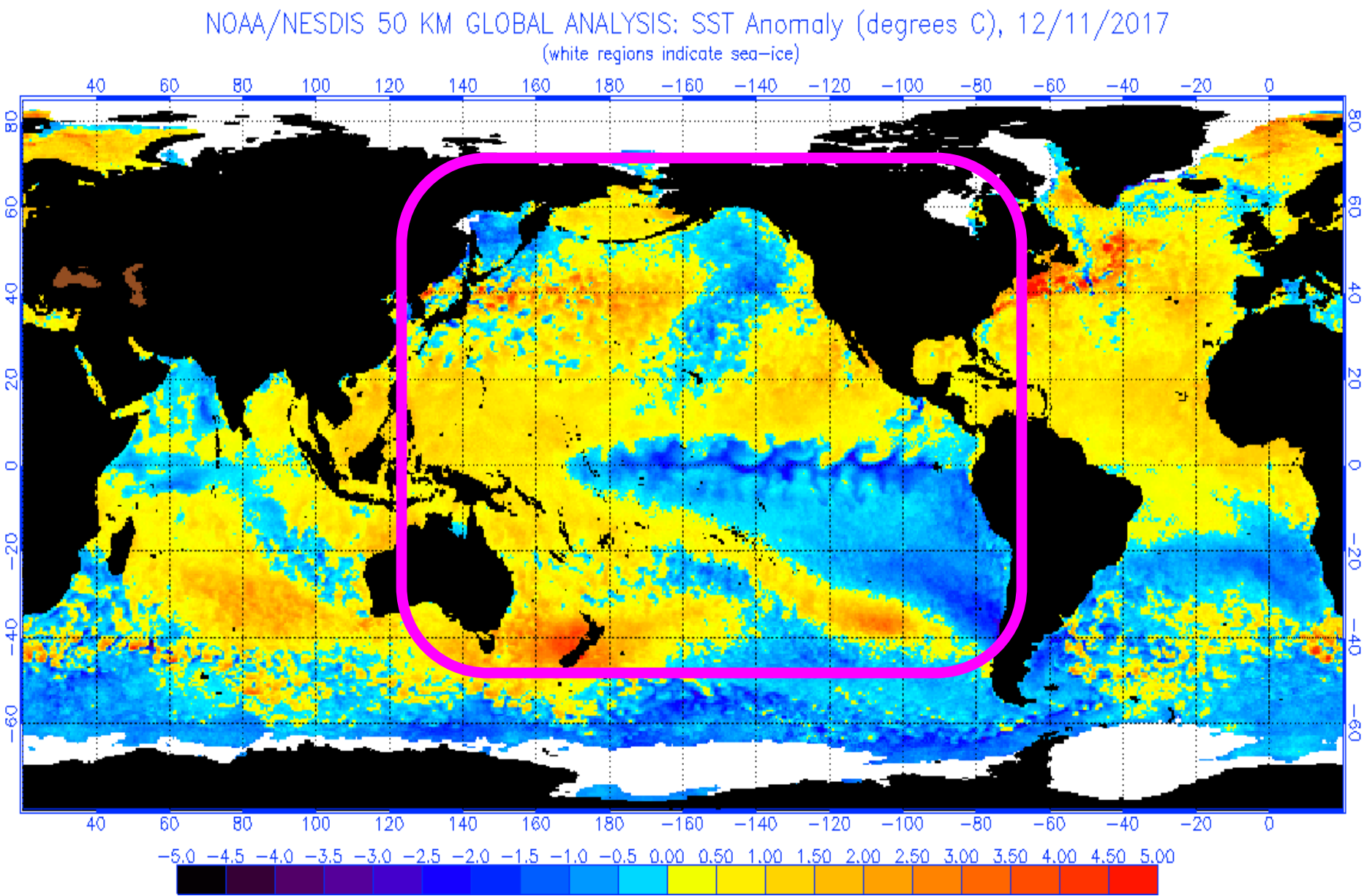(white regions indicate sea–ice)

12/ 5 /2016

Weather patterns – winter storm track for 2016/2017

2/ 20 /2017

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 2/20/2017
(white regions indicate sea-ice)

Current ocean temperatures for 2017/2018 winter
Pete Parsons OR water years   1967/68,   1981/82,   1996/97

12/ 11/2017

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 12/11/2017
(white regions indicate sea-ice)

Weather patterns - 45 Atmospheric Rivers made landfall on West Coast
The atmospheric river activity was unprecedented in the 70-year record

Take Home Point – Oceans & Atmosphere are very active following Strong El Nino Years and have a lot of energy to get rid of… and that's what happened
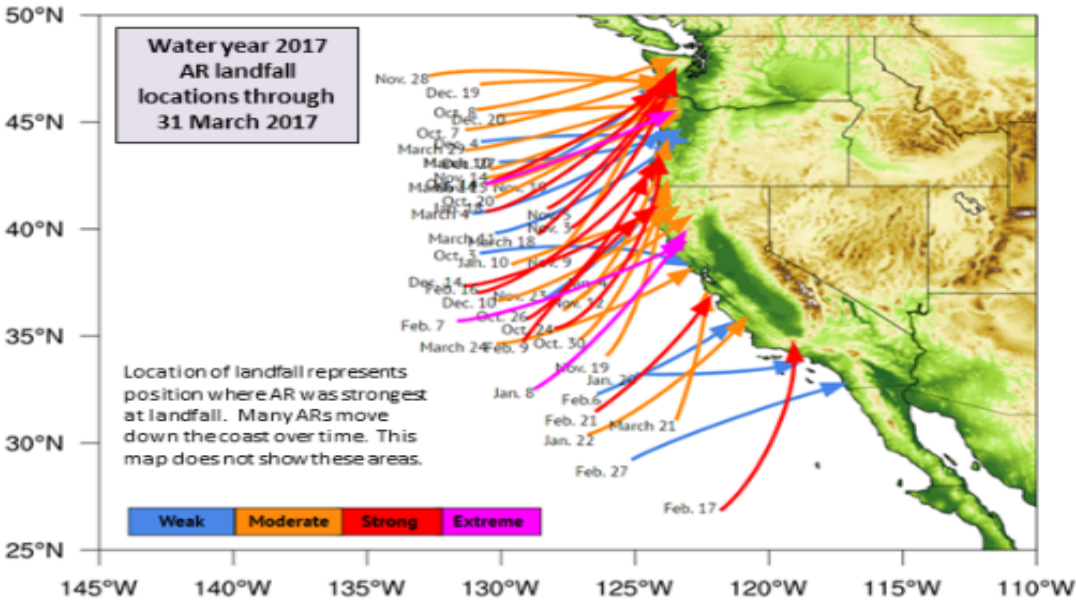

Distribution of Landfalling Atmospheric Rivers on the U.S. West Coast
(From 1 Oct 2016 to 31 March 2017)

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

- 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"

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)

Water year 2017 AR landfall locations through 31 March 2017

Location of landfall represents position where AR was strongest at landfall. Many ARs move down the coast over time. This map does not show these areas.

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

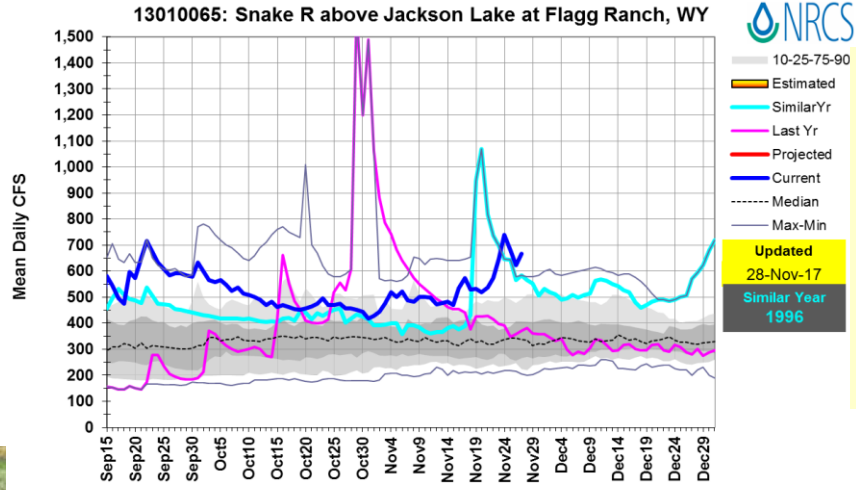By F.M. Ralph, B. Kawzenuk, C. Hecht, J. Kalansky

Experimental

Analysis of Streamflow for a year like 2017 that follows a Strong El Nino Year like 2016

Year	ENSO SE Strong El Nino	Year Following a Strong El Nino	ENSO	Streamflow as % of 1981-2010 Average					
				Feb-Sep	Apr-Sep	Apr-Sep	Apr-Sep	Apr-Sep	Apr-Sep
				Owyhee River blw Dam	Salmon Falls Creek	Boise River nr Boise	Big Wood River blw Magic Dam	Snake River nr Heise	Spokane River nr Post Falls
1978	SE	1979	N	97	116	63	34	90	105
1941	SE	1942	SE	122	173	91	117	86	77
1988	SE	1989	SL	145	100	97	75	102	116
1966	SE	1967	N	69	88	105	151	109	113
1947	SE	1948	LN	58	86	105	66	97	176
1952	SE	1953	N	56	76	124	92	92	108
1998	SE	1999	SL	100	108	135	158	131	129
1994	SE	1995	SE	124	135	138	195	118	70
1995	SE	1996	N	124	115	152	132	148	116
1983	SE	1984	N	363	369	158	206	133	112
1973	SE	1974	SL	120	111	181	184	147	193
1942	SE	1943	N	137	150	209	259	144	150
2016	SE	2017	LN	155	161	180	266	163	112

sorted

12 years

Color coded streamflow as % of average

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

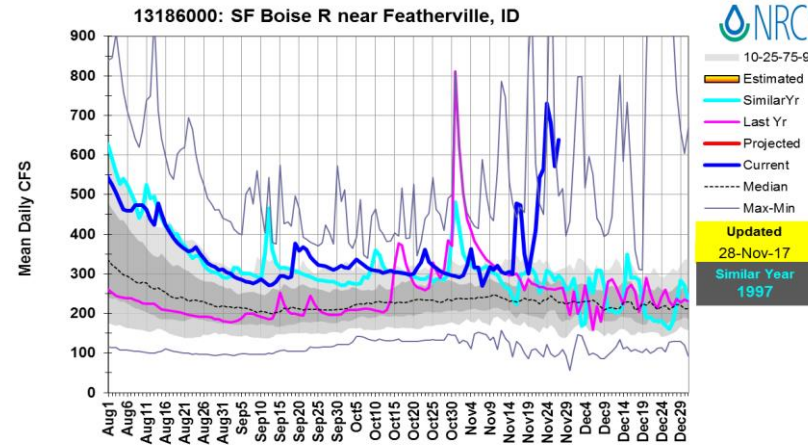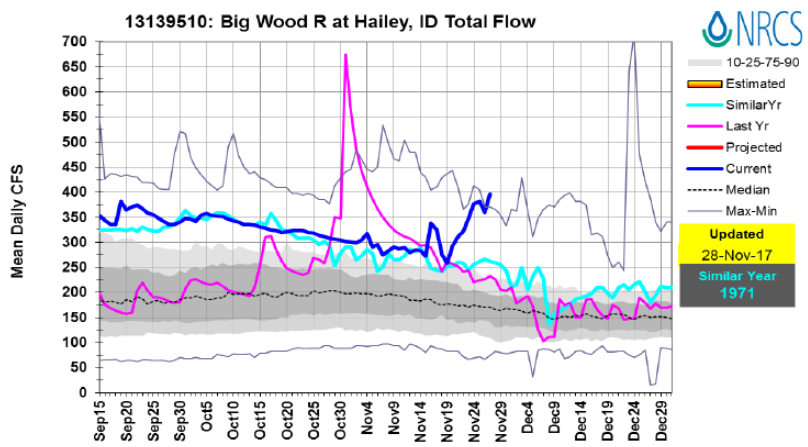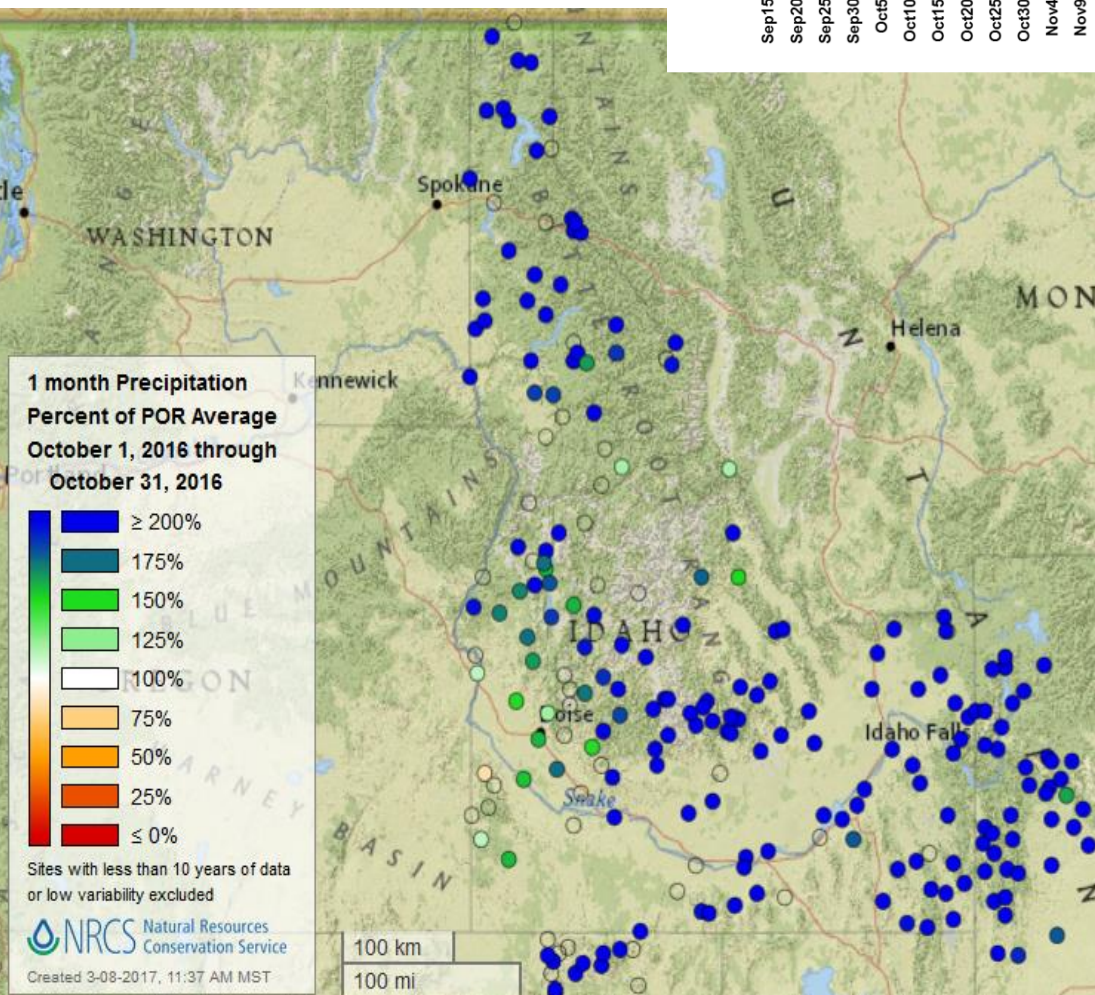**1998/1999 Mt Baker set word snowfall with 95 feet of snowfall**

October 2016 brought record high SNOTEL precipitation that was 200% of normal, increasing soil moisture & streamflow levels

2016 Oct new max

2017 current flow abv avg or at record high

13010065: Snake R above Jackson Lake at Flagg Ranch, WY

13139510: Big Wood R at Hailey, ID Total Flow

13186000: SF Boise R near Featherville, ID

1 month Precipitation
Percent of POR Average
October 1, 2016 through
October 31, 2016

≥ 200%
175%
150%
125%
100%
75%
50%
25%
≤ 0%

Sites with less than 10 years of data
or low variability excluded

NRCS Natural Resources Conservation Service

Created 3-08-2017, 11:37 AM MST

100 km
100 mi

2016 November was drier in Idaho

It's all about Relationships – What pushes what, when something happens, what follows…

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.


SNOW COVER OCT. 31
Alaska
Siberia
Russia
Kazakhstan
Mongolia
China
The Weather Channel

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.

