Winter 2016-2017 Climate Forecast

Oregon AMS and OMSI, Portland, OR

Kyle Dittmer

Hydrologist-Meteorologist

Columbia River Inter-Tribal Fish Commission
Portland, Oregon

Professor of Earth Science

PCC – Southeast Campus, Portland, Oregon

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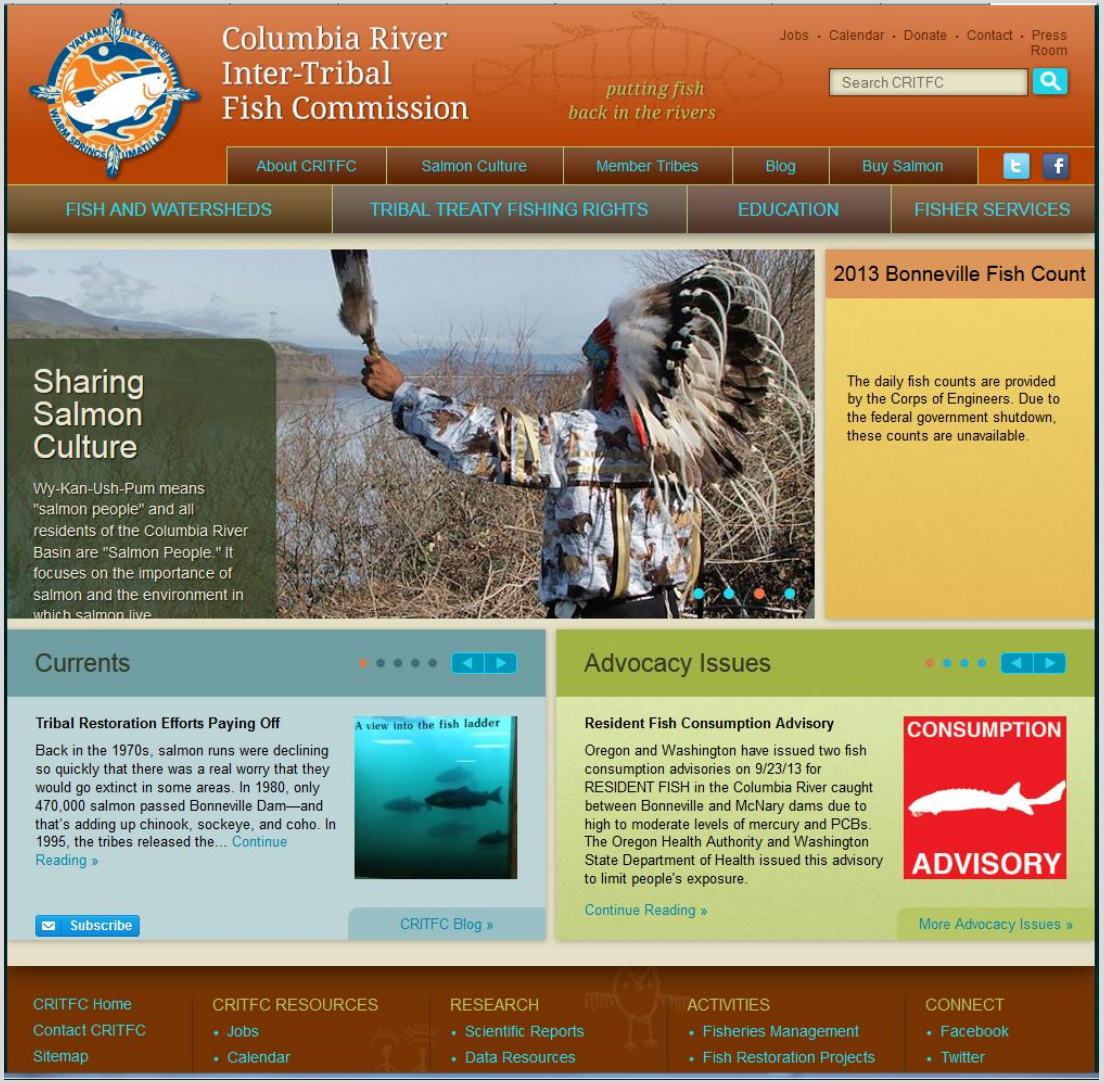
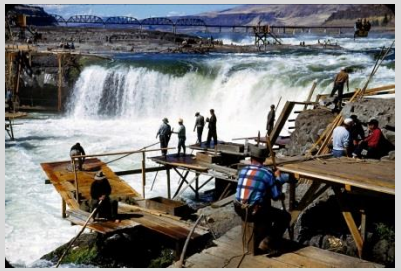
Columbia River Inter-Tribal Fish Commission - CRITFC





CRITFC website, http://www.critfc.org

2015-2016 Portland Climate Forecast Performance

Month:	Temperature (mean monthly):	Avg. (n=20)	Observed	Precipitation (% normal):	Avg. (n=20)	Observed
November	Near Normal (-1.8 to + 1.8 degF)	1	-0.1	Below Normal (70 - 90%)	77%	81%
December	Near Normal (-1.8 to + 1.8 degF)	1	2.7	Near Normal (90 - 110%)	103%	276%
January	Near Normal (-1.8 to + 1.8 degF)	1	1.5	Near Normal (90 - 110%)	96%	155%
February	Near Normal (-1.8 to + 1.8 degF)	1	5.2	Below Normal (70 - 90%)	86%	103%
March	Near Normal (-1.8 to + 1.8 degF)	1	2.1	Below Normal (70 - 90%)	89%	132%
	average:	1.0	**+2.5**	average:	90%	**149%**

…but what about Snow events?!

