Winter 2020-2021 Weather Forecast

TMT Year-End-Review Meeting

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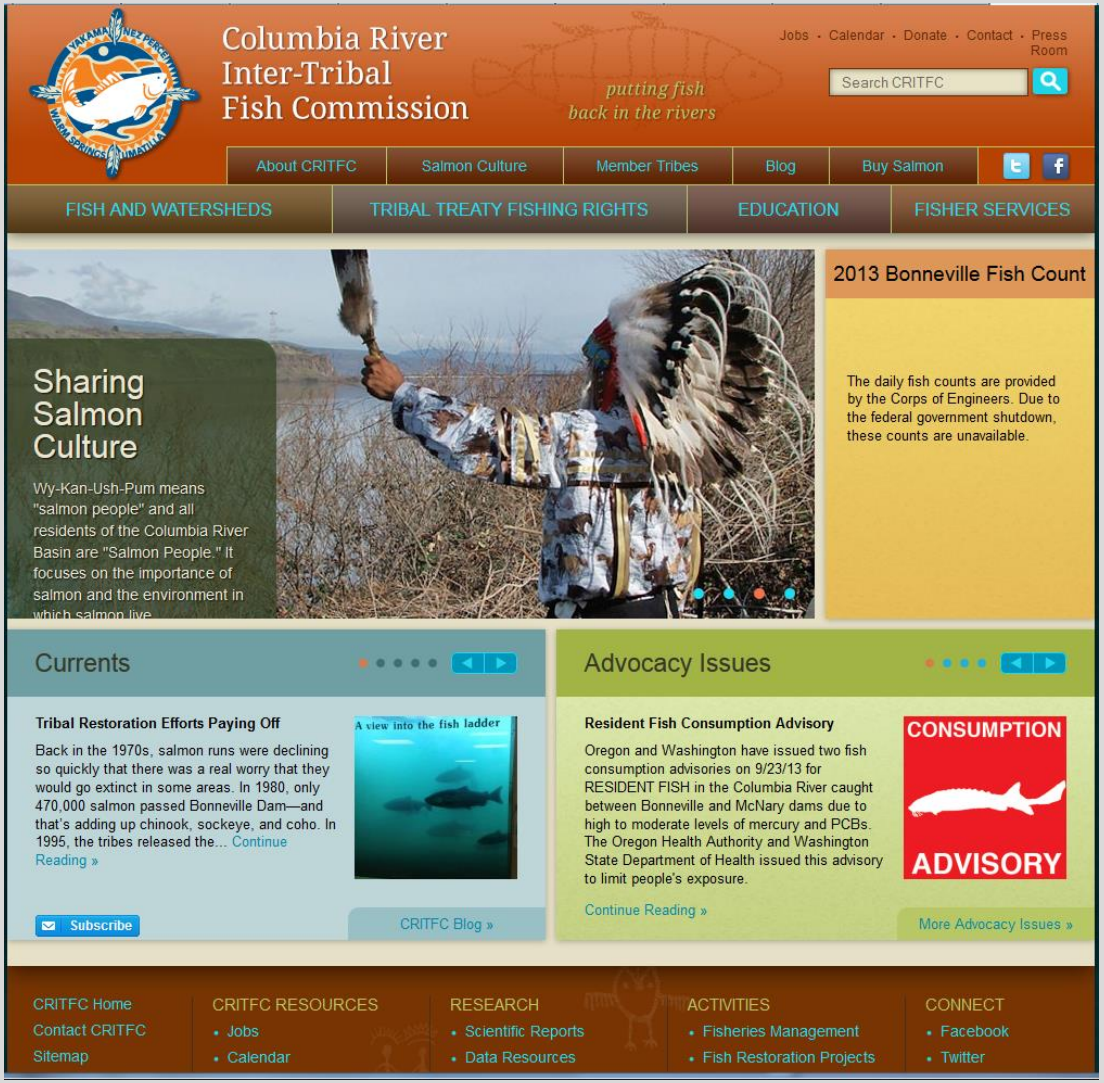
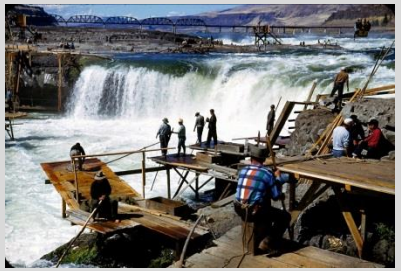
December 2nd, 2020

Columbia River Inter-Tribal Fish Commission - **CRITFC**





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

2019-2020 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)	-0.4	**1.5**	Near Normal (90 - 110%)	93%	**27%**
December	Near Normal (-1.8 to + 1.8 degF)	-0.2	**2.3**	Near Normal (90 - 110%)	94%	**79%**
January	Near Normal (-1.8 to + 1.8 degF)	1.1	**4.4**	Near Normal (90 - 110%)	106%	**155%**
February	Near Normal (-1.8 to + 1.8 degF)	0.5	**0.1**	Below Normal (70 - 90%)	83%	**42%**
March	Near Normal (-1.8 to + 1.8 degF)	-0.3	**-1.8**	Below Normal (70 - 90%)	88%	**66%**
	average:	0.1	1.3	average:	93%	74%

…but what about Snow events?!