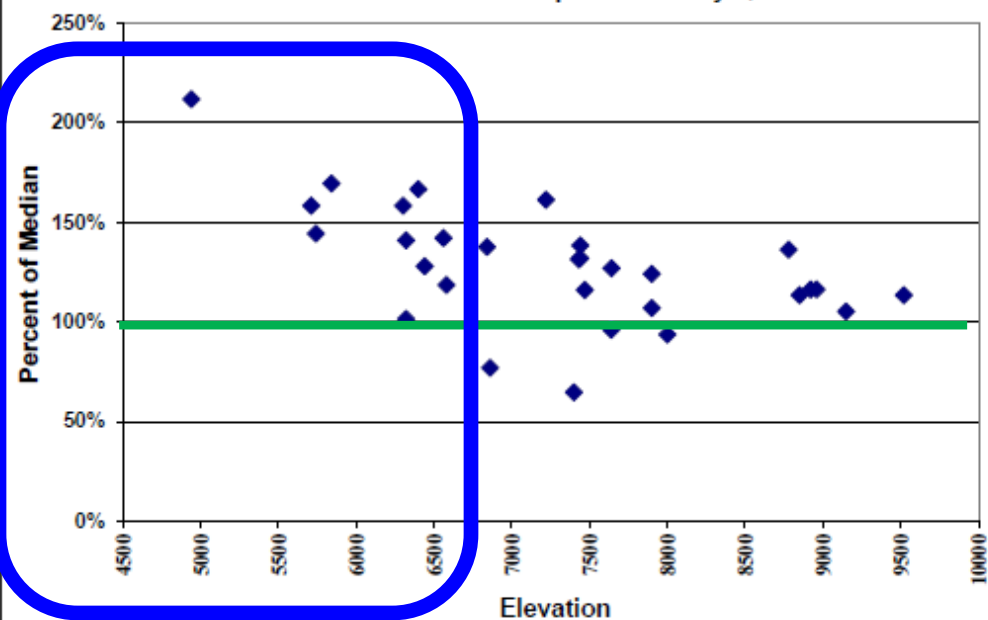Southside Snake Basins Snowpack February 1, 2017
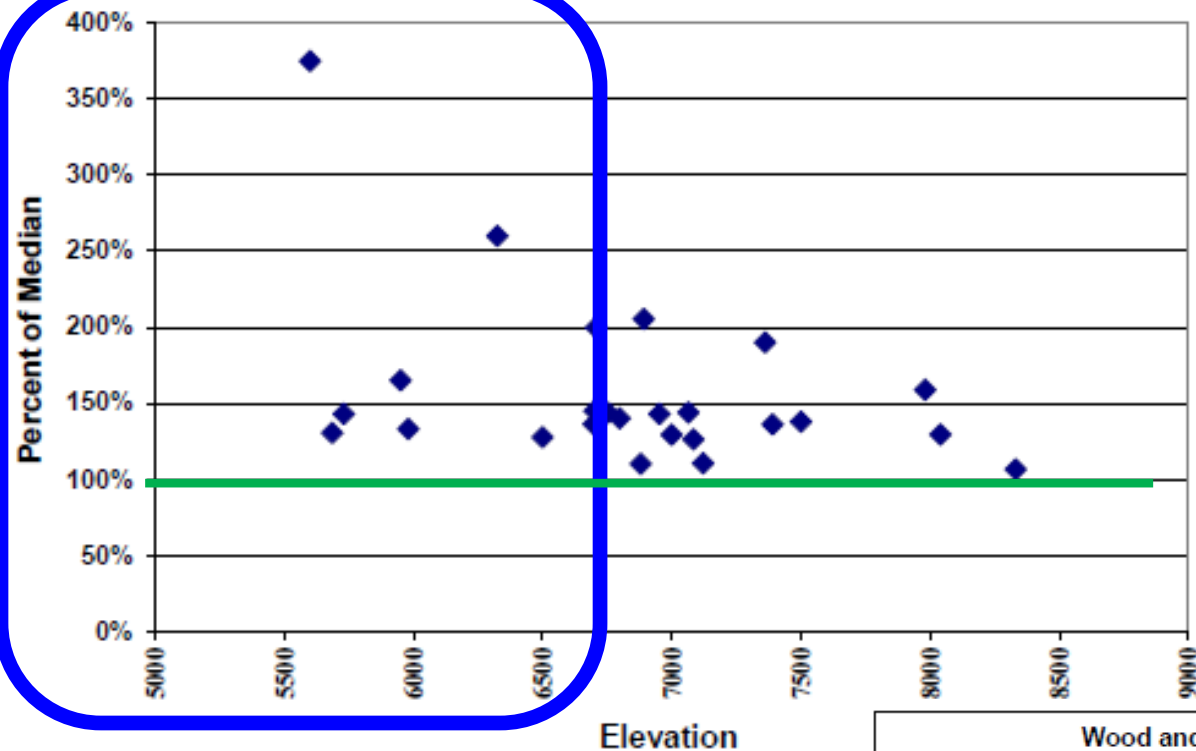
December & January brought cold temps & heavy valley snowfall across most of Idaho
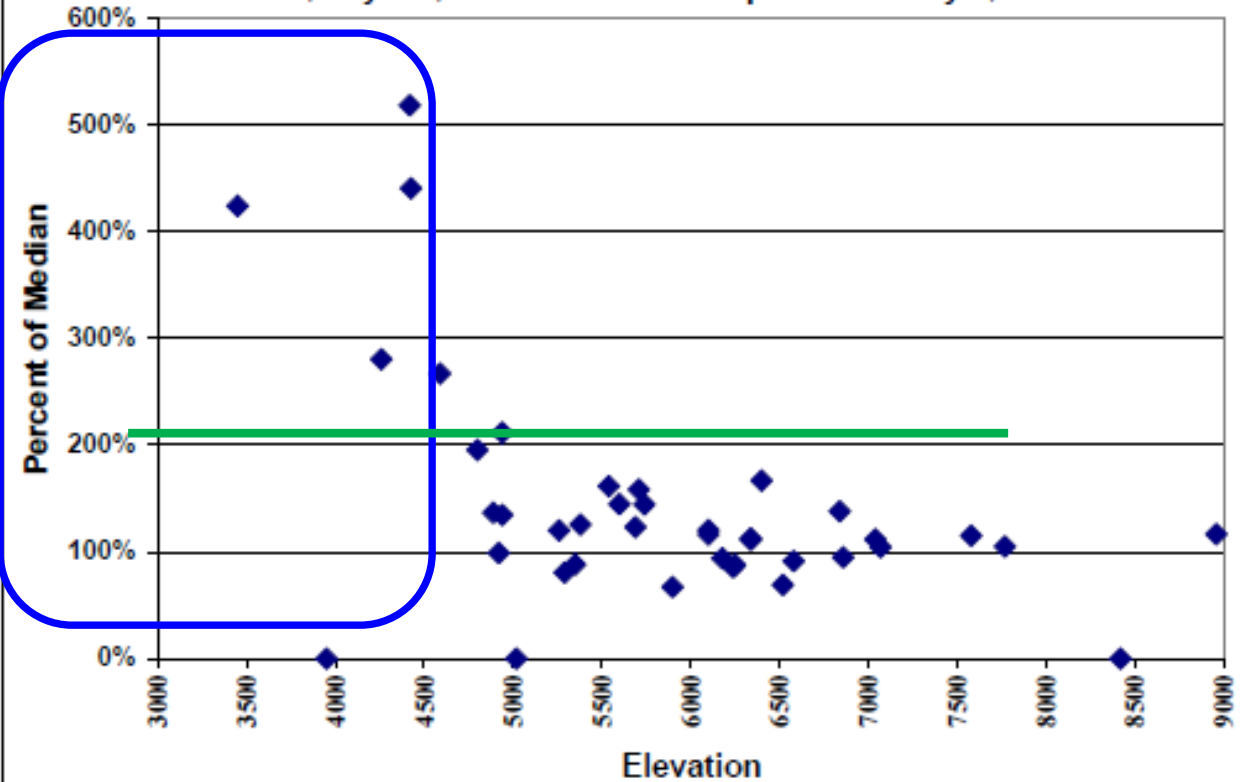
State wide trend: lower elevation sites were well above median in January.

Wood and Lost Basins Snowpack February 1, 2017

Weiser, Payette, Boise Basins Snowpack February 1, 2017

December & January brought cold temps & heavy valley snowfall across most of Idaho

State wide trend: lower elevation sites were well above median in January.

Highway Worship Center of the Assemblies of God
WHOEVER IS PRAYING FOR SNOW STOP
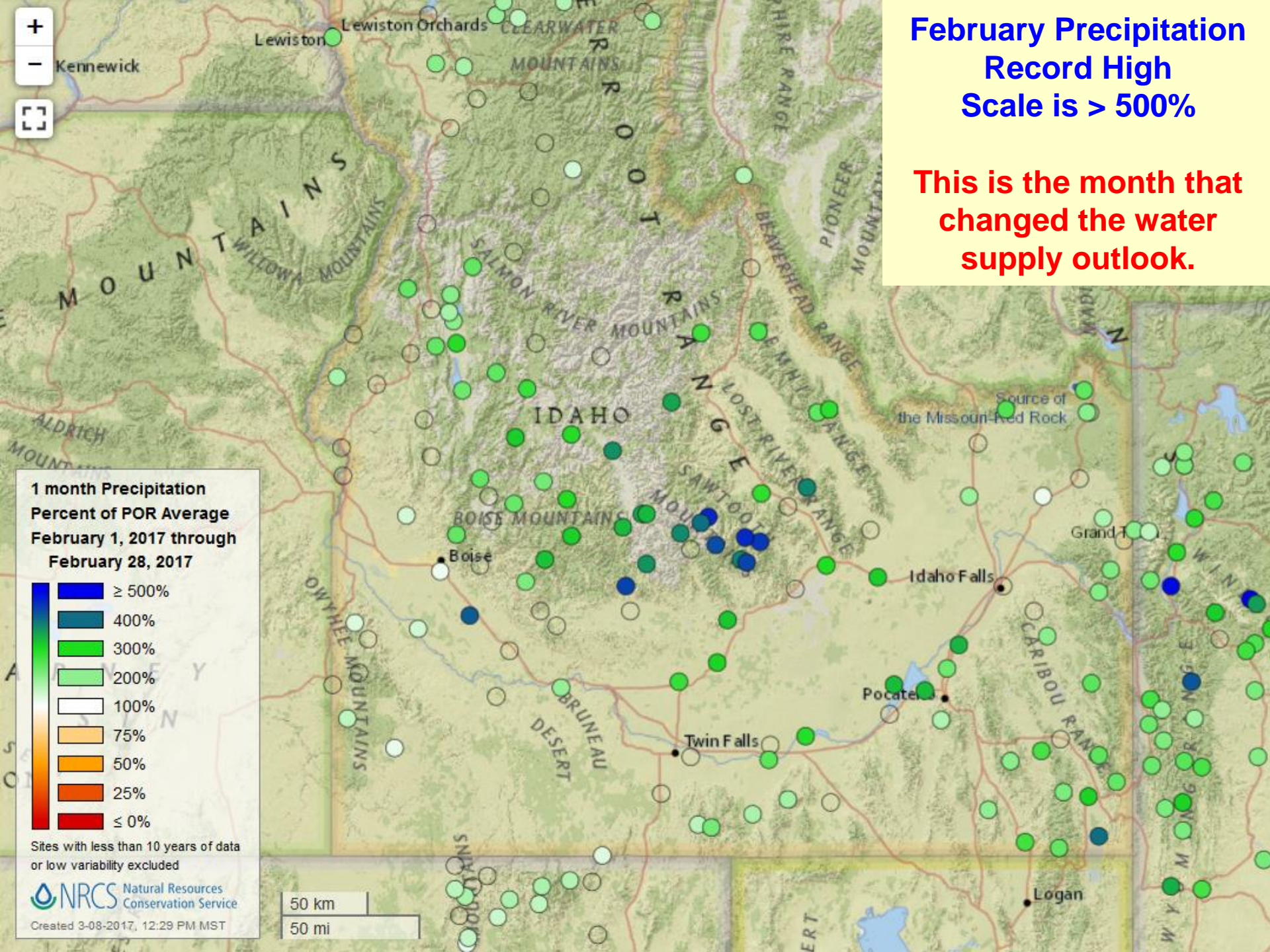
February Precipitation Record High Scale is > 500%

This is the month that changed the water supply outlook.

1 month Precipitation Percent of POR Average February 1, 2017 through February 28, 2017

- ≥ 500%
- 400%
- 300%
- 200%
- 100%
- 75%
- 50%
- 25%
- ≤ 0%

Sites with less than 10 years of data or low variability excluded

NRCS Natural Resources Conservation Service

Created 3-08-2017, 12:29 PM MST

February Snow Water Equivalent (SWE) Change

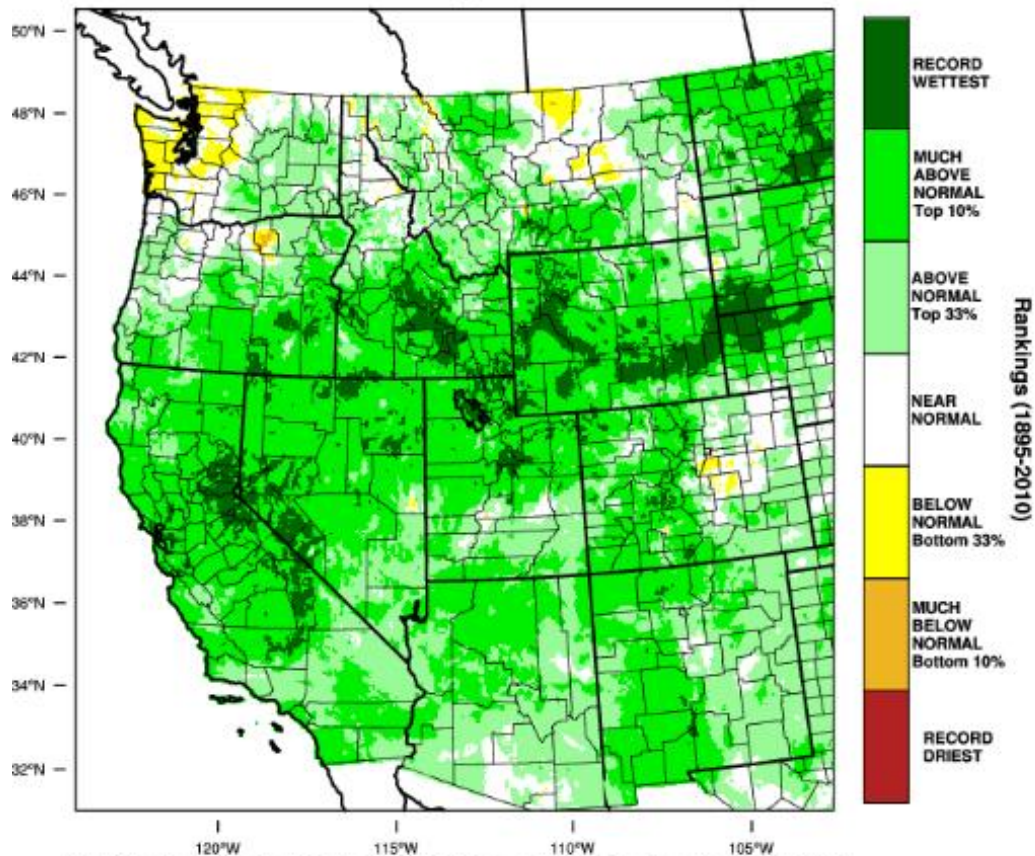**18+ inches of SWE increase in central mountains - doubled the SWE amount in the Big Wood basin**

Feb rain-on-snow event brought low elevation flooding and primed the soils again.
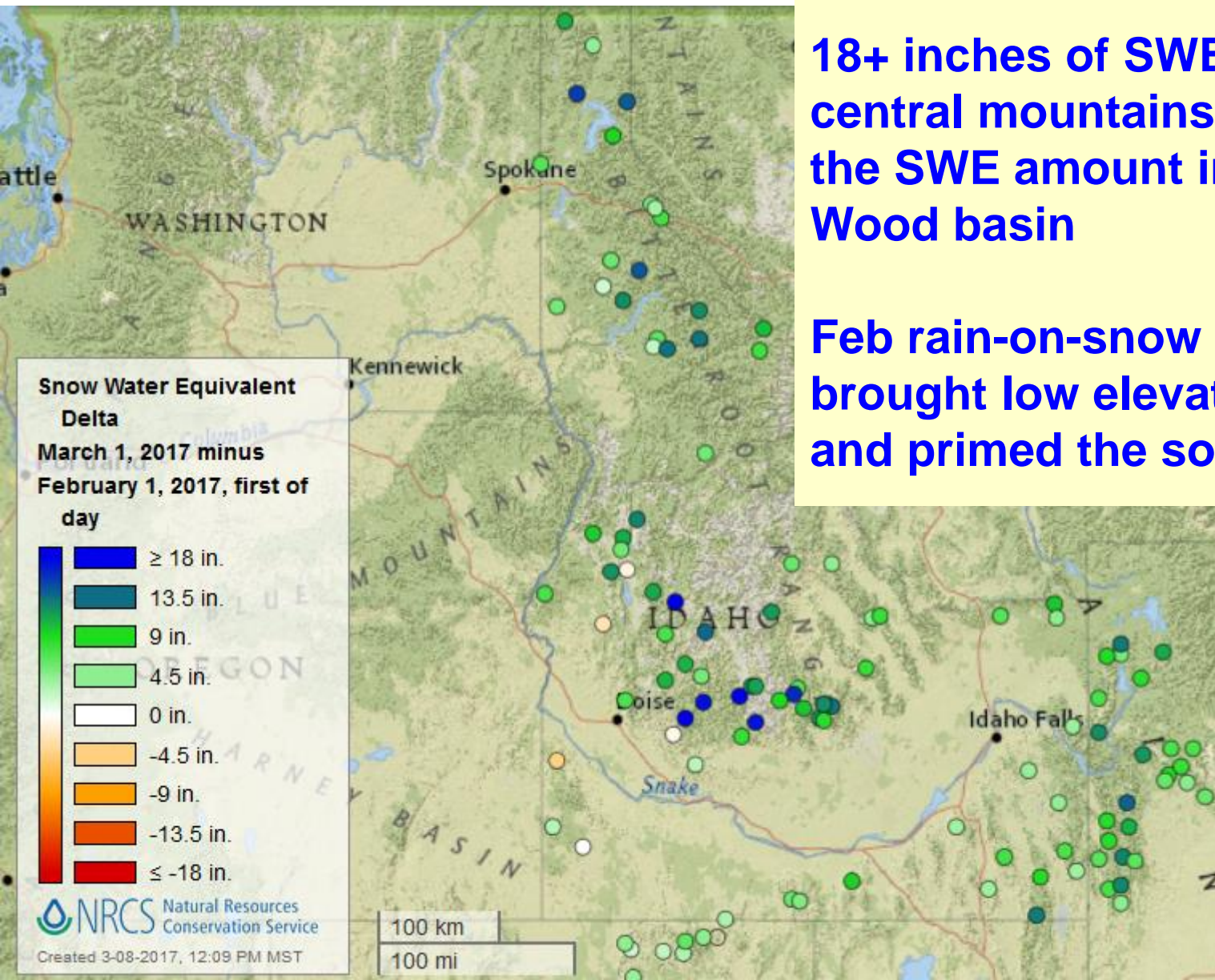
Western United States - Precipitation
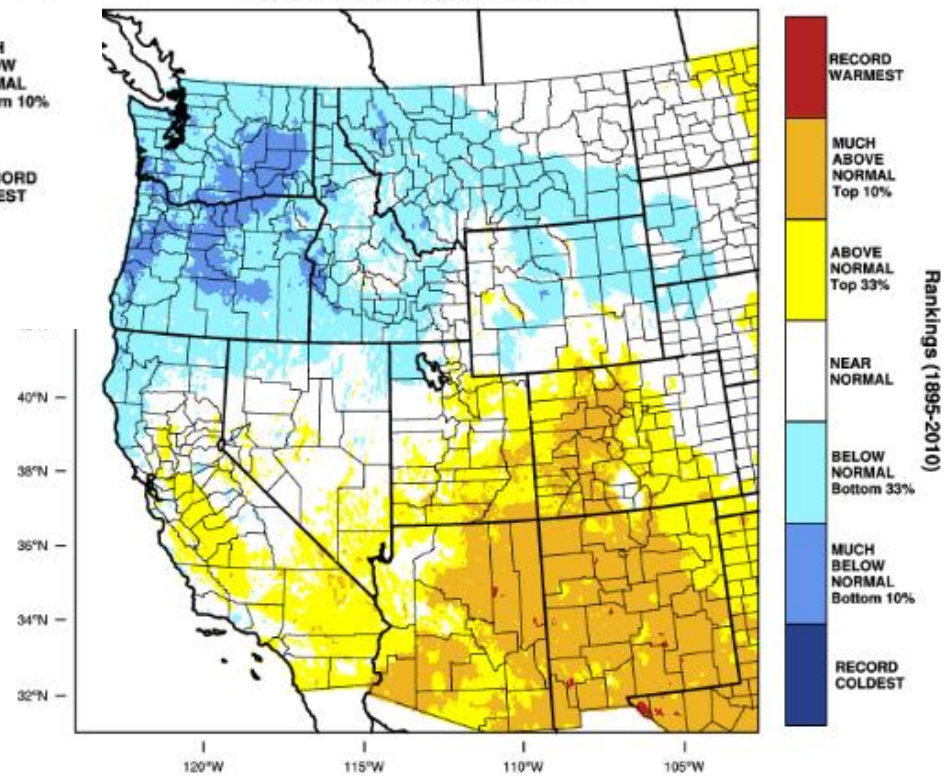December-February 2017 Percentile

WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Final), created 16 SEP 2017

Western United States - Mean Temperature
December-February 2017 Percentile

WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Final), created 16 SEP 2017

Dec – Feb:

Precipitation - Record Wet

Temperatures - Much Below Normal

Cold Air Outbreaks

Lasted 5 Weeks Winter 2016-2017

- "Arctic Outbreaks" - Northerly winds
- Snow-covered terrain from source region
- Temperature Inversions cold air trapped
- Typically drier airmasses with continental origins
- Can be from cold air sneaking in from Great Basin

"It's rare to have it both cold and wet in the same month, When it's very cold, it tends to be dry. When it's a mild month, it tends to be wet."