Forecasted two events…one moderate and one minor (2-inch seasonal total), December to January.

Observed two snow events (Dec. 29, Jan. 3-4)…a 2-inch seasonal total. ☺

2015-2016 Government Camp Climate Forecast Performance

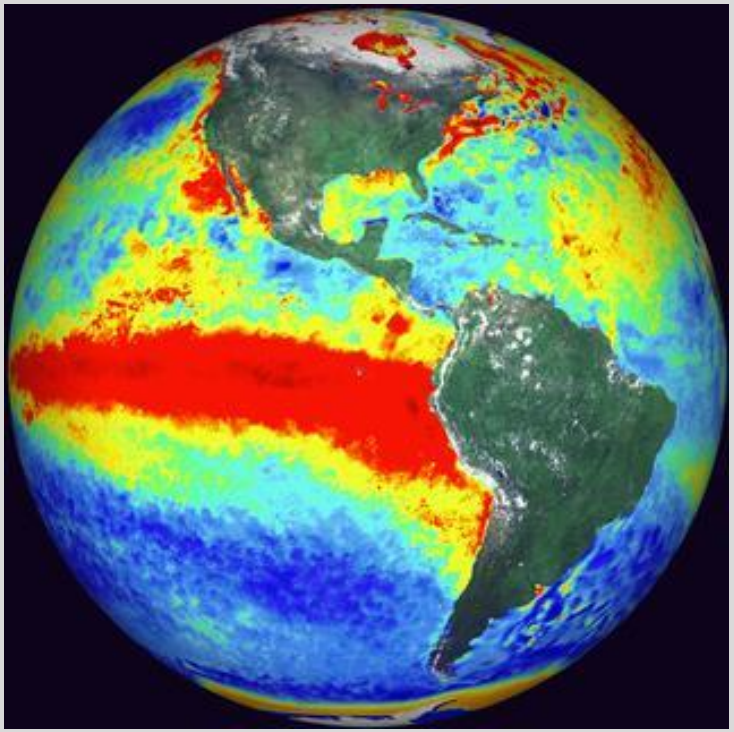
GOV. CAMP	Monthly avg (n=20)							
Month:	Temperature:	**Observed**	Precipitation:	**Observed**	**Snowfall**	**Observed**	Forecast	**Observed**
November	0.3	**-1.1**	128%	**98%**	23	10	65%	28%
December	0.5	**0.2**	97%	**144%**	36	74	74%	153%
January	2.5	**0.3**	103%	**75%**	43	25	95%	55%
February	2.3	**4.4**	115%	**88%**	28	16	81%	46%
March	1.5	**0.1**	107%	**123%**	36	43.5	108%	131%
April	0.8	**6.5**	95%	**54%**	22	6	97%	27%
May	0.5	**2.7**	106%	**83%**	4	0.5	84%	6%
average:	1.2	**1.9**	107%	**95%**	192	175	86%	64%

Water Supply Forecast (MEI method): Columbia R. at The Dalles, Jan.-July:

92 MAF (issued Oct. 2015), 90%. Observed: 97 MAF. Error ±5%.

95 MAF (issued April 2016), 94%. Observed: 97 MAF. Error ±2%.

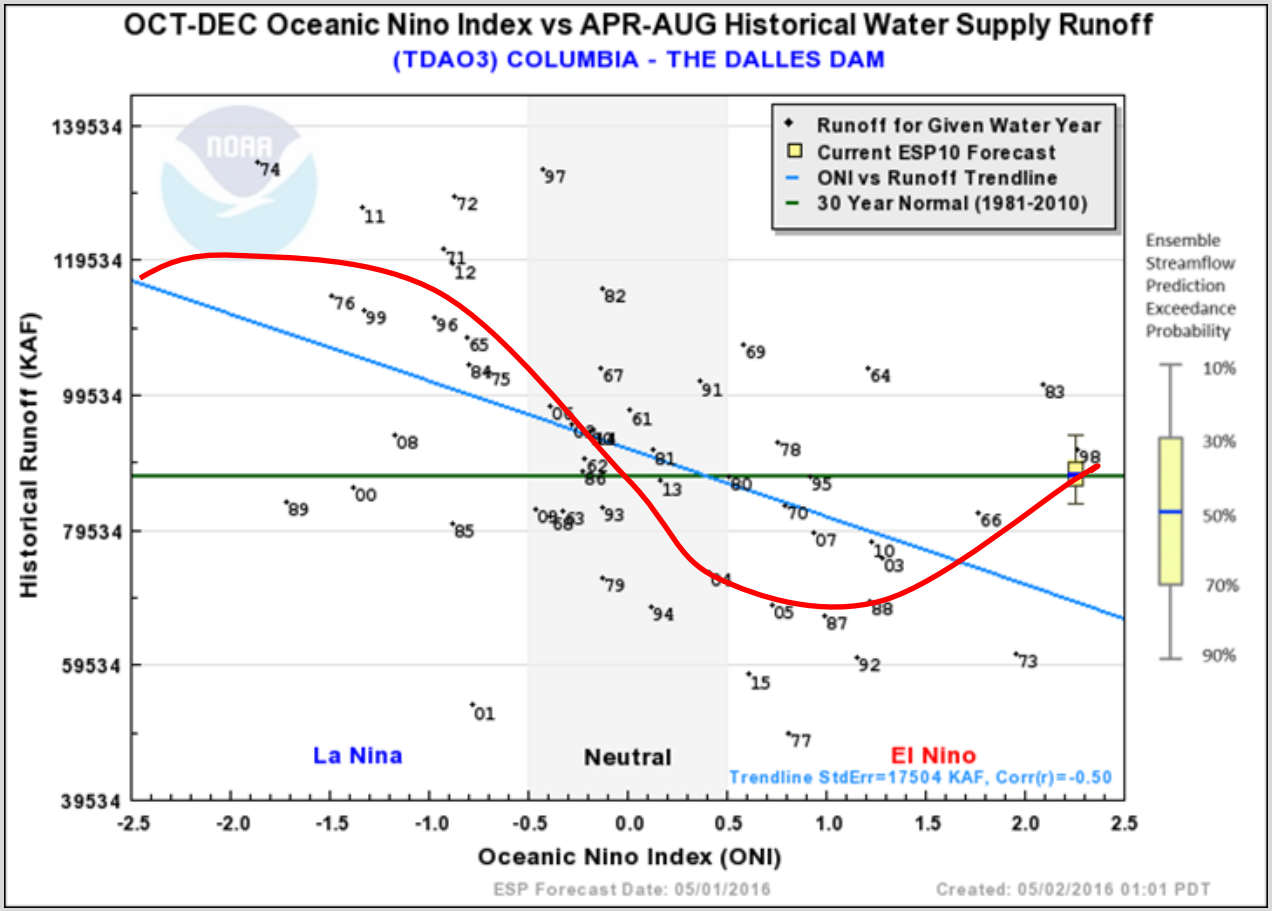
THE GODZILLA EL NIÑO!



…but did we get "stomped" on?

Here is a new analysis to share…

ENSO vs. RIVER FLOW VOLUME



- Strong ENSO events act differently than moderate and weak events.
- Ocean and/or land impacts are *non-linear* in nature!
- More *extreme outlier* years in the last 20-years.

Introduction – Methods

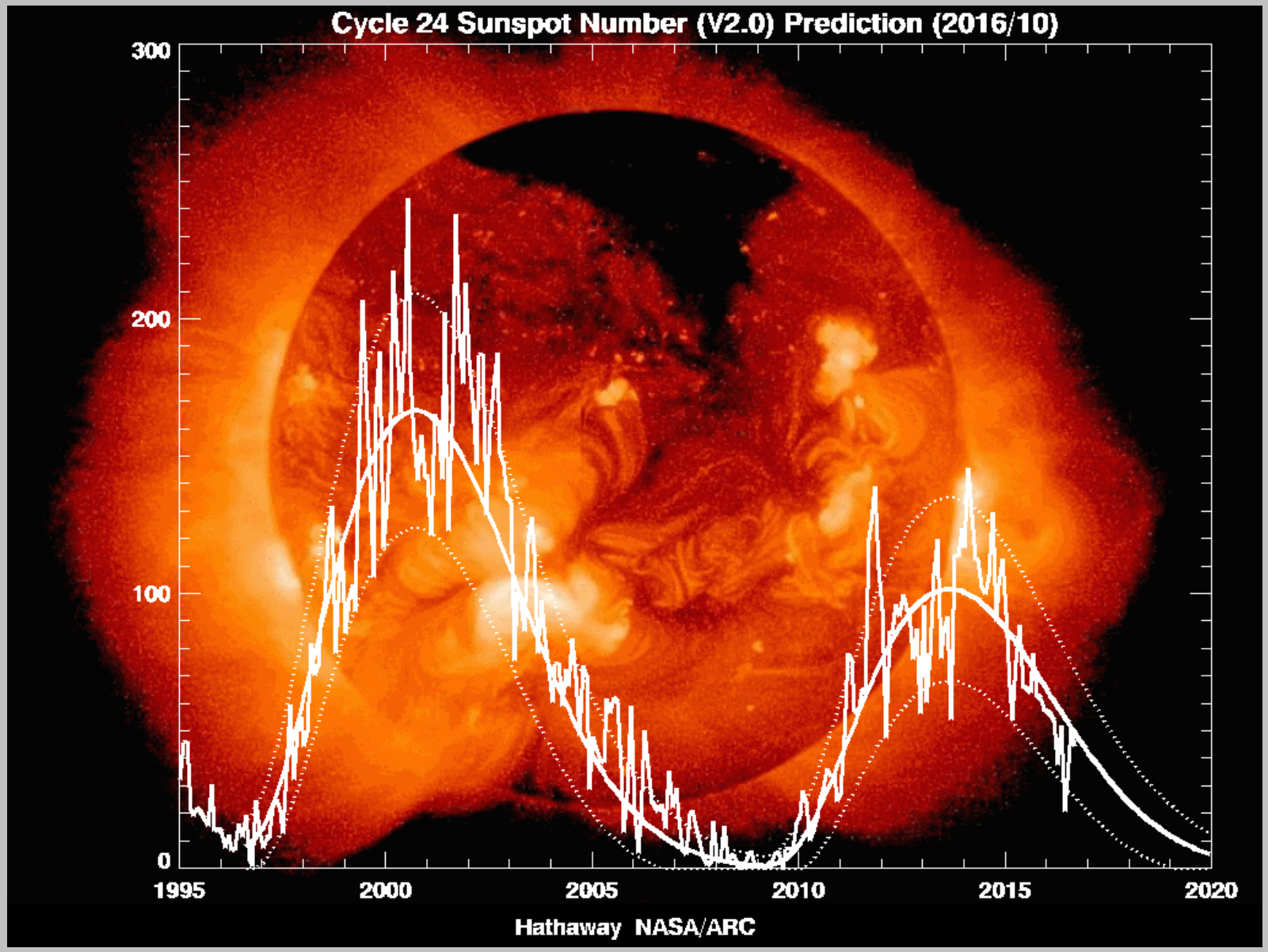
- CRITFC forecast uses a holistic, integrated big picture view.
- Big-picture: **Solar Forcing** (e.g., sunspot cycles) does influence our global weather patterns. *In memoriam:* Dr. Landscheidt, 1922 – 2004, of Germany.
- Track ENSO with the Multi-variable ENSO Index: **MEI**.
- NOAA's Sea-Surface Temperature Departure Forecasts.
- Hydro-Climate approach: Water year 2016 volume forecast uses regressed Multi-variable ENSO Index vs. historic runoff for the Columbia R. at The Dalles. Use a suite of 20 past water years.
- Select the "right" mixture of 20 past Water Years (next slide).
- Pattern recognition is key: both ***La Niña*** and ENSO-Neutral years.