Forecasted seven events… two moderate, five minor (7.5-inch seasonal total), November to March.

Observed only one snow event: March 14 (0.5-inch)… a **0.5-inch** seasonal total. ☹

2019-2020 Hood River Forecast Performance

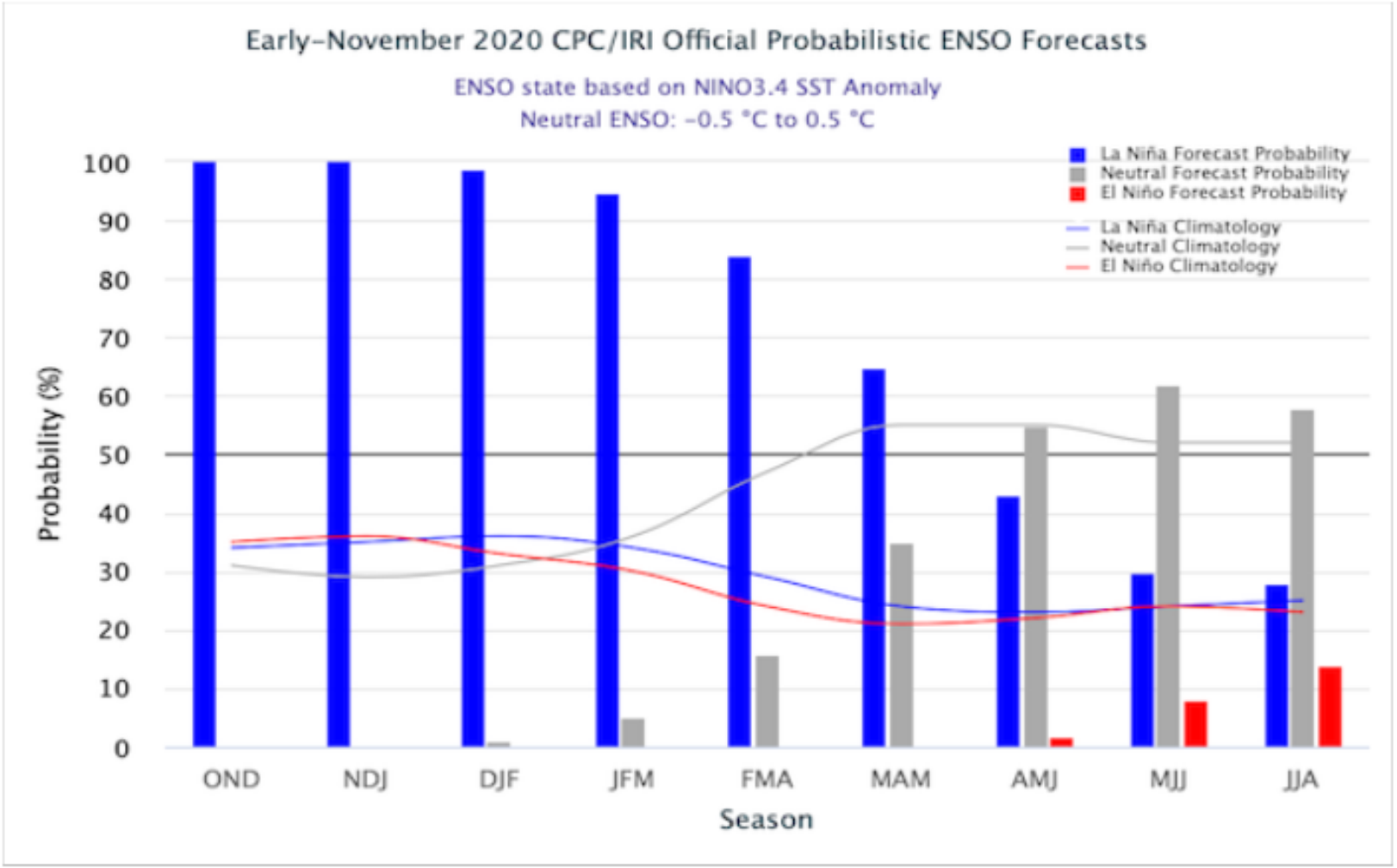
Month:	Temperature (mean monthly):	Avg. (n=20)	**Observed**	Precipitation (% normal):	Avg. (n=20)	**Observed**
November	Near Normal (-1.8 to + 1.8 degF)	-0.1	**-0.4**	Near Normal (90 - 110%)	109%	**14%**
December	Near Normal (-1.8 to + 1.8 degF)	-0.3	**2**	Near Normal (90 - 110%)	93%	**58%**
January	Near Normal (-1.8 to + 1.8 degF)	0.9	**3.5**	Near Normal (90 - 110%)	86%	**143%**
February	Above Normal (> +1.8 degF)	0	**3**	Near Normal (90 - 110%)	84%	**43%**
March	Near Normal (-1.8 to + 1.8 degF)	-1	**-1.2**	Above Normal (110 - 130%)	117%	**72%**
	average:	-0.1	1.4	average:	98%	66%