~ Les Colin. Lead Forecaster NWS Boise

Coleen Haskell
Soulstice Meteorological Services, LLC
Opensnow Idaho Forecaster

Apr 1 Big Wood Basin above Hailey snowpack:

- **Near record based on daily short-term sites**
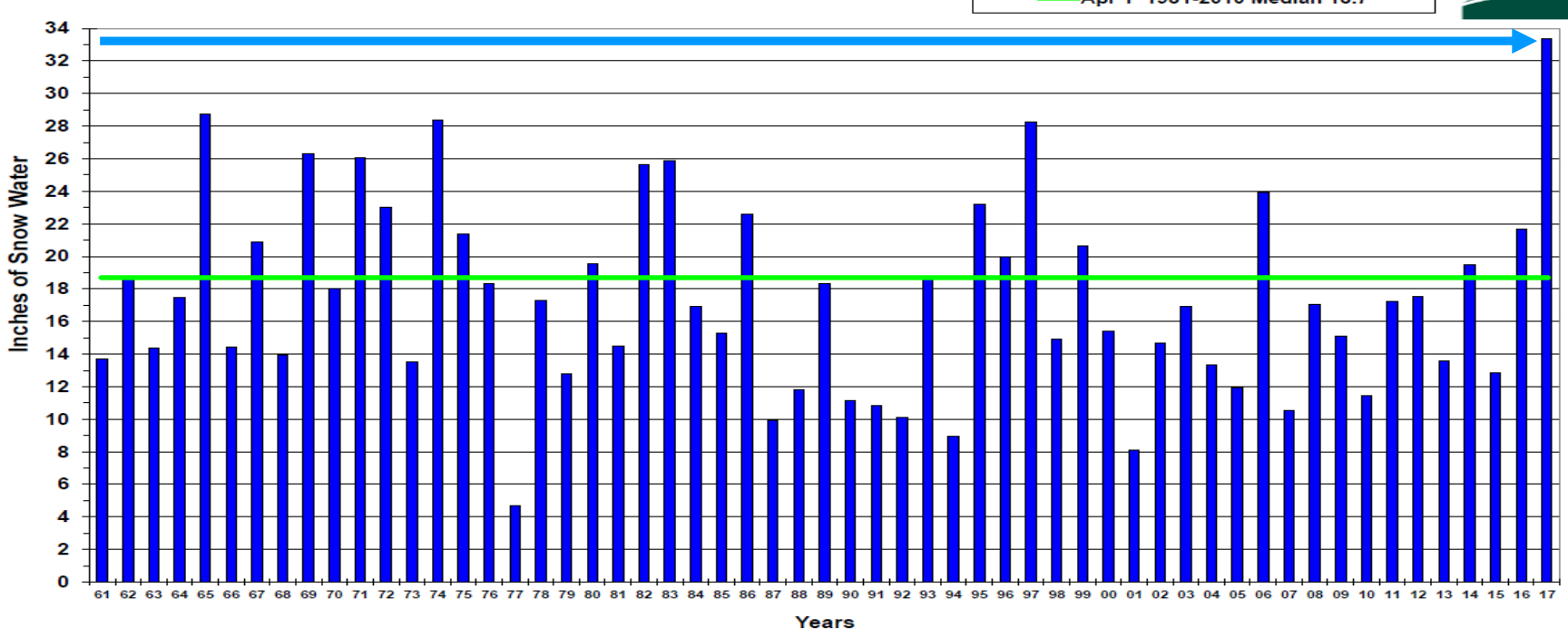- **Record high based on 7 long- term sites that start in 1961, includes Dollarhide that burned**

Take home point – greater snowpack along the Boise-Big Wood Divide

Big Wood Basin 2017 Snow Water with Non-Exceedence Projections (9 sites)
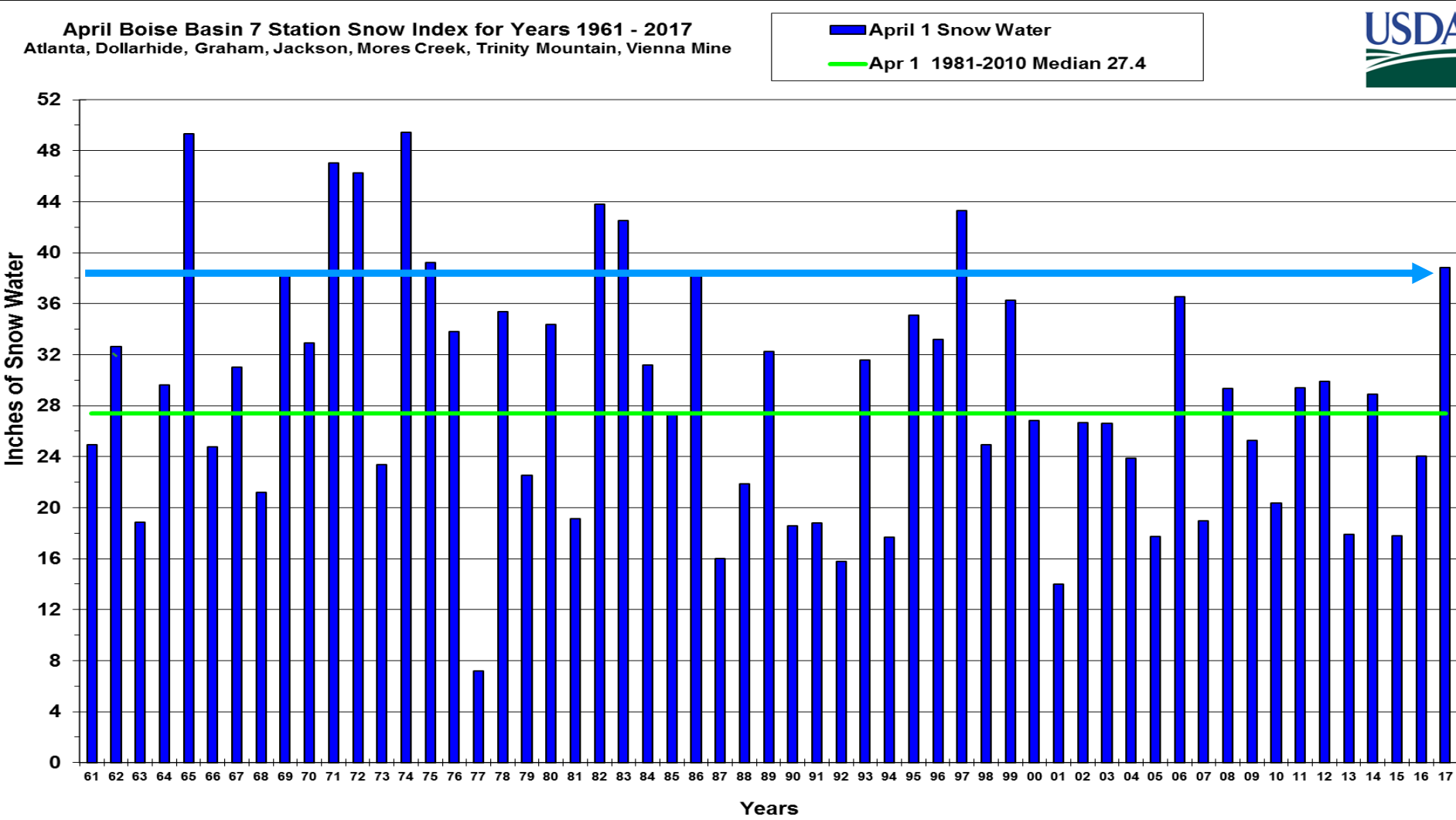Based on Provisional SNOTEL data as of Sep 11, 2017
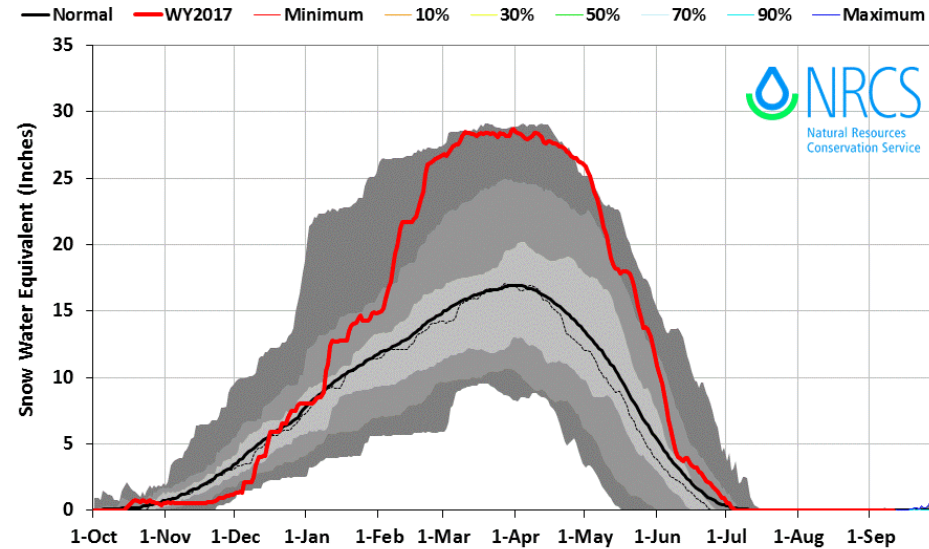
April Big Wood Basin above Hailey 7 Station Snow Index for Years 1961 - 2017
Chocolate Gulch, Dollarhide, Galena, Galena Summit, Hyndman, Lost-Wood Divide, Vienna Mine
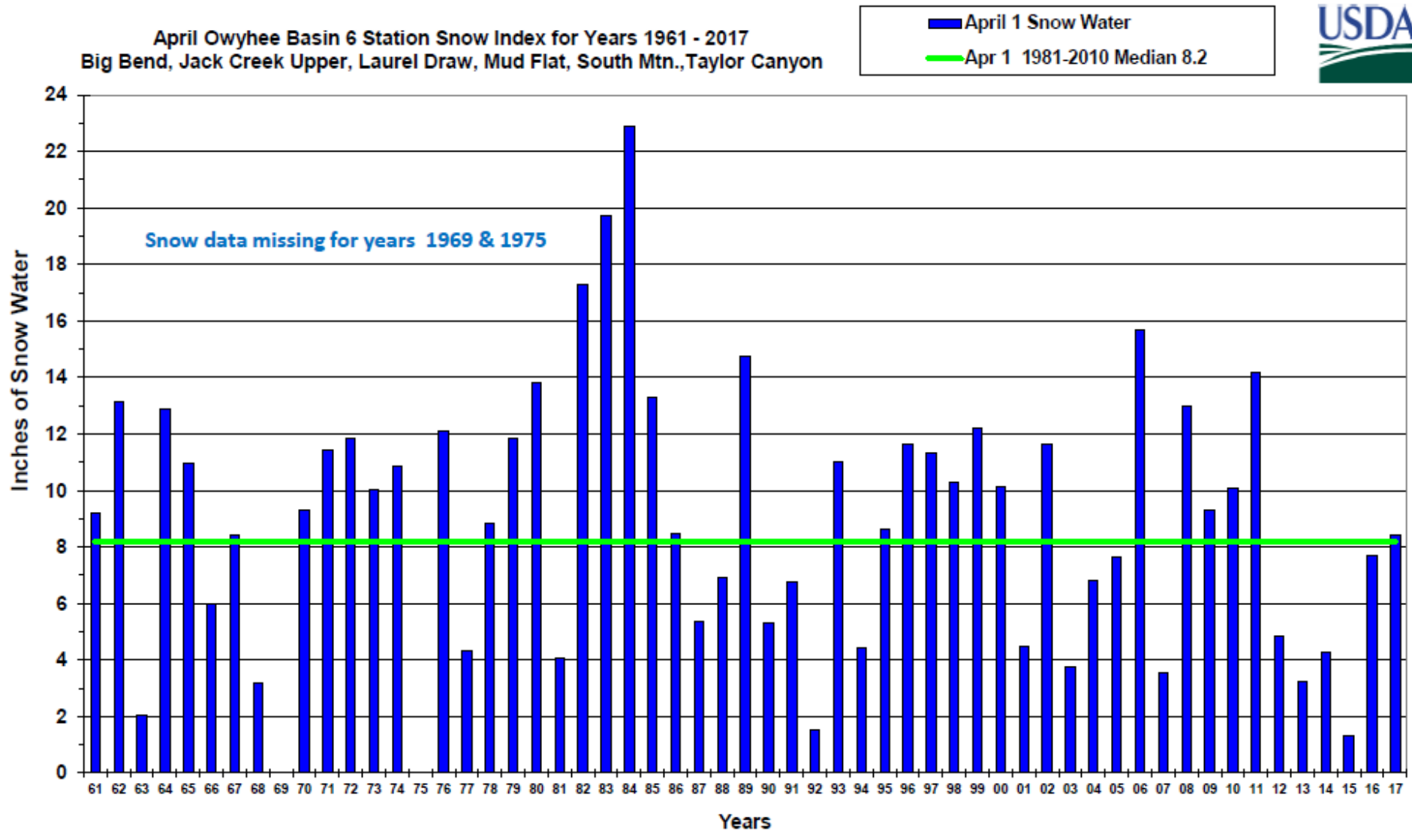
April 1 Snow Water
Apr 1 1981-2010 Median 18.7

Apr 1 Boise snowpack is 8th highest based on 7 long-term sites that start in 1961.

Take Home Point – we have short-term daily sites and long-term sites that were originally snow courses dating back to 1930s in Idaho.


April Boise Basin 7 Station Snow Index for Years 1961 - 2017
Atlanta, Dollarhide, Graham, Jackson, Mores Creek, Trinity Mountain, Vienna Mine

Legend: April 1 Snow Water; Apr 1 1981-2010 Median 27.4

Apr 1, 2017 Owyhee snowpack near the 30 year median based on 6 long-term sites that start in 1961.

April Owyhee Basin 6 Station Snow Index for Years 1961 - 2017
Big Bend, Jack Creek Upper, Laurel Draw, Mud Flat, South Mtn.,Taylor Canyon

Legend: April 1 Snow Water / Apr 1 1981-2010 Median 8.2

USDA

Snow data missing for years 1969 & 1975

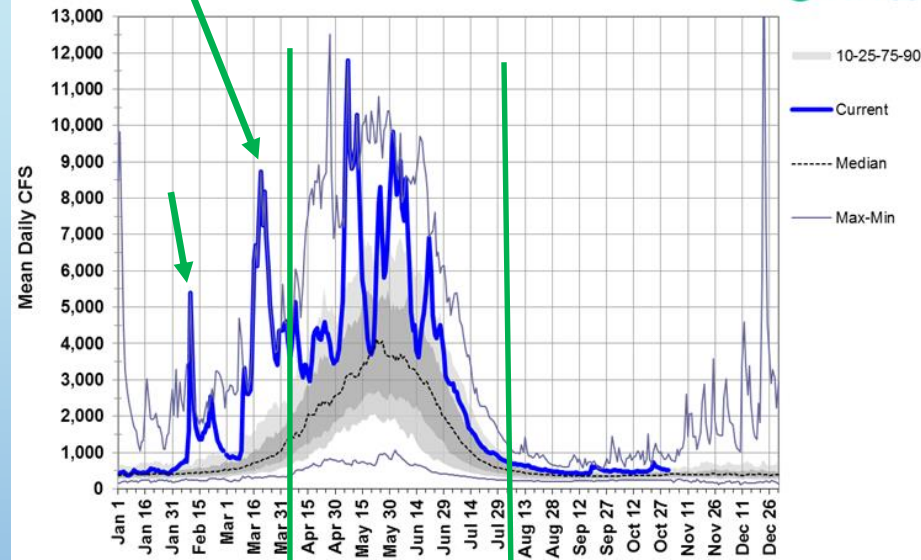Y-axis: Inches of Snow Water
X-axis: Years

2017 Runoff Examples:

- **Fall rains**
- **February rain-on-snow event**
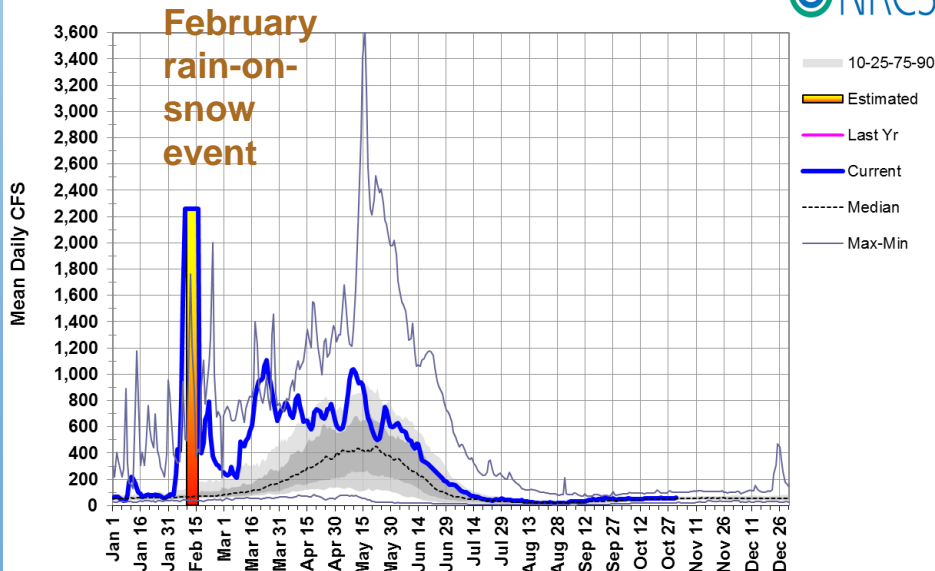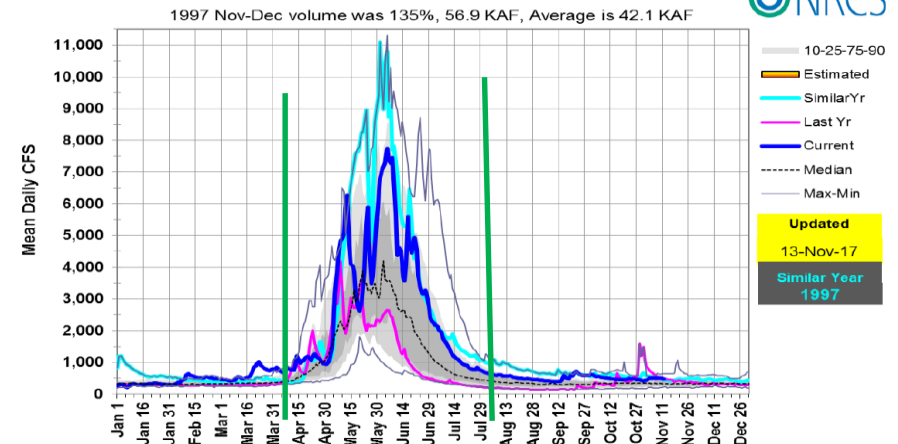- **Two record high peaks prior to start of normal runoff period April 1**
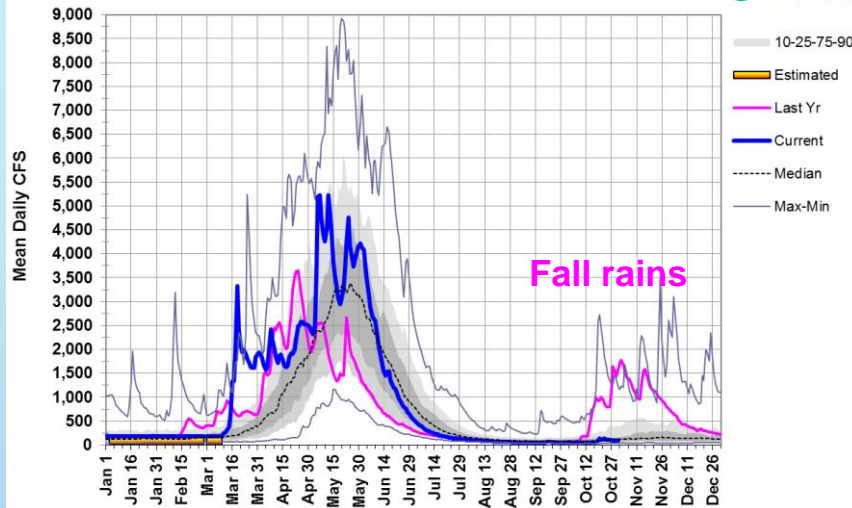
Idaho Surface Water Supply Index (SWSI)

October 1, 2017	SWSI	Oct-Sep Volume Rank since 1981
Basin or Region	Value	
Spokane	3.3	4th
Clearwater	3.1	4th
Salmon	3.3	4th
Payette	3.8	2nd
Boise	3.7	2nd
Big Wood	3.9	1st
Little Wood	3.9	1st
Big Lost	3.7	2nd
Little Lost	3.7	2nd
Teton	3.3	4th
Snake (Heise)	3.7	2nd
Oakley	3.7	2nd
Salmon Falls	3.7	2nd
Bruneau	3.5	3rd
Owyhee	2.2	9th
Bear River	3.3	5th

The October 1 SWSI provides an all-inclusive summary of the water available for the previous water year.