Introduction – Methods

Ensemble forecasting – 20 past water years:

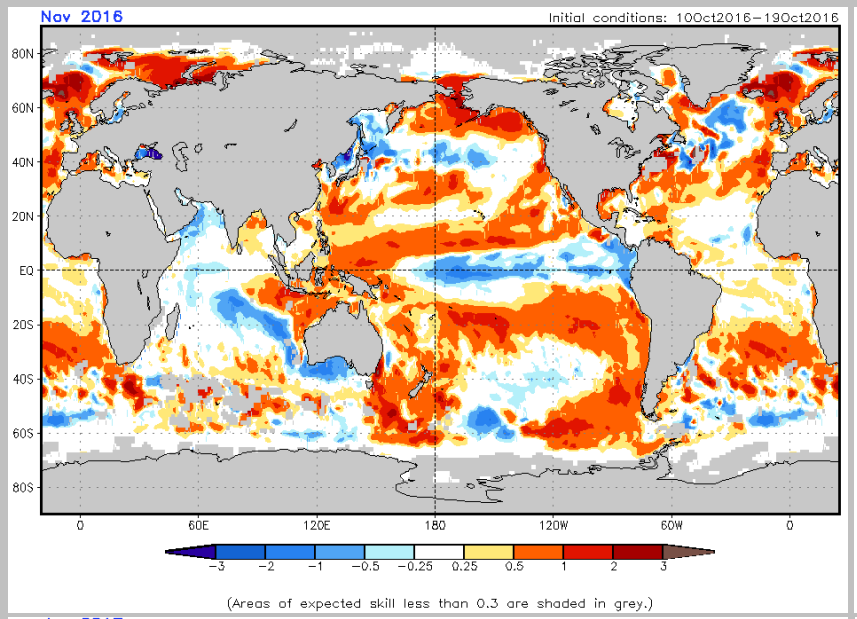
WY2017	TDA runoff	PDO-warm	PDO-cold	El Nino	E-neutral	La Nina
1932	106.7	x				X
1933	108.4	x			X	
1943	118.5	x				X
1953	106.8		x		X	
1956	141		x			X
1960	102.5		x		X	
1961	111.4		x		X	
1967	113.7		x		X	
1975	111.9		x			X
1981	104.5	x			X	
1982	134.9	x			X	
1984	123.7	x				X
1986	112.9	x				X
1989	93.2	x				X
1991	107.1	x			X	
1993	88.1	x			X	
1999	124.1		x			X
2006	114.7		x			X
2007	95.7		x		X	
2014	108.1		x			X
	(MAF)					
Average:	**111.4**		ElNino/LaNina transition:			8
STDEV:	12.5		ElNino/ENSO-N transition:			5