It includes the Oct-Sep streamflow and September 30 reservoir storage as an indicator of the end of season conditions.
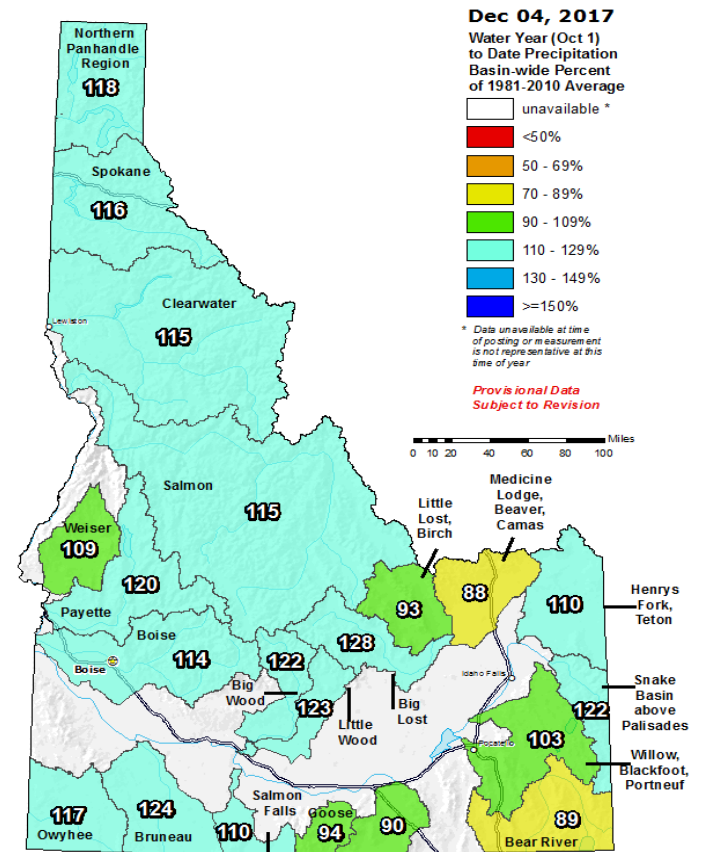
NRCS Natural Resources Conservation Service
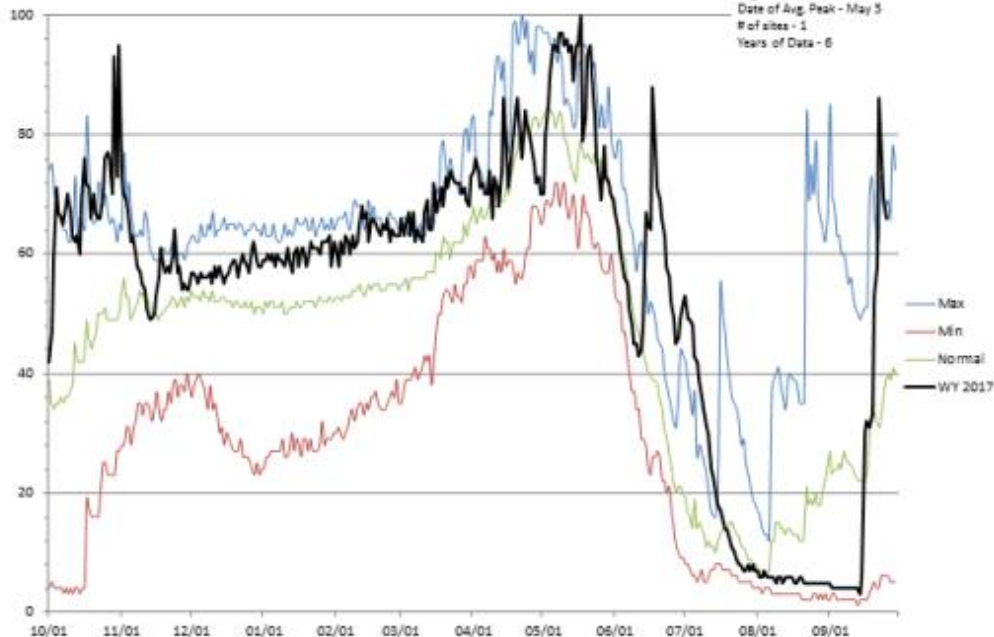
Soil Moisture

2017 Oct-Nov Precipitation

Grand Targhee (1082) Wyoming SNOTEL Site - 9260 ft Reporting
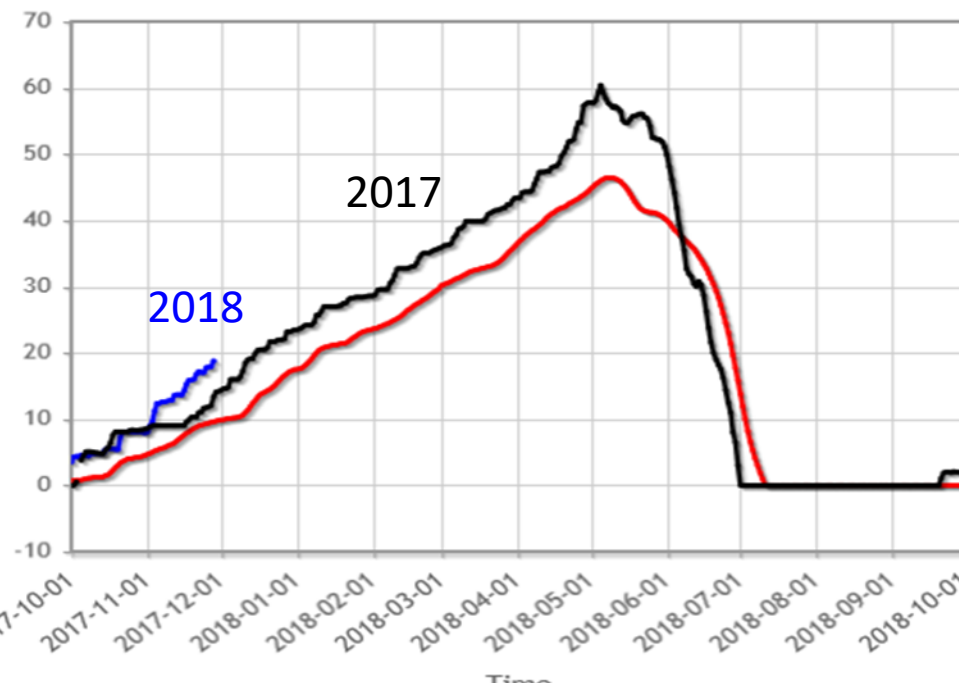
Basin Site Name	Elev (ft)	Snow Water Equivalent				Percent of	
		Current (in)	Today's Median (in)	Median Peak (in)	Median Peak Date	Today's Median	Median Peak
Grand Targhee	9260	18.8	9.6R	46.4R	May 08	196	41

- Snow Water Equivalent (in) Start of Day Values
- Median Snow Water Equivalent (1981-2010) (in) Start of Day Values
- Snow Water Equivalent (in) Start of Day Values

2017
2018

Idaho SNOTEL Current Snow Water Equivalent (SWE) % of Normal
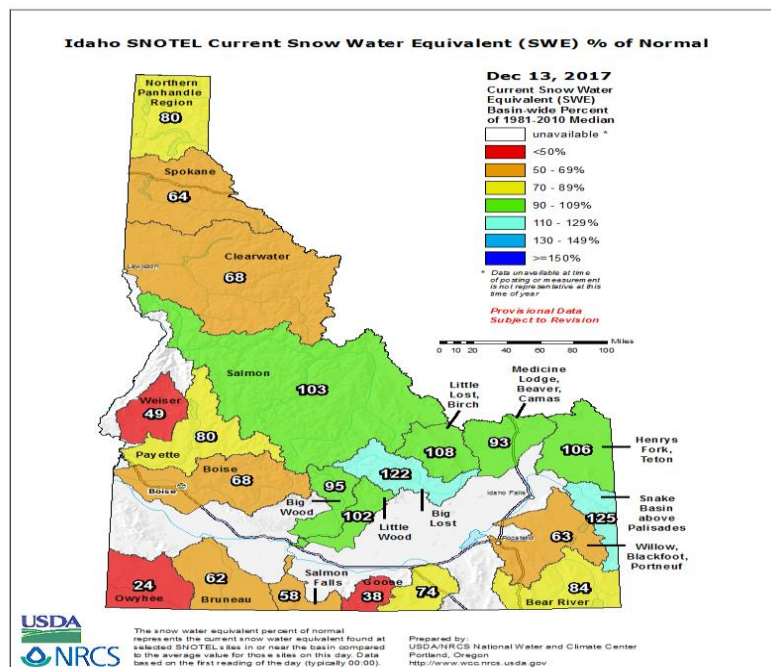
Snake River basins above Hells Canyon			
Snow Water Equivalent		Percent of	
Basin Dec 1, 2017		Today's Median	Median Peak
SNAKE BASIN ABOVE PALISADES		151	34
BIG LOST BASIN		167	32
LITTLE LOST, BIRCH BASINS		125	30
SNAKE BASIN ABOVE AMERICAN FALLS		138	29
HENRYS FORK, TETON BASINS		135	29
LITTLE WOOD BASIN		143	25
MEDICINE LODGE, BEAVER, CAMAS BASINS		117	25
BIG WOOD BASIN		136	24
PAYETTE BASIN		103	17
BOISE BASINS		93	16
BRUNEAU BASIN		77	14
SALMON FALLS BASIN		65	13
WILLOW, BLACKFOOT, PORTNEUF BASINS		55	9
WEISER BASIN		57	8
GOOSE CREEK BASIN		32	6
OWYHEE BASIN		12	3
BEAR RIVER BASIN		91	17

Deadwood Summit (439) Idaho SNOTEL Site - 6860 ft Reporting Frequency

Data based on the first reading of the day (typically 00:00) for

Basin Site Name	Elev (ft)	Snow Water Equivalent				Percent of	
		Current (in)	Today's Median (in)	Median Peak (in)	Median Peak Date	Today's Median	Median Peak
Deadwood Summit	6860	11.8	9.0	40.1	Apr 15	131	29

- ■ Snow Water Equivalent (in) Start of Day Values
- ■ Snow Water Equivalent (in) Start of Day Values
- ■ Average Snow Water Equivalent (1981-2010) (in) Start of Day Values
- ■ Median Snow Water Equivalent (1981-2010) (in) Start of Day Values
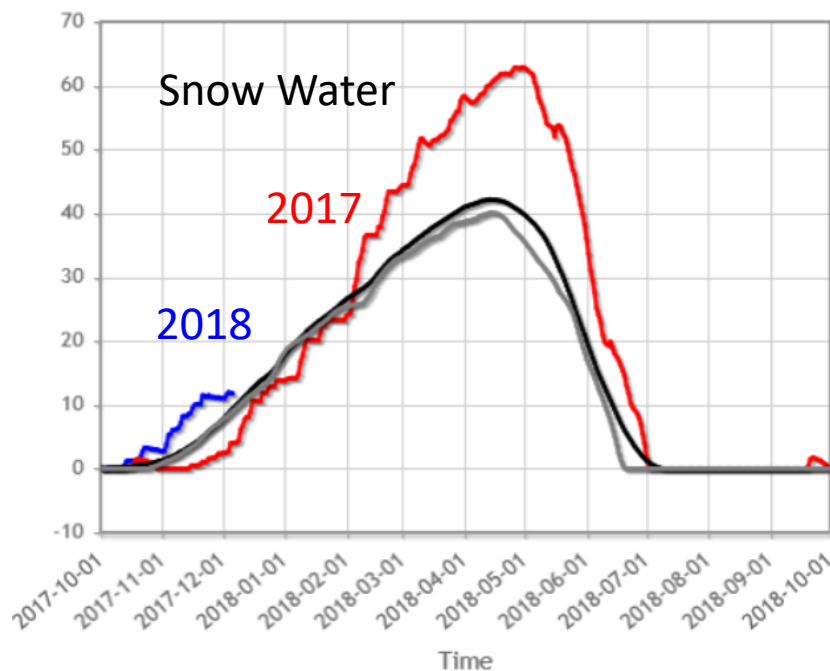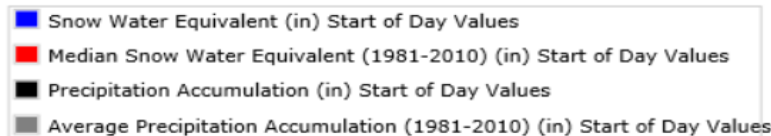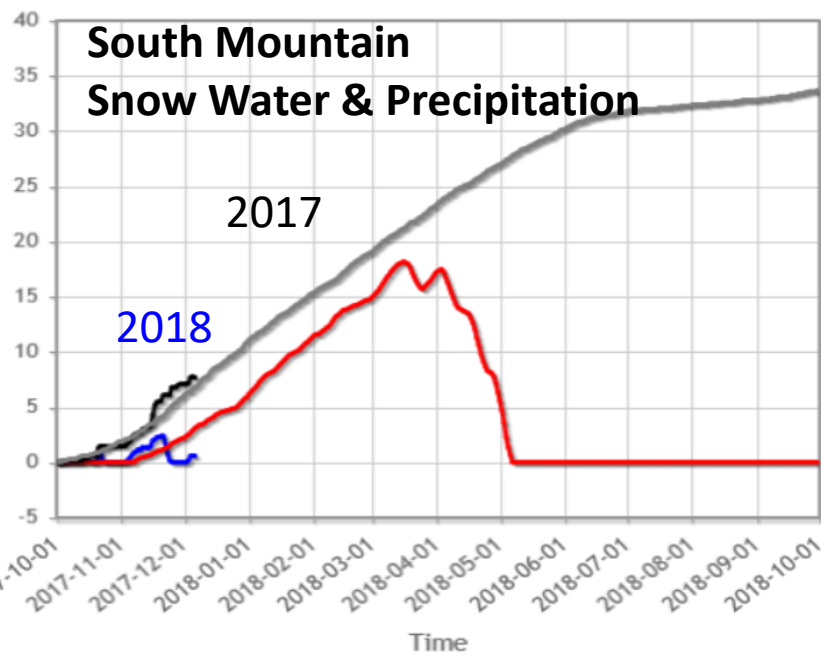
Data based on the first reading of the day (typically 00:00) for

Basin Site Name	Elev (ft)	Snow Water Equivalent				Percent of	
		Current (in)	Today's Median (in)	Median Peak (in)	Median Peak Date	Today's Median	Median Peak
South Mtn.	6500	0.6	3.1	18.2	Mar 16	19	3

- ■ Snow Water Equivalent (in) Start of Day Values
- ■ Median Snow Water Equivalent (1981-2010) (in) Start of Day Values
- ■ Precipitation Accumulation (in) Start of Day Values
- ■ Average Precipitation Accumulation (1981-2010) (in) Start of Day Values

Bureau of Reclamation, Pacific Northwest Region
Major Storage Reservoirs in the Upper Snake River Basin

12/03/2017

Henrys Lake
82795/90000
92% Full
HENI 34 cfs

Grassy Lake
12754/15180
84% Full
FLGY 577 cfs

Island Park
117424/135205
87% Full
ISLI 476 cfs

ANTI 1874 cfs
REXI 2197 cfs

TEAI 577 cfs

Jackson Lake
656395/847000
77% Full
JCK 591 cfs

Little Wood
18025/30000
60% Full

LORI 3907 cfs

LWOI 93 cfs
WODI 2 cfs

HEII 4771 cfs

Ririe
40784/80540
51% Full
RIRI 0 cfs

SHYI 6272 cfs

WTXO 62 cfs

JKSY 2130 cfs

SNAI 5635 cfs

SIFI 6169 cfs

ALPY 2640 cfs
GREY 462 cfs
SALY 700 cfs

BFTI 5913 cfs

American Falls
1370305/1672590
82% Full
AMFI 2203 cfs

Miner
22724/50000
45% Full
MILI 1580 cfs

MINI 2396 cfs

Lake Walcott
88893/95180
93% Full

Palisades
1159830/1200000
97% Full
PALI 4258 cfs

PROVISIONAL DATA - Subject to change

Dec 3 85% of capacity

Average daily streamflows indicated in cubic feet per second.
Reservoir levels current as of midnight on date indicated.
Click on gaging stations (red dots) for streamflow hydrographs.

Upper Snake River system is at 85 % of capacity.

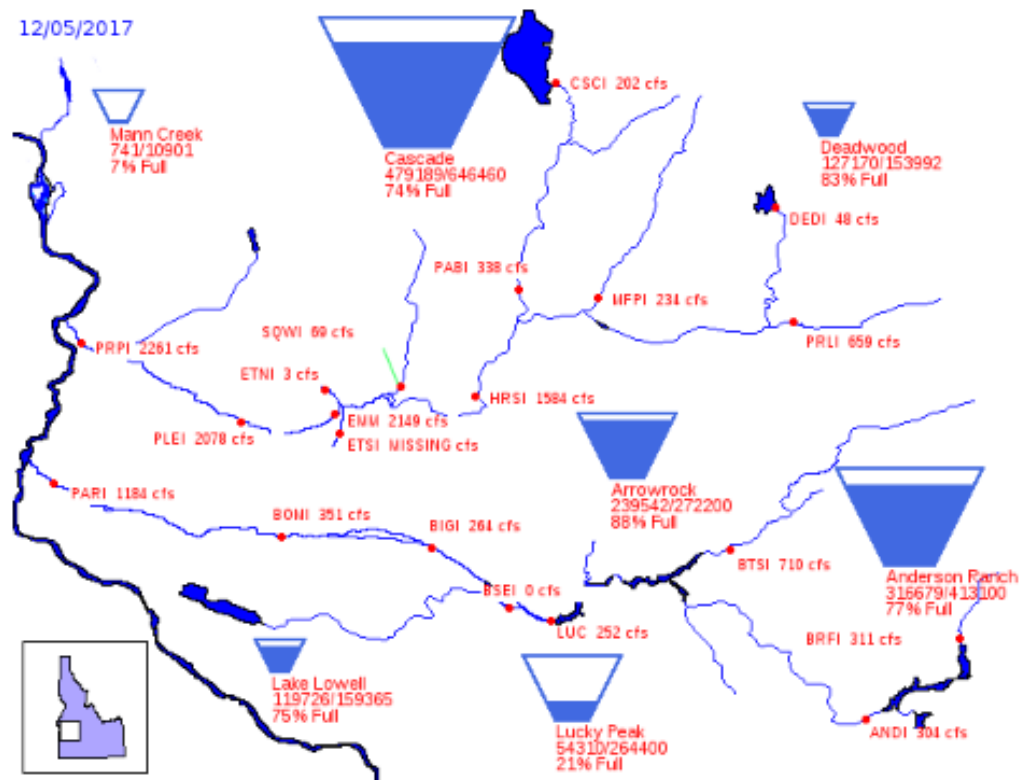(Jackson Lake,Palisades, Grassy Lake,Island Park,Ririe,American Falls,LakeWalcott)

Total space available:	599310 AF
Total storage capacity:	4045695 AF

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

12/05/2017

CSCI 202 cfs

Mann Creek
741/10901
7% Full

Cascade
479189/646460
74% Full

Deadwood
127170/153992
83% Full

DEDI 48 cfs

PABI 338 cfs

MFPI 234 cfs

SQWI 89 cfs

PRPI 2261 cfs

PRLI 659 cfs

ETNI 3 cfs

HRSI 1584 cfs

EMM 2149 cfs

PLEI 2078 cfs

ETSI MISSING cfs

PARI 1184 cfs

Arrowrock
239542/272200
88% Full

BONI 351 cfs

BIGI 264 cfs

BTSI 710 cfs

Anderson Ranch
316679/413100
77% Full

BSEI 0 cfs

LUC 252 cfs

BRFI 311 cfs

Lake Lowell
119726/159365
75% Full

ANDI 304 cfs

Lucky Peak
54310/264400
21% Full

PROVISIONAL DATA - Subject to change

Boise River system (Anderson Ranch, Arrowrock, Lucky Peak) is at 64 % of capacity.

Total space available:	339169 AF
Total storage capacity:	949700 AF
Natural Flow:	1247 CFS

Payette River system (Cascade, Deadwood) is at 76 % of capacity.

Dec 5
Boise   85% of capacity
Payette 76% of capacity

Reservoir Storage Projection for Spring 2018

As of October 30, 2017 -- Updated December 1, 2017
Projected change in reservoir storage from Fall 2017 to start of runoff season in Spring 2018.

	Sep 30 storage KAF	Observed Oct 31 storage KAF	Observed Nov 30 storage KAF	Observed Dec 31 storage KAF	Projected Jan 31 Storage KAF	Projected Feb 28 storage KAF	Projected Mar 31 storage KAF	Estimated change in storage KAF
Boise Reservoir System	603.3	584.9	663.5				800	197
Magic Reservoir	107.8	123.8	138.9				160	52
Little Wood Reservoir	12.7	12.4	17.5			22		9
Mackay Reservoir	38.1	38.1	37.6				20	-18
Jackson & Palisades Reservoir System	1909.8	1929.9	2016.0				1900	-10
Oakley Reservoir	28.5	29.7				38		10
Salmon Falls Reservoir	92.8	92.1	92.7			97		4
Lake Owyhee	432.2	422.0	441.5		480			48
Bear Lake	1114.5	1090.7	1058.6				1000	-115

Other basins, Spokane, Clearwater, Salmon, Weiser, Payette and Bruneau basins, the surface agricultural irrigation demand is not known or relevant. For the Henrys Fork basin, recent diversion data has not been loaded in our AWDB streamflow database.

Amount of Runoff Needed in 2018 for Adequate Irrigation Supply

Summary Table: Amount of streamflow needed in 2018 for adequate surface irrigation supplies.

For complete summary see: Surface Water Supply Index (SWSI)
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/id/snow/waterproducts/?cid=stelprdb1240689
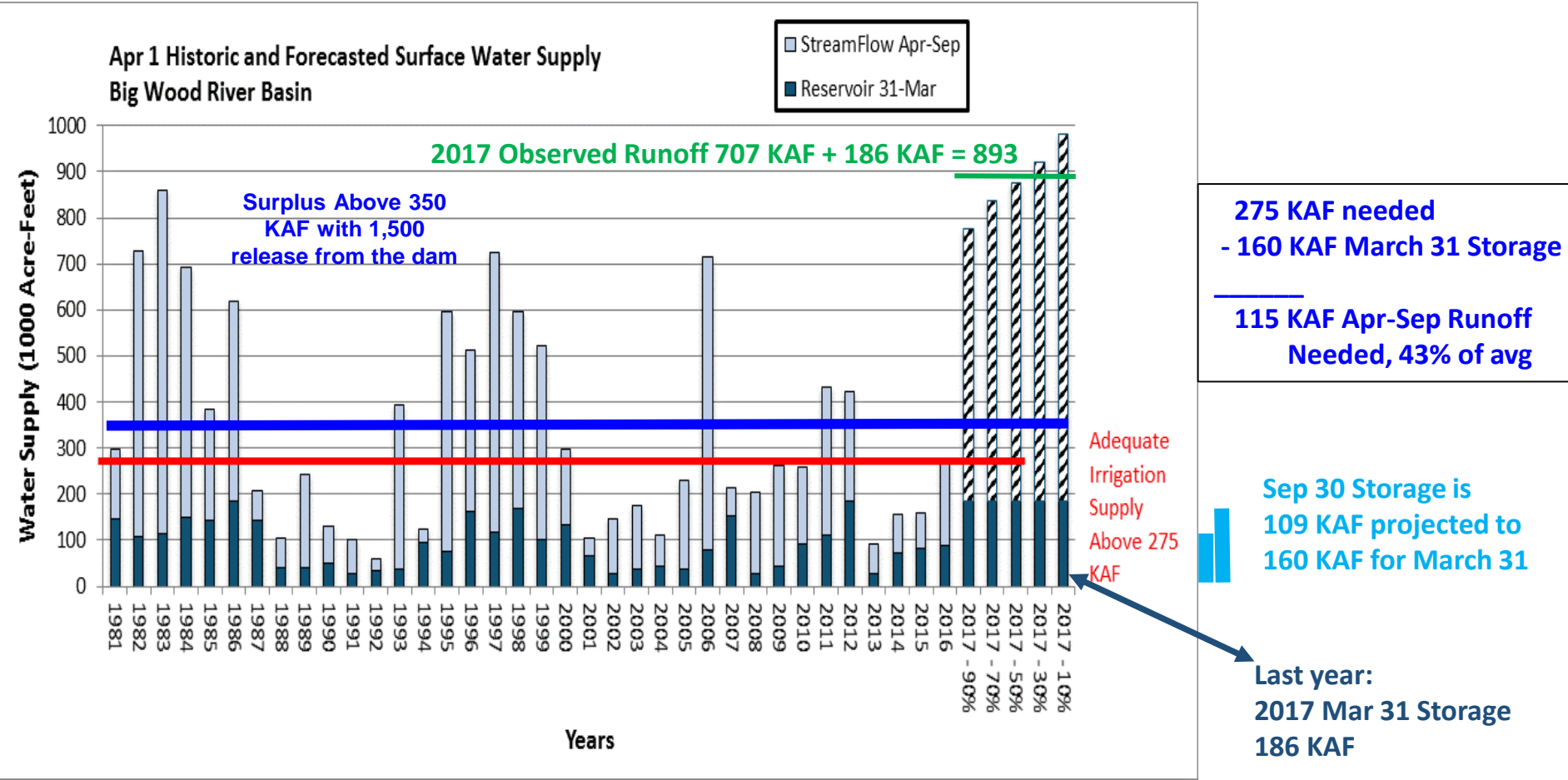
Created: October 30, 2017
Updated: December 1, 2017

Fall reservoir carryover storage is used to project spring reservoir storage levels based on current conditions and recent trends. Then, by knowing the adequate irrigation water supply needed in your basin, the projected spring reservoir volumes are subtracted from the adequate irrigation supply to determine the volume of streamflow to marginally meet adequate surface irrigation supplies in 2018.

	Column 2 -	Column 3 =	Column 4	Col4/Col6 X 100= Col 5			
Column 1	2	3	4	5	6	7	9
Basin	Amount needed for adequate irrigation water supply KAF	Projected end of month reservoir storage (Jan, Feb or Mar) KAF	2018 streamflow volume needed for adequate water supply KAF	% of average streamflow to meet adequate irrigation supply in 2018 KAF	1981-2010 average streamflow KAF	Streamflow runoff period used in the analysis	2017 Streamflow Runoff KAF | % of | average
Boise	1500	800	700	51%	1360	Apr-Sep	2460	181%
Big Wood	275	160	115	43%	265	Apr-Sep	707	267%
Little Wood	60	22	38	41%	92	Mar-Sep	250	272%
Big Lost	180	20	160	107%	150	Apr-Sep	310	207%
Little Lost	40	---	40	118%	34	Apr-Sep	48.5	143%
Teton	85	---	85	44%	193	Apr-Sep	285	148%
Snake (Heise)	4,400	1900	2500	66%	3,780	Apr-Sep	6116	162%
Oakley	50	38	12	39%	31	Mar-Sep	48.6	157%
Salmon Falls	110	97	13	15%	85	Mar-Sep	157	185%
Owyhee	575	480	95	14%	665	Feb-Sep	1030	155%
* Bear River	280	1000	35	17%	205	Apr-Sep	540	263%

* Based on **Bear River** reservoir allocation: only 245 KAF in storage can be used in 2018 and remaining 35 KAF to meet adequate irrigation supply is from runoff.
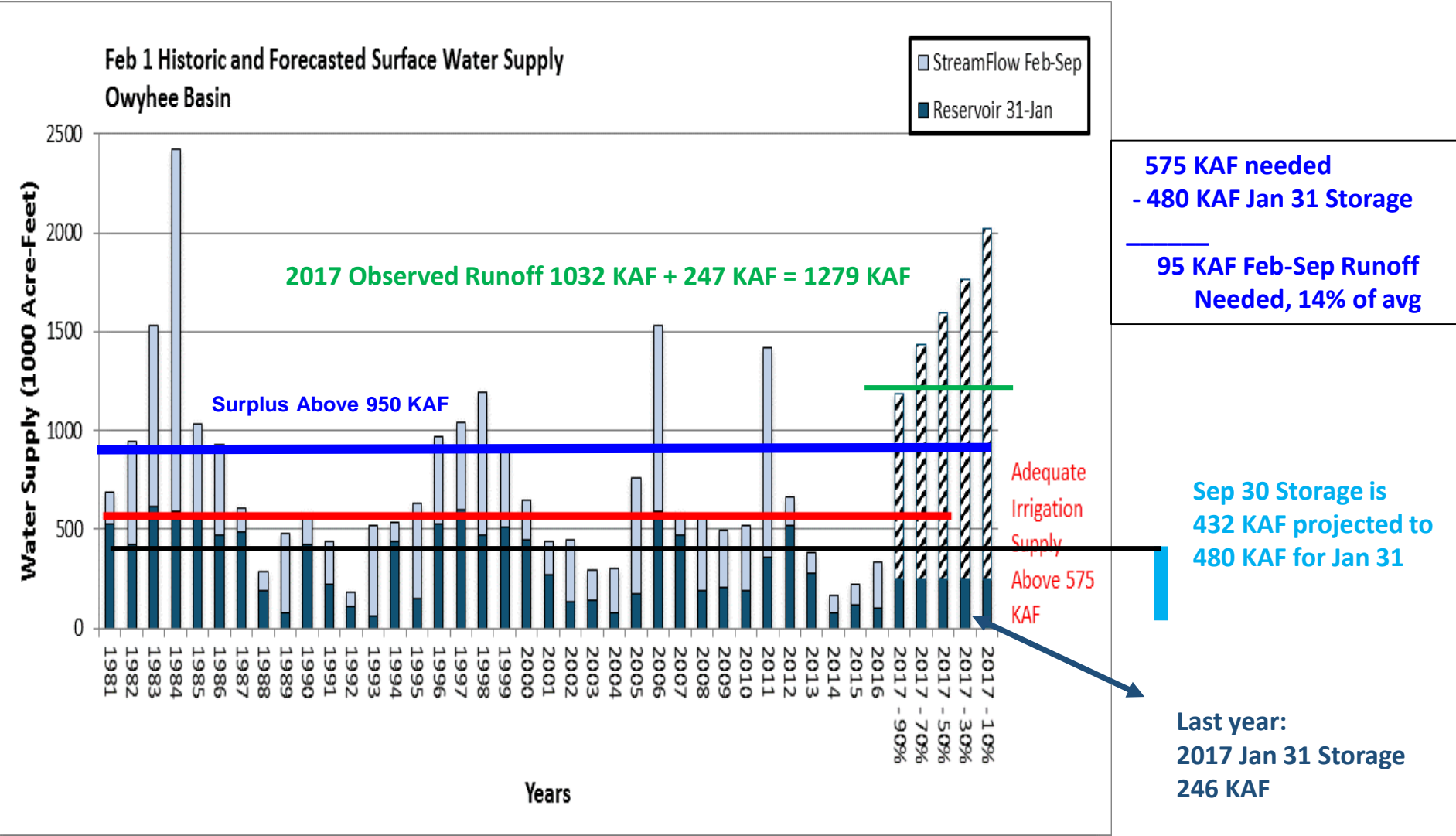
Big Wood Basin April 1 SWSI
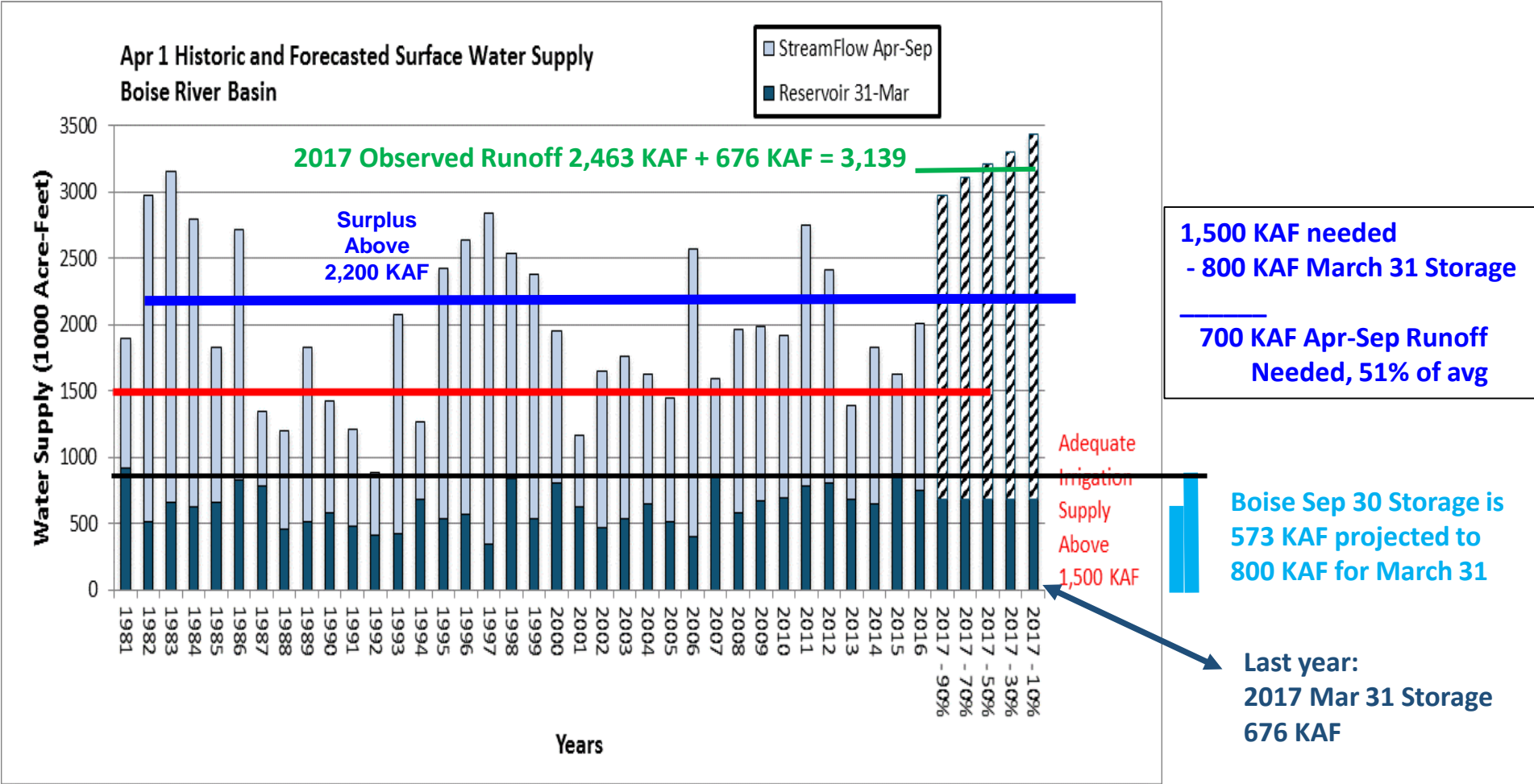## with Adequate Irrigation Supply & Surplus Threshold

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

- StreamFlow Apr-Sep
- Reservoir 31-Mar

2017 Observed Runoff 707 KAF + 186 KAF = 893

Surplus Above 350 KAF with 1,500 release from the dam

Adequate Irrigation Supply Above 275 KAF

275 KAF needed
- 160 KAF March 31 Storage
_____
115 KAF Apr-Sep Runoff Needed, 43% of avg

Sep 30 Storage is 109 KAF projected to 160 KAF for March 31

Last year:
2017 Mar 31 Storage
186 KAF

Water Supply (1000 Acre-Feet)

Years

Owyhee Basin February 1 SWSI with **Adequate Irrigation Supply** & **Surplus Threshold**

Owyhee Surplus: >950 KAF with a flow greater than 1,800 cfs for 8 or more days meets the surplus threshold.