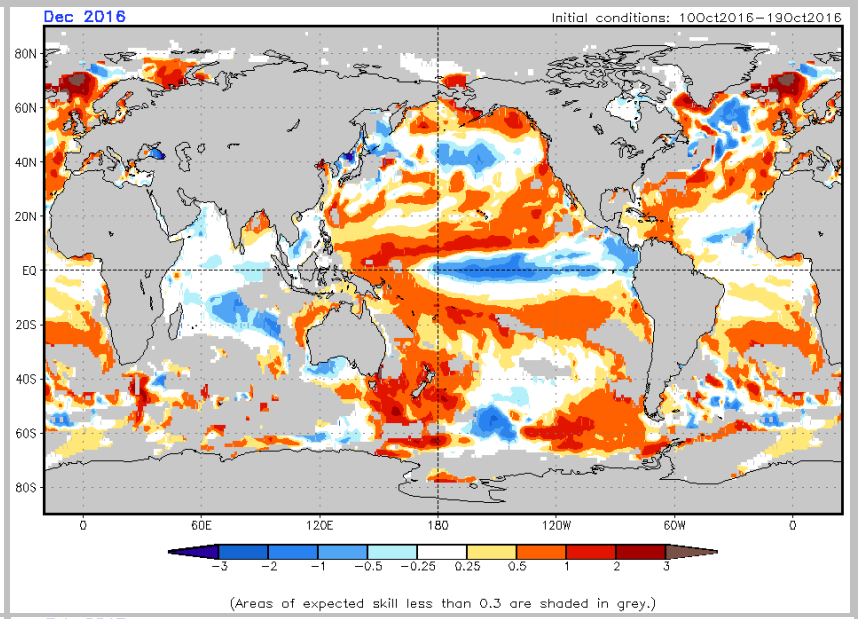
SUNSPOT COUNTS – "LA NIÑA"

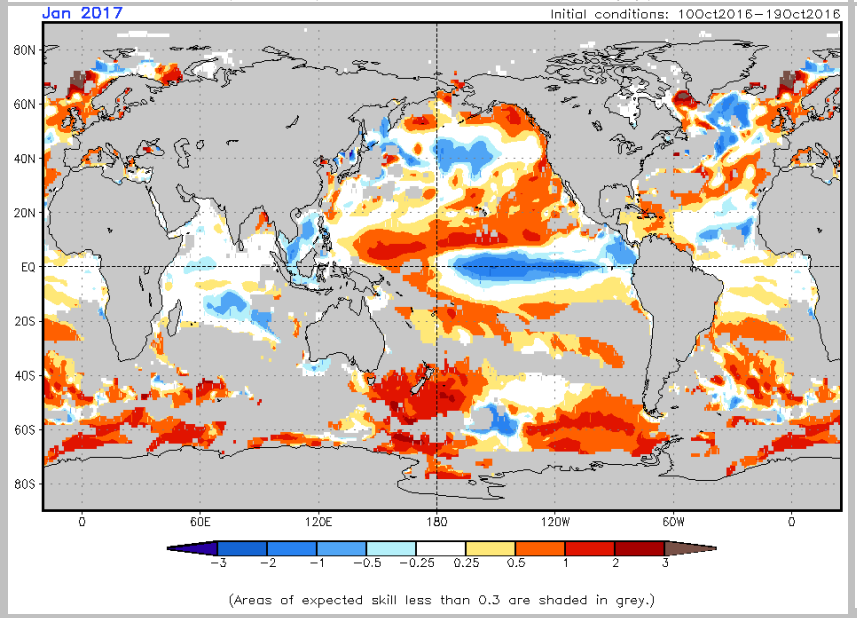


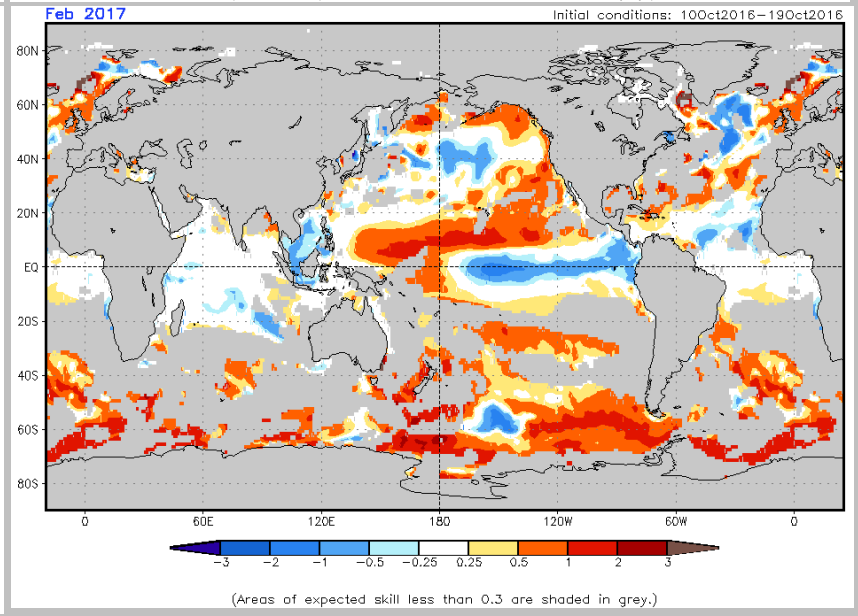
http://solarscience.msfc.nasa.gov/images/ssn_predict_l.gif