Feb 1 Historic and Forecasted Surface Water Supply
Owyhee Basin

Legend:
☐ StreamFlow Feb-Sep
■ Reservoir 31-Jan

2017 Observed Runoff 1032 KAF + 247 KAF = 1279 KAF

Surplus Above 950 KAF

Adequate Irrigation Supply Above 575 KAF

Y-axis: Water Supply (1000 Acre-Feet), 0 to 2500
X-axis: Years 1981 – 2016, then 2017 -90%, 2017 -70%, 2017 -50%, 2017 -30%, 2017 -10%

575 KAF needed
- 480 KAF Jan 31 Storage
_____
95 KAF Feb-Sep Runoff Needed, 14% of avg

Sep 30 Storage is 432 KAF projected to 480 KAF for Jan 31

Last year: 2017 Jan 31 Storage 246 KAF

Boise Basin April 1 SWSI
with Adequate Irrigation Supply & Surplus Threshold

Apr 1 Historic and Forecasted Surface Water Supply
Boise River Basin

StreamFlow Apr-Sep
Reservoir 31-Mar

2017 Observed Runoff 2,463 KAF + 676 KAF = 3,139

Surplus
Above
2,200 KAF

Adequate
Irrigation
Supply
Above
1,500 KAF

Water Supply (1000 Acre-Feet)

Years

1,500 KAF needed
 - 800 KAF March 31 Storage
  _____
   700 KAF Apr-Sep Runoff
    Needed, 51% of avg

Boise Sep 30 Storage is
573 KAF projected to
800 KAF for March 31

Last year:
2017 Mar 31 Storage
676 KAF

Planning Volume Forecasts

- **Monthly streamflow forecasts since 1930s or 1940s**

- **Today - Daily Water Supply Forecasts are available thanks to 30 years of daily SNOTEL data**

Boise R nr Boise (ID): Apr-Jul Volume

Created 8:08 Dec 11 2017
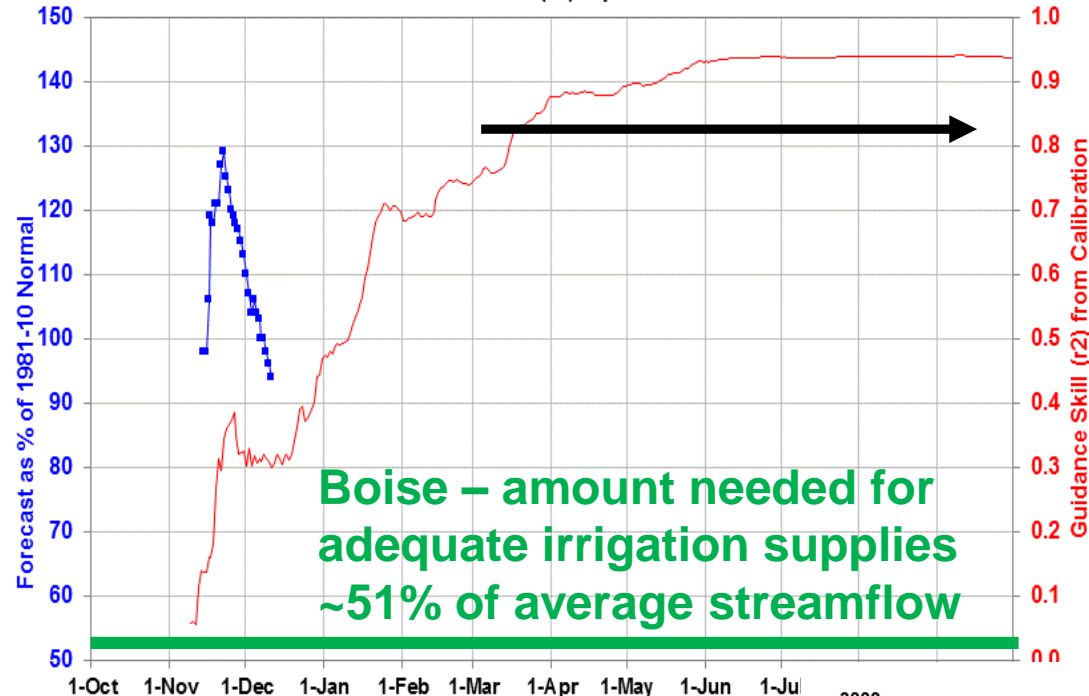
Boise – amount needed for adequate irrigation supplies ~51% of average streamflow

Guidance fcst % norm
Guidance Skill (r2)

This is an automated product based solely on SNOTEL data, provi...
This product is a statistically based guidance forecast combining indic...
Skill is defined as the correlation (squared) between the guidanc...
This product does not consider climate information such as El Nino or ...
a variety of other factors considered in the official forecasts. T...
or supercede the official forecasts produced in coordination ...
Science Contact: Cara.s.McCarthy@por.usda.gov www.wcc.nrcs...

Boise R nr Boise (ID): Apr-Jul Volume

POR Median
81-10 Norm
9 in 10 (drier)
7 in 10
5 in 10 exceed
3 in 10
1 in 10 (wetter)

Created 8:08 Dec 11 2017

This is an automated product based solely on SNOTEL data, provisional data are subject to change.
This product is a statistically based guidance forecast combining indices of snowpack and precipitation.
Yellow squares are the official outlooks. **Gray background** is the historical period of record variability.
This product does not consider climate information such as El Nino or short range weather forecasts, or
a variety of other factors considered in the official forecasts. This product is not meant to replace
or supercede the official forecasts produced in coordination with the National Weather Service.
Science Contact: Cara.s.McCarthy@por.usda.gov www.wcc.nrcs.usda.gov/wsf/daily_forecasts.html
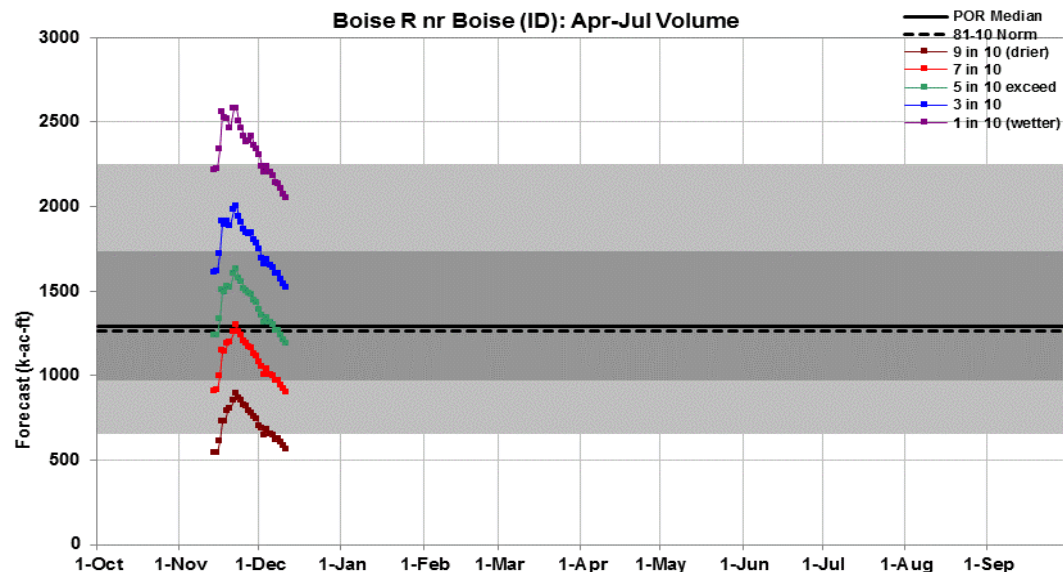
Snake River near Heise April 1 SWSI
with Adequate Irrigation Supply & Estimated Surplus Threshold

Estimated Surplus Above 6,800 KAF based on flow > 21,000 cfs at Blackfoot

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

2017 Observed Runoff 6,116 KAF + 1,000 KAF = 7,116

StreamFlow Apr-Sep
Reservoir 31-Mar

4,400 KAF needed
- 1,900 KAF Mar 31 Storage
_____
2,500 KAF Apr-Sep Runoff Needed, 66% of avg

Adequate Irrigation Supply Above 4,400 KAF

Sep 30 PAL & JCK Storage 1,910 KAF projected to 1,900 KAF for March 31

Last year:
2017 Mar 31 Storage
1,000 KAF

2018 Winter Weather OutlookS & Crystal Balls

Dec – Jan – Feb Forecast
produced Nov 16, 2017

Temperature

Precipitation
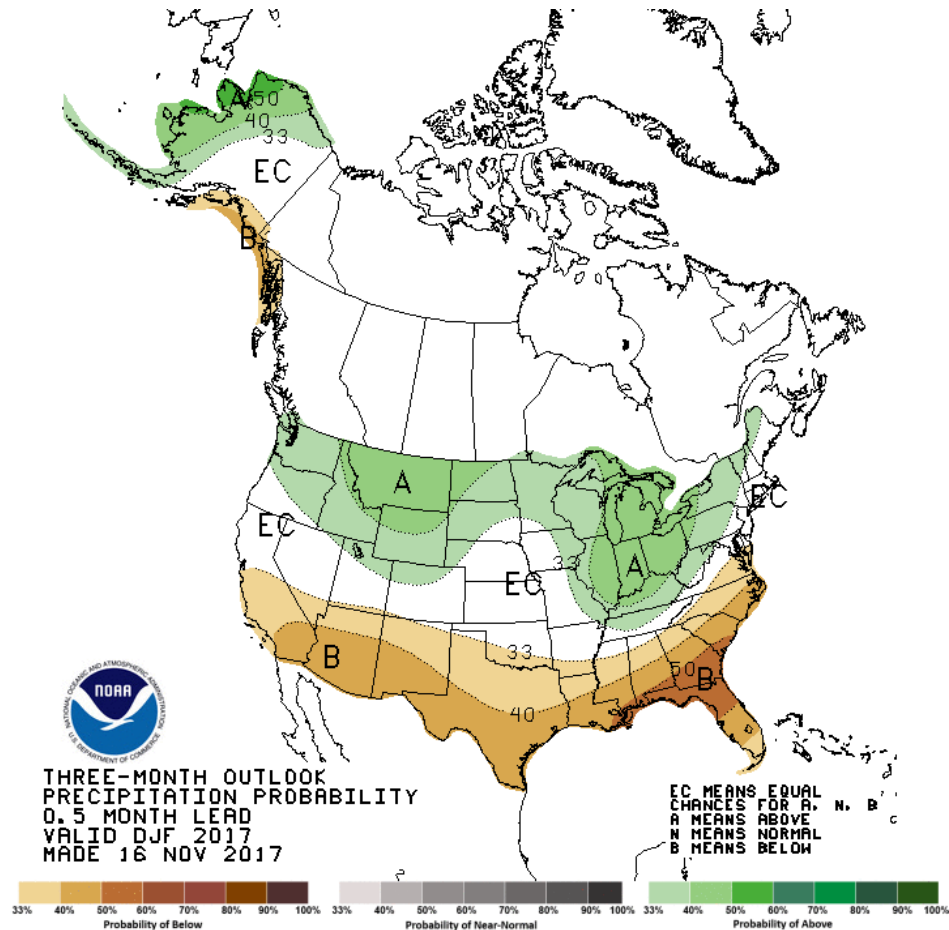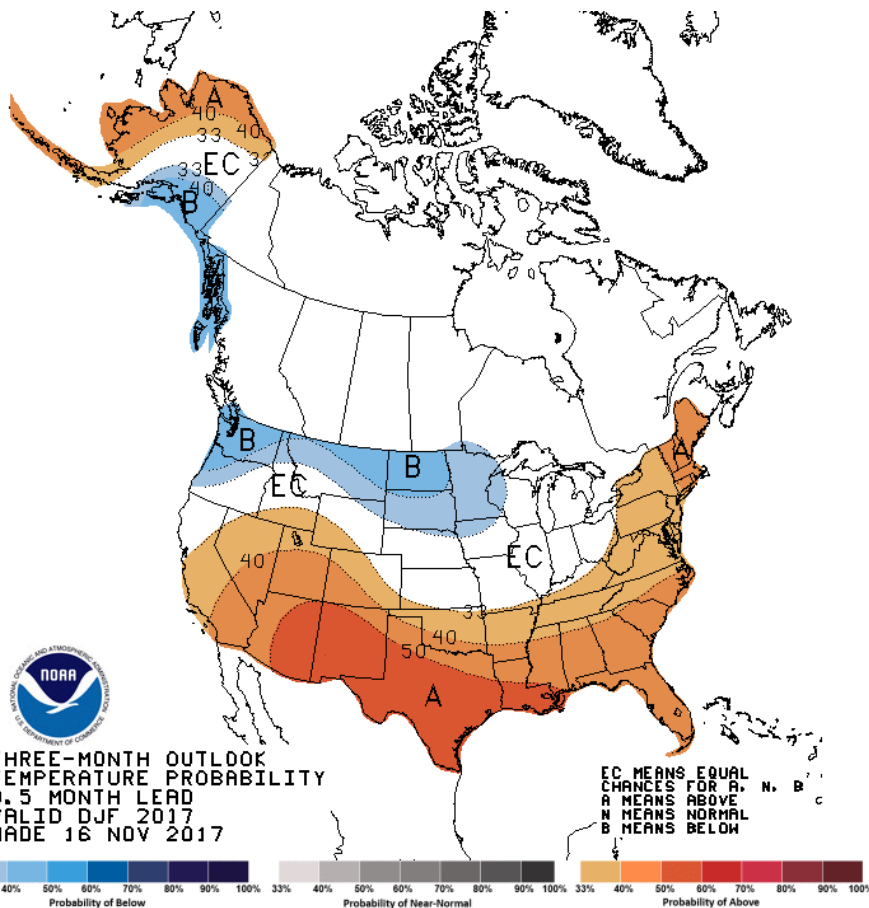
Seasonal Climate Forecast
http://www.oregon.gov/oda/programs/naturalresources/pages/weather.aspx
The Seasonal Climate Forecast is provided courtesy of Oregon Department of Forestry meteorologist **Pete Parsons**

And Coleen Haskell below.

La Niña – Weaker is Favorable for Idaho Precipitation
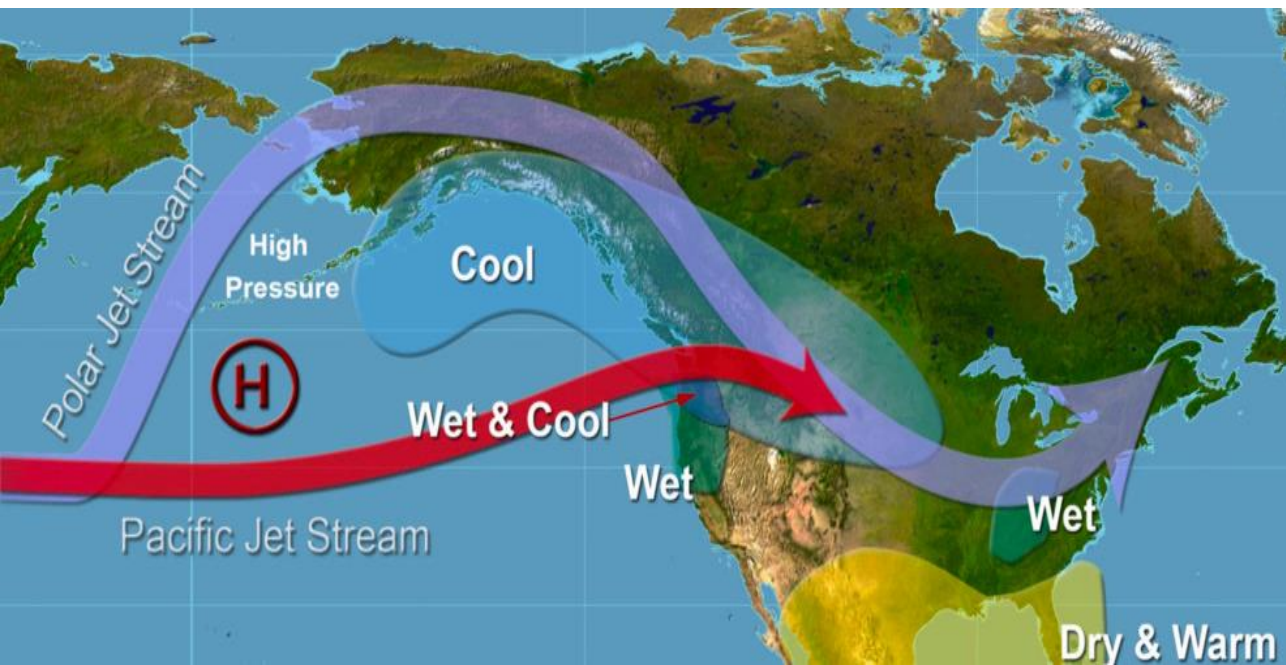
Associated with cooler-than-average sea surface temperatures in the central and eastern tropical Pacific Ocean

Forecast Overview

- **The analog years (1967-68; 1981-82; 1996-97)** **all bordered on cold ENSO-neutral / La Niña conditions in the tropical Pacific Ocean, similar to the current year.** The 1967-68 and 1996-97 winters remained borderline ENSO-neutral / La Niña, while the 1981-82 winter SSTs warmed slightly, into the middle-range of ENSO-neutral. **If La Niña strengthens, as predicted by many dynamic models, the analog years will need updating.**

- ENSO-neutral and La Niña exhibit wide-ranging weather conditions, which reduces forecast confidence. **However, chances for very stormy periods, heavy mountain snow, and Arctic intrusions are elevated, along with the chances for low-elevation snowfall.**

- **Confidence is high for above-average precipitation and mountain snowfall. More variation is possible with temperatures**. The current analog years only experienced brief intrusions of moderately-cold Arctic air and limited valley snow. **However, if La Niña conditions fully develop and strengthen, that would produce a tropical Pacific SST pattern more in-line with some of Oregon's coldest/snowiest winters. Stay tuned…**

Boise Basin Snowpack and Historic Range, 1982-2017
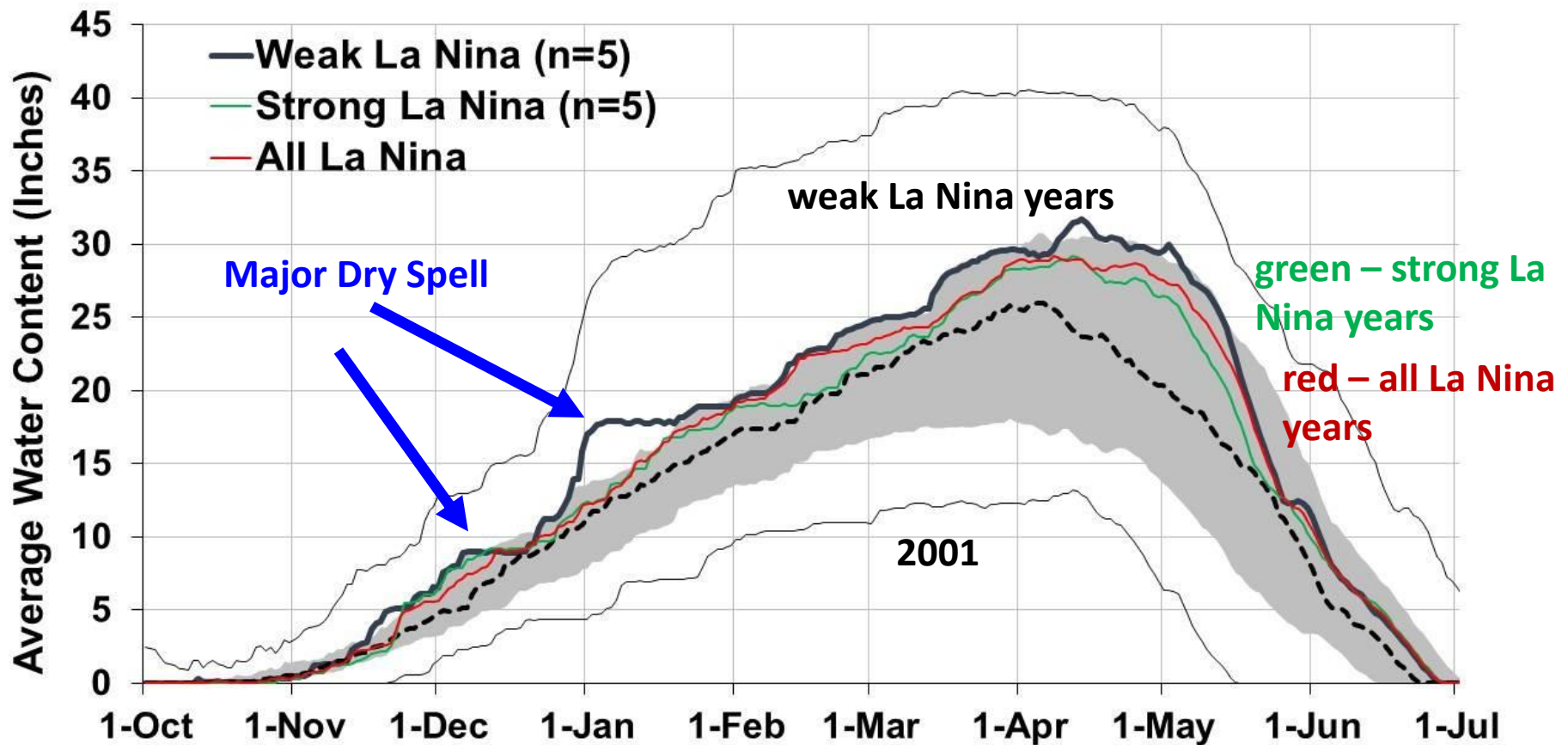
The black dashed line is a "normal snowpack", while **darker line represents weak La Nina years**, green – strong La Nina years, and **red – all La Nina years**.