NOAA SEA SURFACE TEMPERATURES - "LA NIÑA"



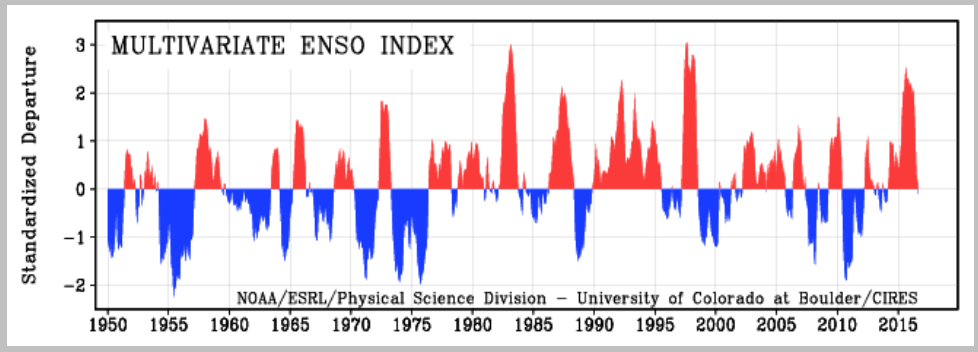


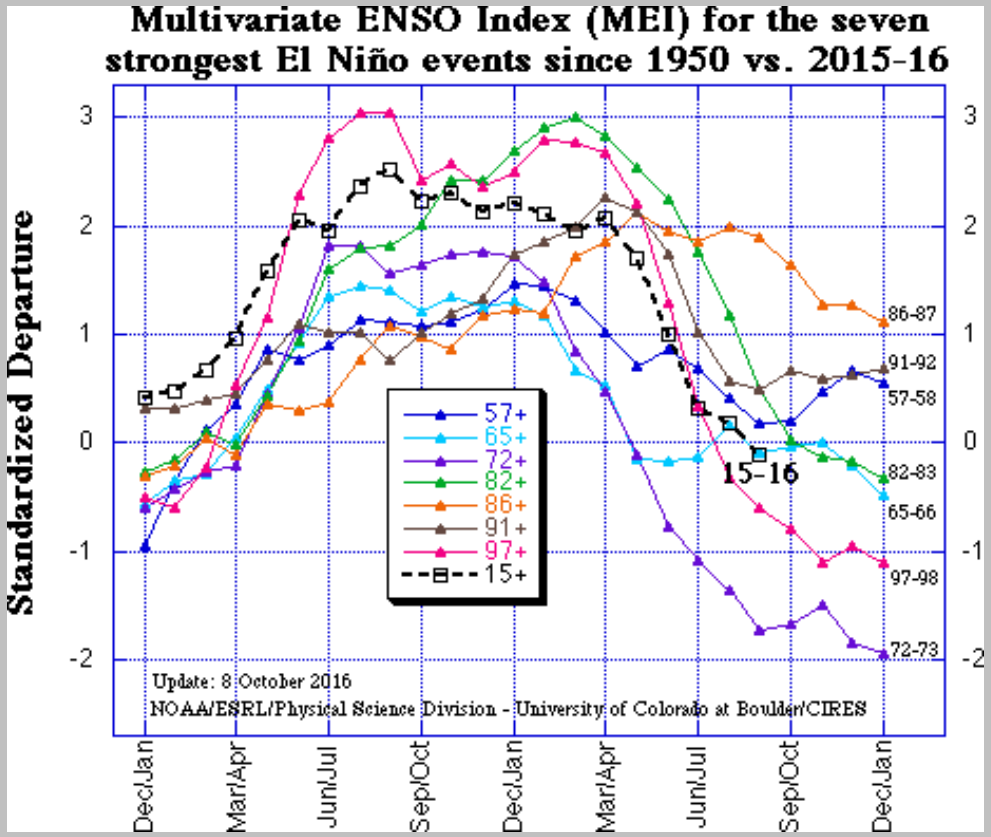




http://www.cpc.ncep.noaa.gov/products/CFSv2/htmls/glbSSTe3MonMask.html

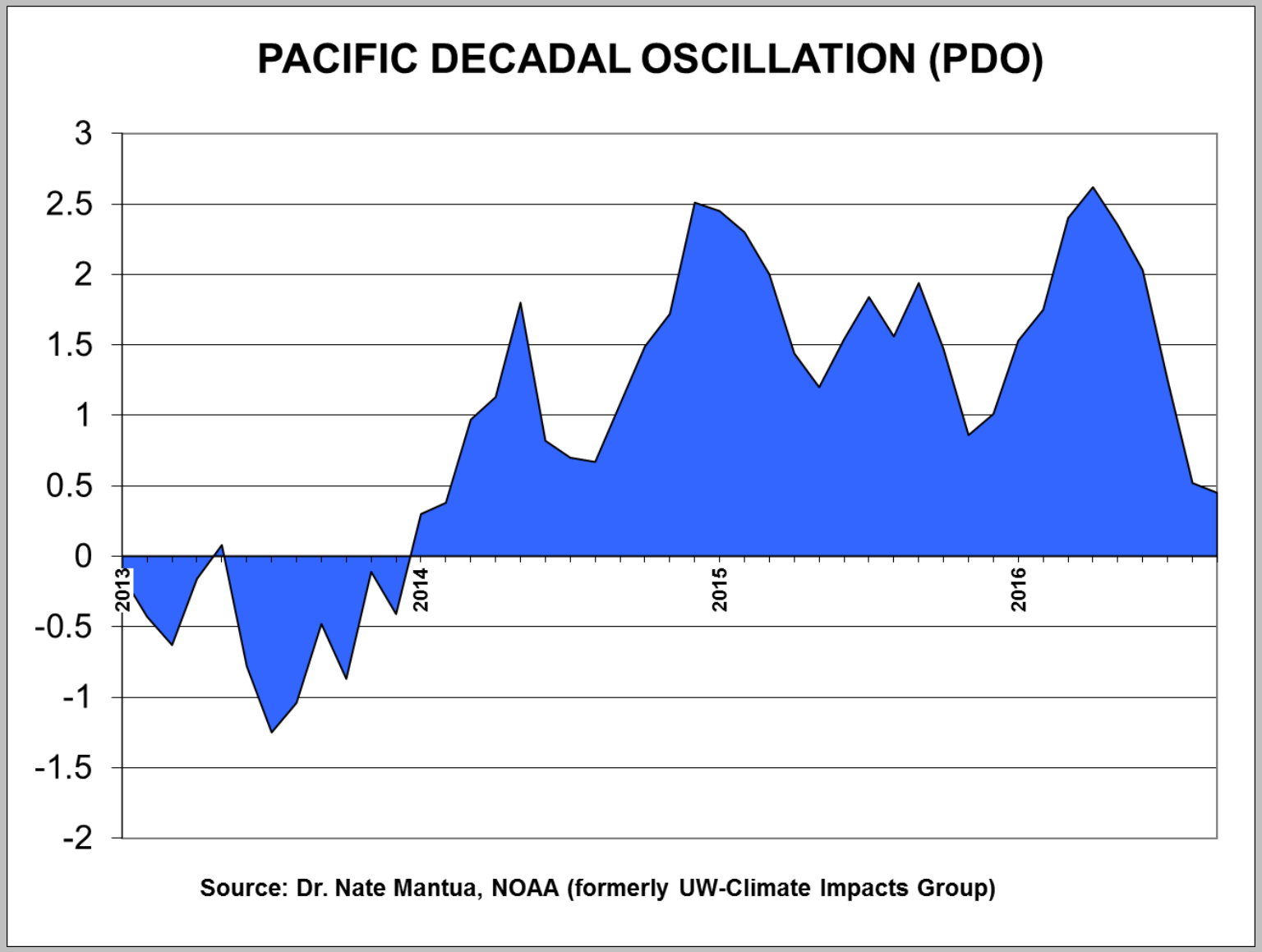
MEI SIGNAL SUGGESTS ENSO NEUTRAL OR "LA NIÑA"



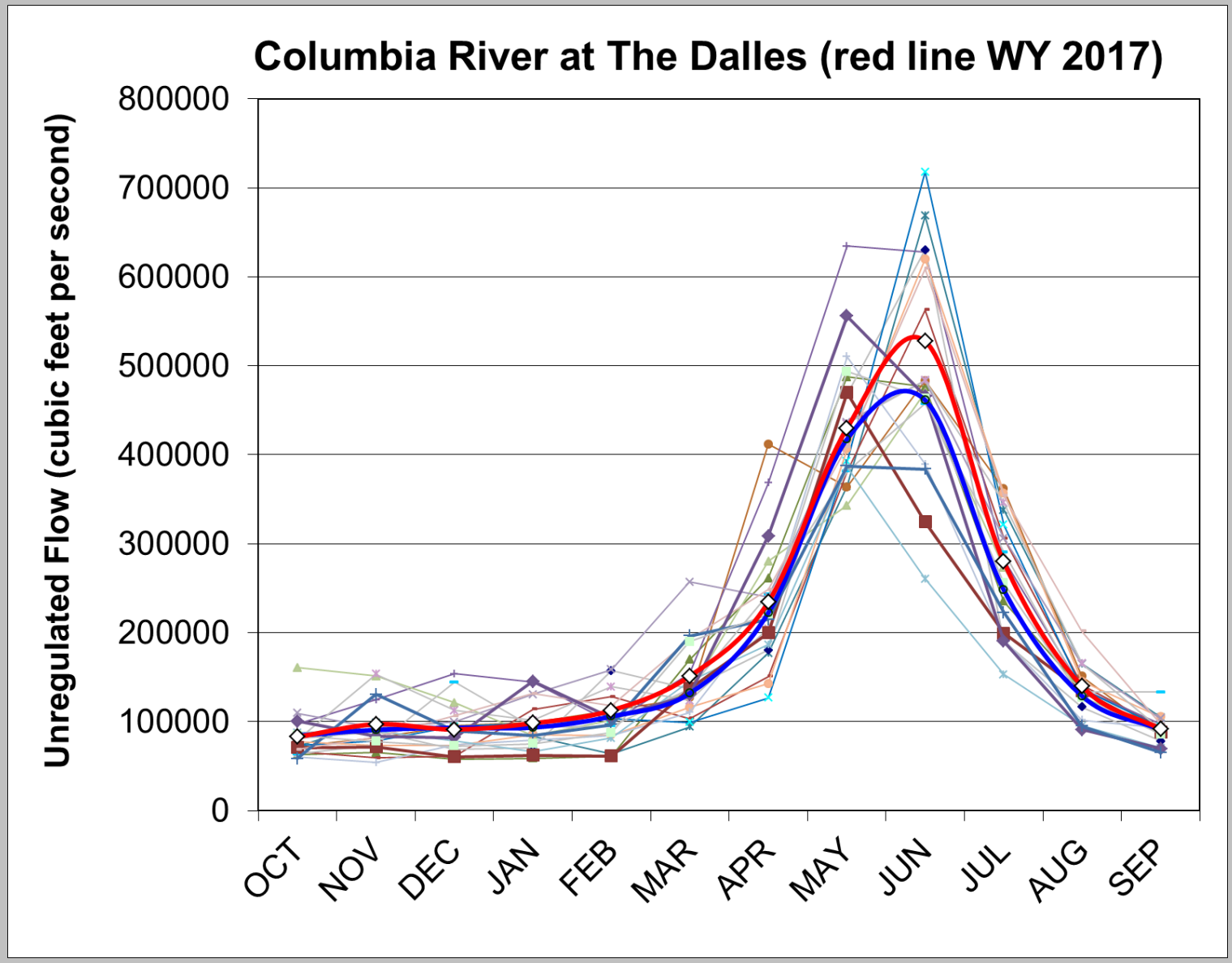


MEI tracks the Sea-Level Pressure, surface winds (2D), Sea-surface Temperature, Air Temperature, and fraction of Cloud cover.

PDO SIGNAL...THE COLD PHASE CONTINUES (however...)



ENSEMBLE STREAMFLOW FORECAST



Blue line = long-term average (WY 1929-2016)

Summary: A New Forecast

Hood River ☺

Month:	Temperature (mean monthly):	Avg. (n=20)	Precipitation (% normal):	Avg. (n=20)	Snow fall	% Normal
November	Near Normal (-1.8 to + 1.8 degF)	-0.4	Above Normal (110 - 130%)	123%	3	144%
December	Below Normal (< -1.8 degF)	-1.9	Near Normal (90 - 110%)	107%	11	133%
January	Above Normal (> + 1.8 degF)	2.2	Near Normal (90 - 110%)	101%	11	134%
February	Near Normal (-1.8 to + 1.8 degF)	-0.7	Above Normal (110 - 130%)	112%	6	97%
March	Near Normal (-1.8 to + 1.8 degF)	-0.1	Near Normal (90 - 110%)	108%	2	282%

Summary: the mountains

Government Camp

Month:	Temperature (mean monthly):	Avg. (n=20)	Precipitation (% normal):	Avg. (n=20)	Snow fall	% Normal
November	Near Normal (-1.8 to + 1.8 degF)	-1	Above Normal (110 - 130%)	128%	31	89%
December	Near Normal (-1.8 to + 1.8 degF)	-1.2	Near Normal (90 - 110%)	97%	47	98%
January	Near Normal (-1.8 to + 1.8 degF)	1.7	Near Normal (90 - 110%)	103%	50	109%
February	Near Normal (-1.8 to + 1.8 degF)	-1.3	Above Normal (110 - 130%)	115%	47	136%
March	Near Normal (-1.8 to + 1.8 degF)	0.1	Near Normal (90 - 110%)	107%	43	130%
April	Near Normal (-1.8 to + 1.8 degF)	-0.6	Near Normal (90 - 110%)	95%	25	112%
May	Near Normal (-1.8 to + 1.8 degF)	-0.9	Near Normal (90 - 110%)	106%	7	143%

Summary: The Portland Forecast

Month:	Temperature (mean monthly):	Avg. (n=20)	Precipitation (% normal):	Avg. (n=20)
November	Near Normal (-1.8 to + 1.8 degF)	-0.2	Above Normal (110 - 130%)	118%
December	Near Normal (-1.8 to + 1.8 degF)	-1.1	Near Normal (90 - 110%)	93%
January	Near Normal (-1.8 to + 1.8 degF)	1.6	Near Normal (90 - 110%)	102%
February	Near Normal (-1.8 to + 1.8 degF)	-0.7	Near Normal (90 - 110%)	98%
March	Near Normal (-1.8 to + 1.8 degF)	0.2	Above Normal (110 - 130%)	117%

EXPECT HIGH VARIABILITY –- INTENSE RAIN EVENTS, FREEZING RAIN, FLOODS, DRY SPELLS, etc.

WATER SUPPLY FORECAST: **111 MAF** or 109%, COLUMBIA RIVER AT THE DALLES, JANUARY - JULY.

…but what about Snow events?!

Expect Four events…two moderate (3-inch), two minor.

(85% - 90% likely), December through February.