13 total La Nina events since 1982 - snowpack was above normal 12 of those 13 years in the Boise River basin.

Weak La Nina's appear to produce the most snow, **with the median snowpack during 5 La Nina events hovering around or above the 75th percentile.** **Danny Tappa**

2017-2018 Winter Synopsis   Posted: 24 Nov 2017 06:48 PM PST

To Summarize:

- Currently expecting a cooler than normal winter for the far northern Plains and Upper Midwest into New England as a result of the negative PDO and La Nina.

- Wetter than normal conditions likely for the Ohio Valley and eastern Midwest, with drier than normal conditions expected to prevail in the Southeast, Gulf Coast and Deep South.

- The La Nina & negative PDO combination should dictate the broader weather pattern through the winter, with warmer waters in the Bering Sea encouraging meridional flow in the Pacific, **and likely an active Pacific jet.**
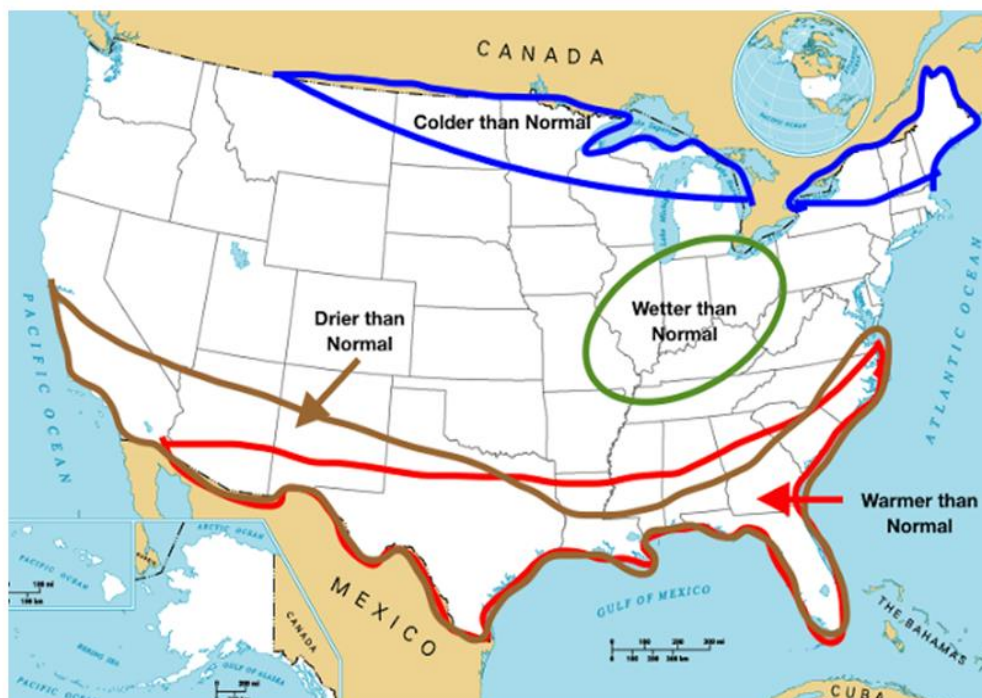
Graphical Forecast

Long-Range Forecast: November 24th - December 21st, 2017 Posted: 24 Nov 2017 02:42 PM PST

This is a long-range forecast for the November 24th thru December 21st, 2017.

To Summarize:
- Warmer than normal conditions are expected for the majority of the country through the end of November and the first week of December.

- Colder than normal conditions may present themselves in the Eastern U.S. by the second week of December with the emergence of a ridge in the Arctic Circle, **but a strong Pacific jet stream may not permit this cooler weather to stay for a prolonged period of time.**

Andrew

2017-18 Winter Outlook Matthew Holliday | November 12, 2017 |

Brief Forecast Discussion:

300 mb Jet Stream — GFS Analysis for 06Z 14 DEC 2017

Wnd Spd: knots   06Z 14 DEC 2017

X

**My House
Today's Jet Stream**

2017-18 Winter Forecast

1. Active & Cold
2. Avg. to above Avg. Snow/Cold
3. Avg. Precip. / Avg. to Above Avg. Precip.
4. Dry/Above Avg. Temps.
5. Brutal Cold/Snowy — Avg. to Below Avg. Temps./Avg. Precip.
6.
7. Avg. Temps./Precip.
8. Battle Zone
9. 1 to 2 Winter Storm Chances / Slightly Above Avg. Temps.
10. Slightly Above Avg. Temps. Dry
11. Temps. Will Fluctuate A Lot

FirsthandWeather.com – Matthew Holliday

Figure 3: Firsthand Weather's official 2017-18 Winter Outlook

This winter is probably going to be characterized by a lot of volatility in the pa[...]
regions 8, 9, and 11. We've already seen quite a bit of that this month (Nove[...]

2017-2018 Winter Outlook

2017-2018 Snow Outlook

A: Below Av. Snow
B: Av. Snow
C: Ice Threat
D: Snowy
E: Frequent Snow
F: Well Ab. Av. Snow
G: Above Av. Snow
H: Heavy Mnt. Snow

FirsthandWeather.com
Christopher Nunley

THE IDAHO DAILY SNOW

by **Meteorologist Coleen Haskell**

Coleen has 30 years of weather forecasting experience as a meteorologist with the Air National Guard, the National Weather Service, and the Bureau of Land Management. She currently lives in Boise, Idaho and spends as much time as possible skiing (alpine and nordic) as well as biking and hiking.

Groundhog Day...Not Much Longer

by Meteorologist Coleen Haskell
1 hour ago

Summary

Although we will see a few high clouds streaming in on Wednesday, there's no significant change in the weather pattern until late Friday. Basically, it's deja-vu until this weekend when a weak storm system will arrive from the Gulf of Alaska. After that, we will start to open the gate for the snow train that will be pushing in for an epic January. Details to come later this week.

After that, we will start to open the gate for the snow train that will be pushing in for an epic January.

It appears, Idaho farmers & water users are in good shape for the 2018 irrigation season.

This is based on:
- **good baseflows**
- **good reservoir storage**
- **2018 weather outlooks**
- **very early streamflow forecasts**

Shortages are not expected at this time.

Reservoir releases may / will be needed depending upon future weather patterns after this dipole pattern changes.

Links to snow survey data, water supply products and analysis tools

http://www.id.nrcs.usda.gov/snow/

Climate and Soil Moisture

> Climate Summaries by County
> Soil Moisture & Temperature Graphs

Site Information

Data site locations, maps, descriptions, etc...

Additional Snow Survey Information

> Idaho Snow & Water Supply News ↗
> Related Links
> FTP Site
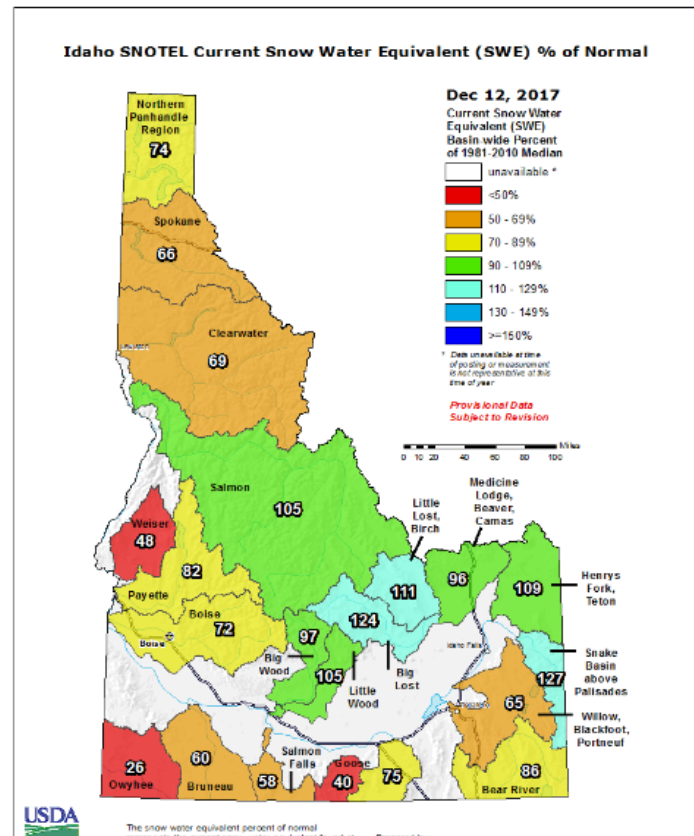> Frequently Asked Questions
> Contact Idaho Snow Survey

Attention Educators:

> You Tube Video "The Boise River: From Snow, to River to You" ↗
> Adopt-a-SNOTEL Teacher's Manual PDF (10.5 MB)

Current Snowpack and Precipitation Conditions

Links to snow survey data, water supply products and analysis tools

http://www.id.nrcs.usda.gov/snow/

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

Extra slides

nature
climate change

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home ▸ archive ▸ issue ▸ commentary ▸ full text ▸ figure 1

Figure 1: Dipole pattern from one extreme to the other.

a 2016–2017 flooding in California

250-hPa geopotential height anomalies
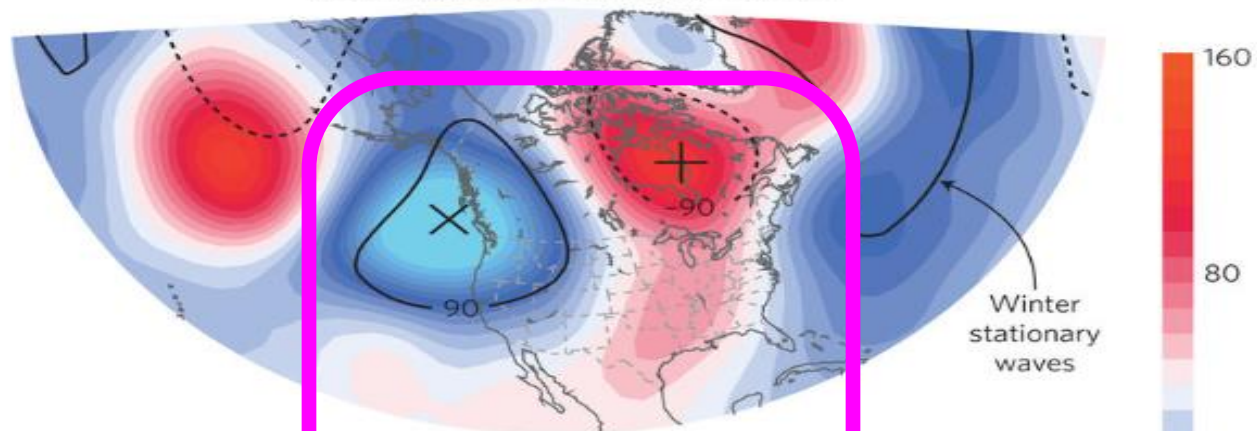
b 2013–2014 drought in California
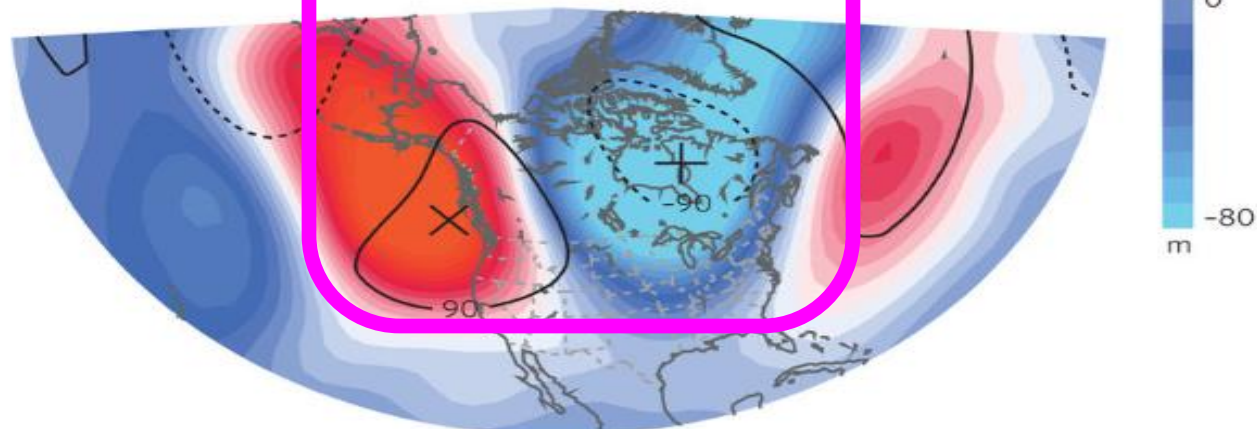
NOAA December Outlook Temperature — Made 30 Nov 2017 Precipitation
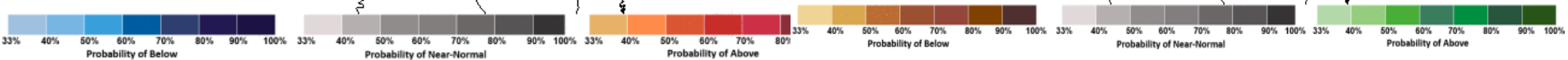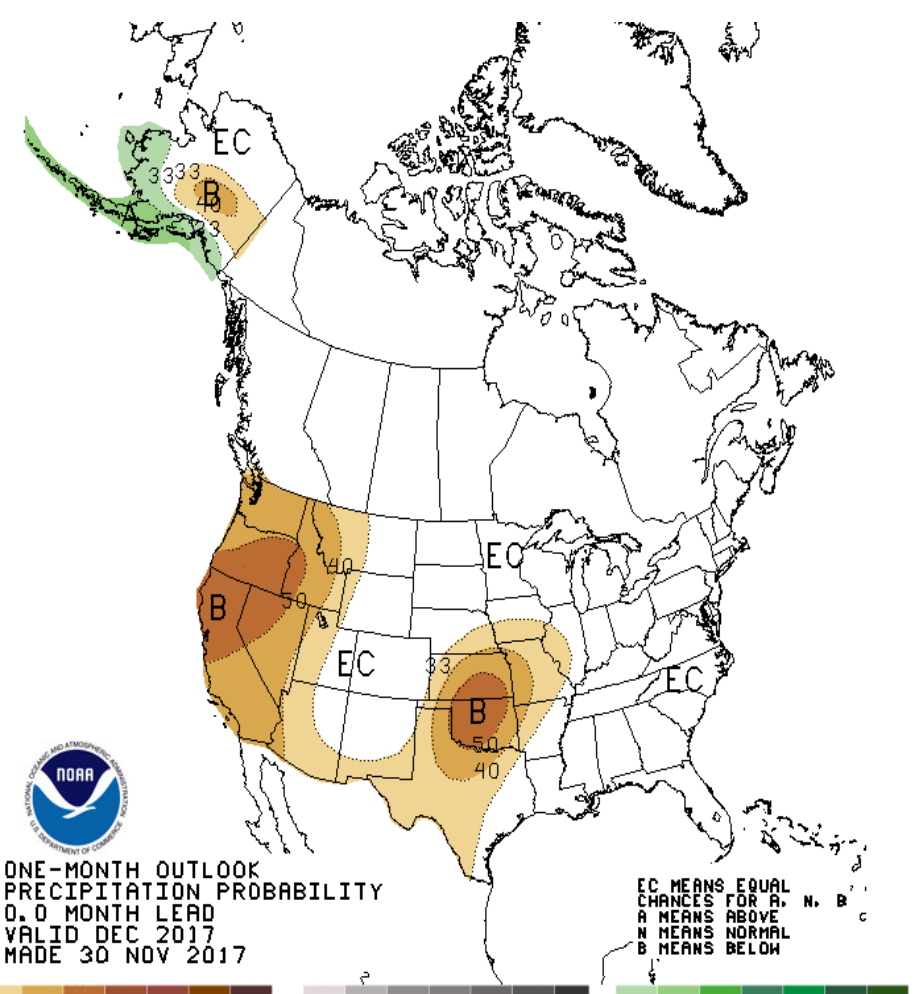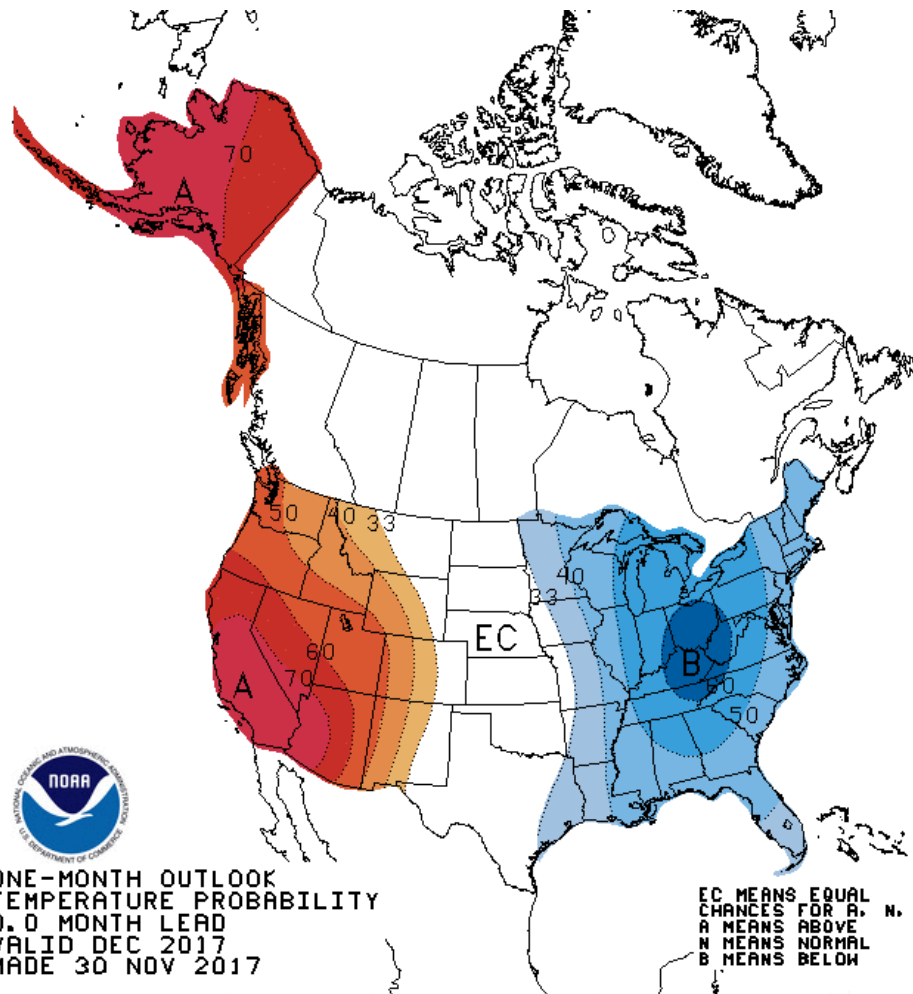
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RECOMMENDED RESORTS

After that, we will start to open the gate for the snow train that will be pushing in for an epic January.

Salmon Falls Basin April 1 SWSI
with Adequate Irrigation Supply & Surplus Threshold

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

StreamFlow Apr-Sep
Reservoir 31-Mar

2017 Observed Runoff 119 KAF + 111 KAF = 230 KAF

Surplus Above 180 KAF

Adequate Irrigation Supply Above 110 KAF

110 KAF needed
- 97 KAF March 31 Storage
_____
13 KAF Apr-Sep Runoff Needed, 15% of avg

Sep 30 Storage is 93 KAF projected to 97 KAF for March 31

Last year:
2017 Mar 31 Storage 111 KAF

Bear River April 1 SWSI
with Adequate Irrigation Supply
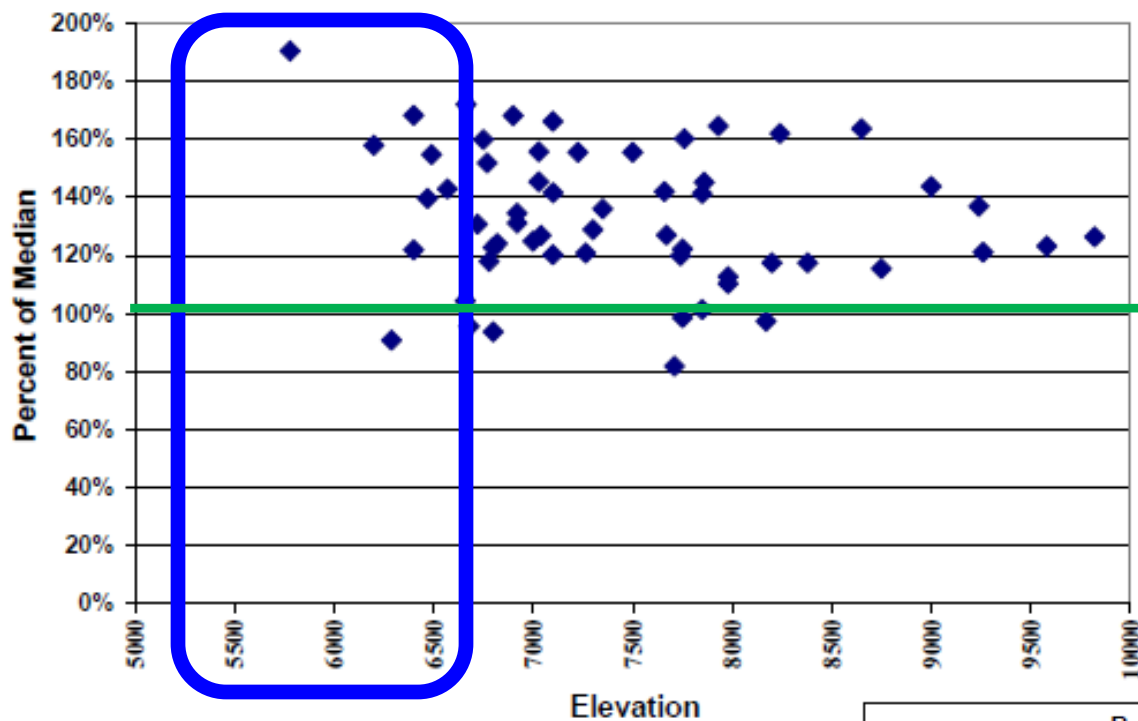
Apr 1 Historic and Forecasted Surface Water Supply
Bear River Basin

StreamFlow Apr-Sep
Reservoir 31-Mar

2017 Observed Runoff 541 KAF + 664 KAF = 1,205 KAF

Adequate
Irrigation
Supply
Above 280
KAF

280 KAF needed
-245 KAF in reservoir
that can be used
_____
35 KAF Apr-Sep Runoff
Needed, 17% of avg

Sep 30 Storage
1,115 KAF projected to
1,000 KAF for March 31

Last year:
2017 Mar 31 Storage
664 KAF

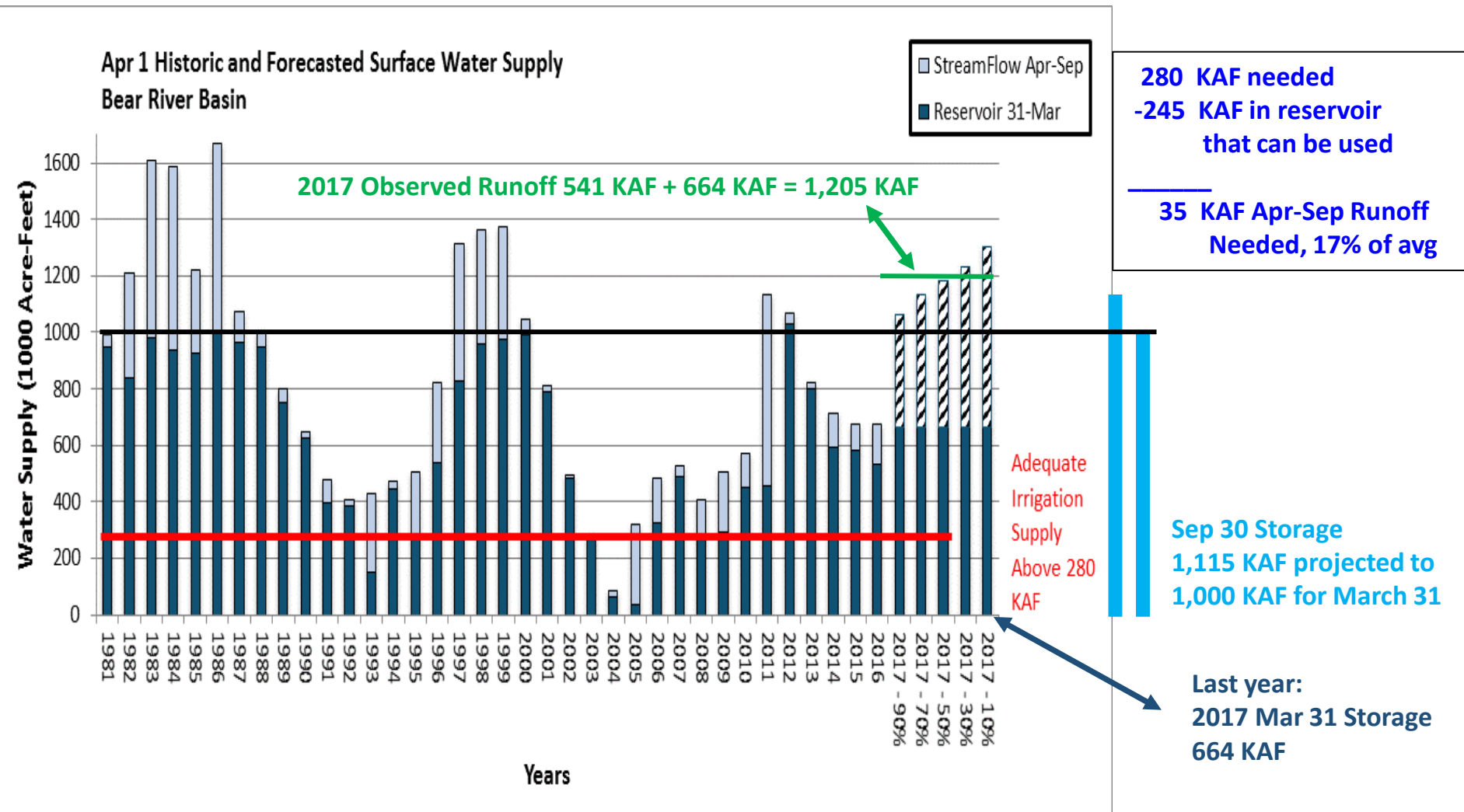Upper Snake Basins Snowpack February 1, 2017

Bear River Basin Snowpack February 1, 2017

December & January brought cold temps & heavy valley snowfall across most of Idaho

State wide trend: lower elevation sites were well above median in January.

Exception is Bear River

Highway Worship Center of the Assemblies of God

WHOEVER IS PRAYING FOR SNOW STOP

Apr 1 Upper Snake snowpack similar to 2014 & 2011
10th highest based on 17 station index that starts in 1961

April Snake River Basin abv Heise 17 Station Snow Index for Years 1961 - 2017
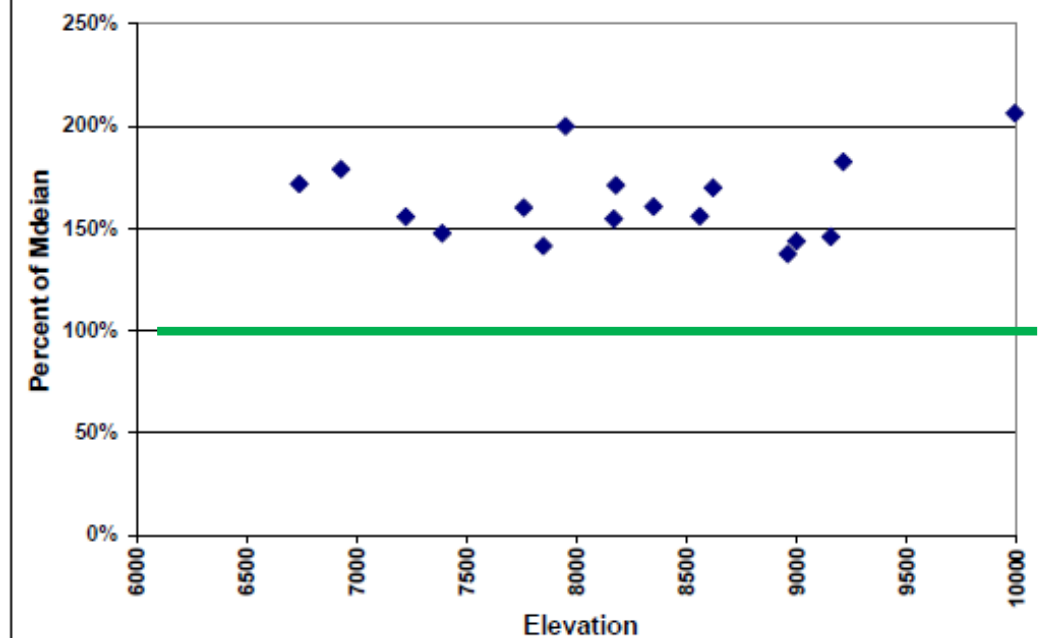Grassy Lake, Lewis Lake Divide, Snake River Station, Thumb Divide, Two Ocean, Base Camp, Blind Bull, Cottonwood, East Rim, Granite Crk, Gros Ventre, Loomis Park, Phillips Bench, Salt River Summit, Spring Crk, Togwotee Pass, Willow Crk

Legend:
- April 1 Snow Water
- Apr 1 1981-2010 Median 21.6

USDA
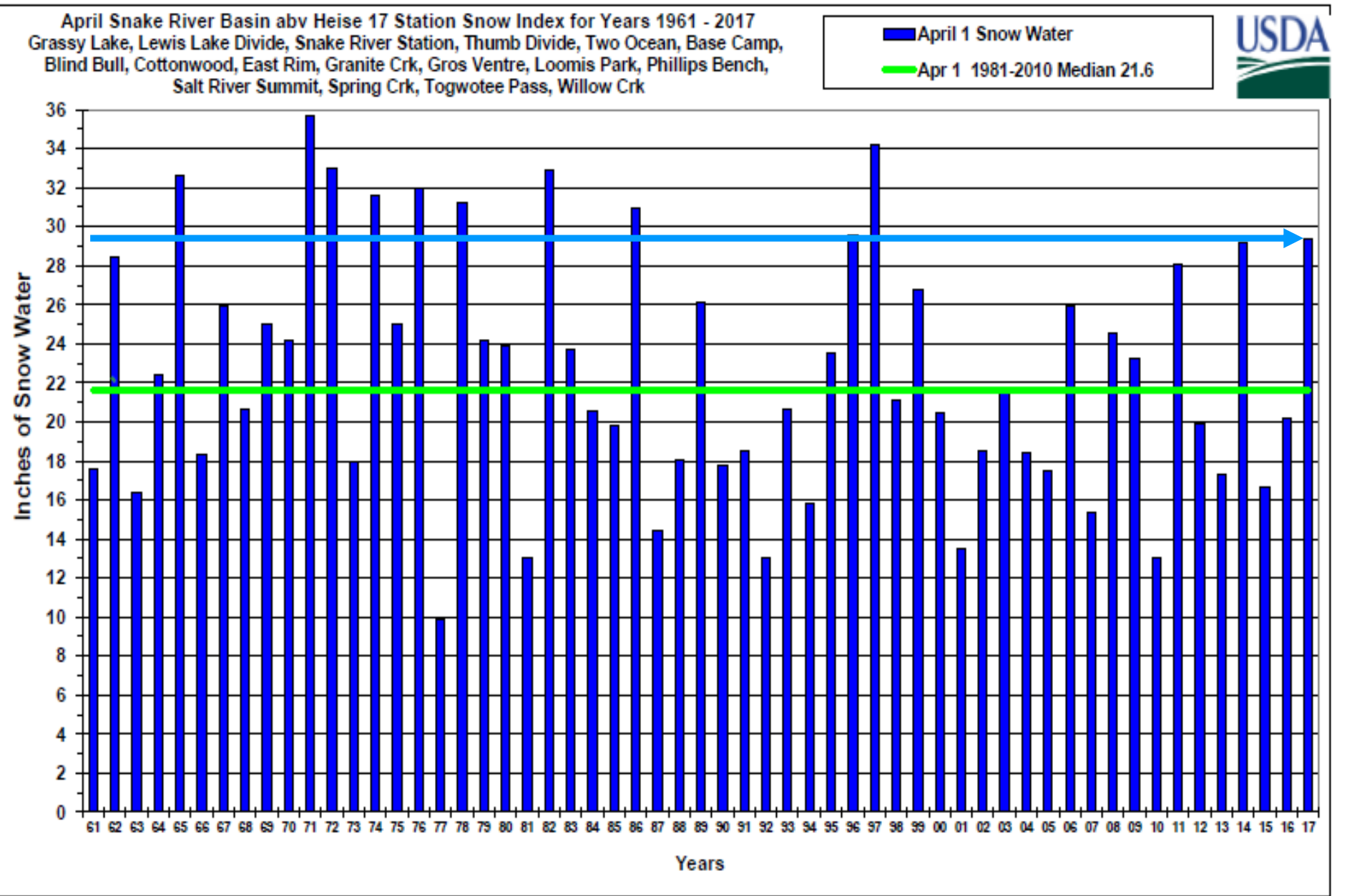
2017 Runoff & 2018 Amount of Runoff Needed for Adequate Irrigation Supply

ENSO Classification
SE Strong El Nino - EN Mild El Nino - N Neutral - LN Mild La Nina - SL Strong La Nina

Rank		Year	Ens o	Flow Apr-Sep	Reservoir 31-Mar	ow + Reservoir Sum	Exceedance Probabili	SWSI
1		1997	N	7009	949	7958	97%	3.9
2		2011	SL	6343	1493	7836	95%	3.7
3		2017	LN	6116	999	7114	92%	3.5
4		1986	N	6054	962	7016	89%	3.3
5		1996	N	5584	1314	6898	87%	3.1
6		1982	N	5772	1064	6836	84%	2.9
7		1983	SE	5008	1740	6748	82%	2.6
8		1984	N	5046	1654	6700	79%	2.4
9		2009	N	4610	1759	6368	76%	2.2
10		1999	SL	4947	1311	6258	74%	2.0
11		1998	SE	4495	1632	6127	71%	1.8
12		1995	SE	4442	1041	5483	68%	1.5
13		2014	N	4534	864	5458	66%	1.3
14		2006	N	4076	1264	5340	63%	1.1
15		2008	N	4286	989	5275	61%	0.9
16		2012	LN	3384	1780	5164	58%	0.7
17		2015	EN	3204	1896	5101	55%	0.4
18		2010	EN	3106	1880	4986	53%	0.2
19		2000	N	3057	1846	4903	50%	0.0
20		1981	N	2912	1955	4867	47%	-0.2
21		1993	EN	4113	735	4848	45%	-0.4
22		1985	N	3490	1335	4825	42%	-0.7
23		1989	SL	3866	889	4755	39%	-0.9
24		1990	N	2806	1755	4561	37%	-1.1
25		2016	SE	3009	1550	4559	34%	-1.3
26		1991	N	3354	1131	4485	32%	-1.5
	2018 Amount Needed		LN	2500	1900	4400	26%	-2.0
27		1994	SE	2318	2023	4341	29%	-1.8
28		2007	EN	2309	1815	4124	26%	-2.0
29		2005	EN	3193	864	4057	24%	-2.2
30		2013	N	2719	1327	4046	21%	-2.4
31		1987	N	2547	1482	4029	18%	-2.6
32		2003	EN	2923	924	3847	16%	-2.9
33		1988	SE	2647	1060	3707	13%	-3.1
34		1992	EN	1998	1684	3682	11%	-3.3
35		2004	N	2833	793	3626	8%	-3.5
36		2002	N	2774	743	3517	5%	-3.7
37		2001	LN	1964	1414	3378	3%	-3.9

Ocean temperatures for Winter 2013-14 with the Blog

1/ 27/2014

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 1/2/2014
(white regions indicate sea-ice)