2019-2020 Government Camp Climate Forecast Performance

Month:	Temperature:	**Observed**	Precipitation:	**Observed**	**Snowfall**	**Observed**	Forecast	**Observed**
November	0	**3.2**	101%	**32%**	25	21	110%	84%
December	0	**2.7**	100%	**45%**	48	19.5	118%	36%
January	1.3	**1**	105%	**176%**	54	102	109%	206%
February	0.5	**-0.6**	95%	**145%**	42	38	102%	102%
March	0.4	**-1.7**	93%	**69%**	45	33	117%	101%
April	0.2	**2.3**	114%	**50%**	23	7	119%	32%
May	-0.2	**1.9**	106%	**118%**	4	5	143%	91%
average:	0.3	**1.3**	102%	**91%**	241	225.5	117%	93%

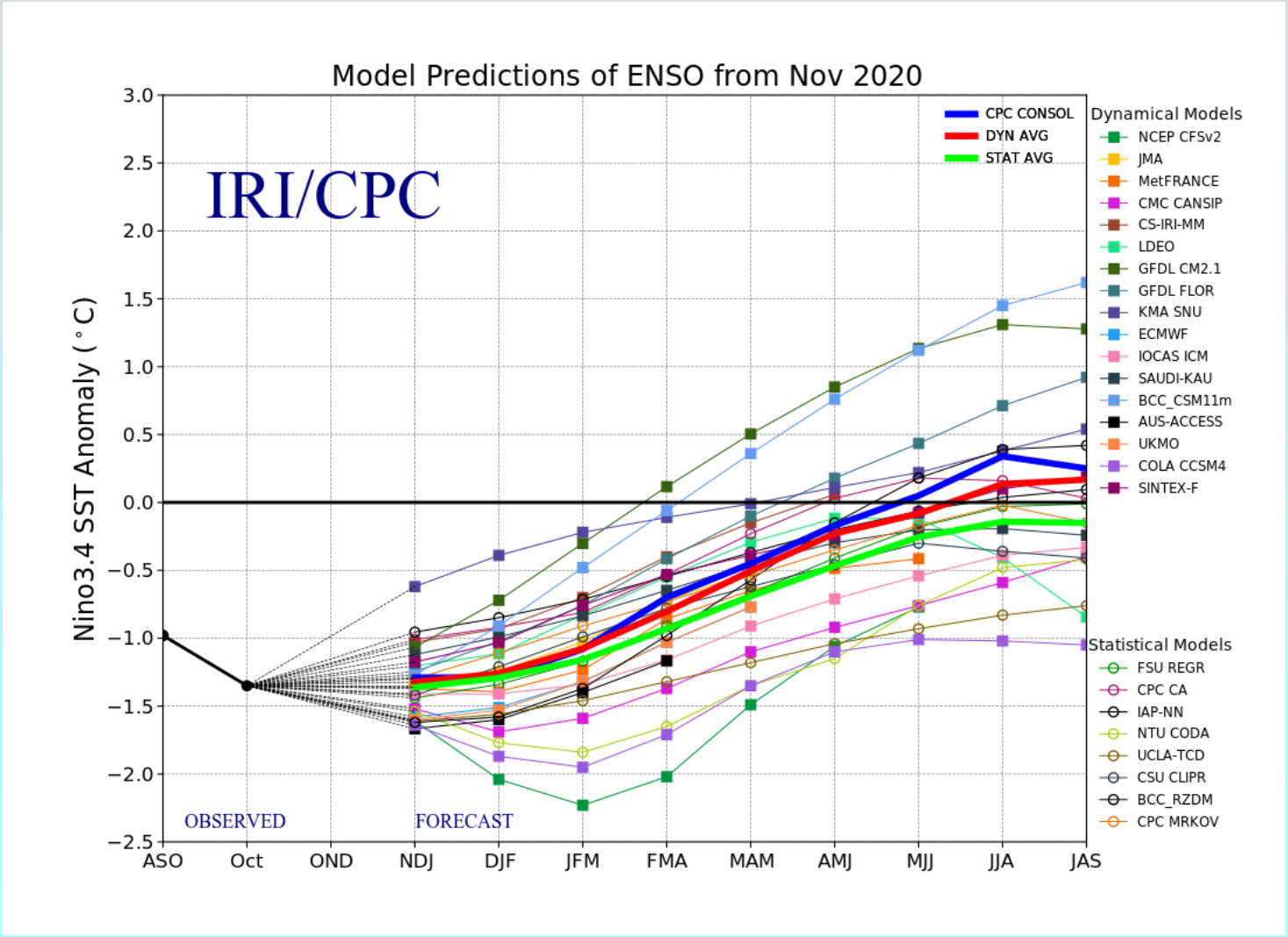
Water Supply Forecast (MEI method): Columbia R. at The Dalles, Jan.-July:
98 MAF (issued Oct. 2019), 97%. Observed: 101 MAF. Error ±3%.
97 MAF (issued April 2020), 96%. Observed: 101 MAF. Error ±4%.

NOAA/CPC and Columbia U. IRI ENSO 2020-2021 Forecast



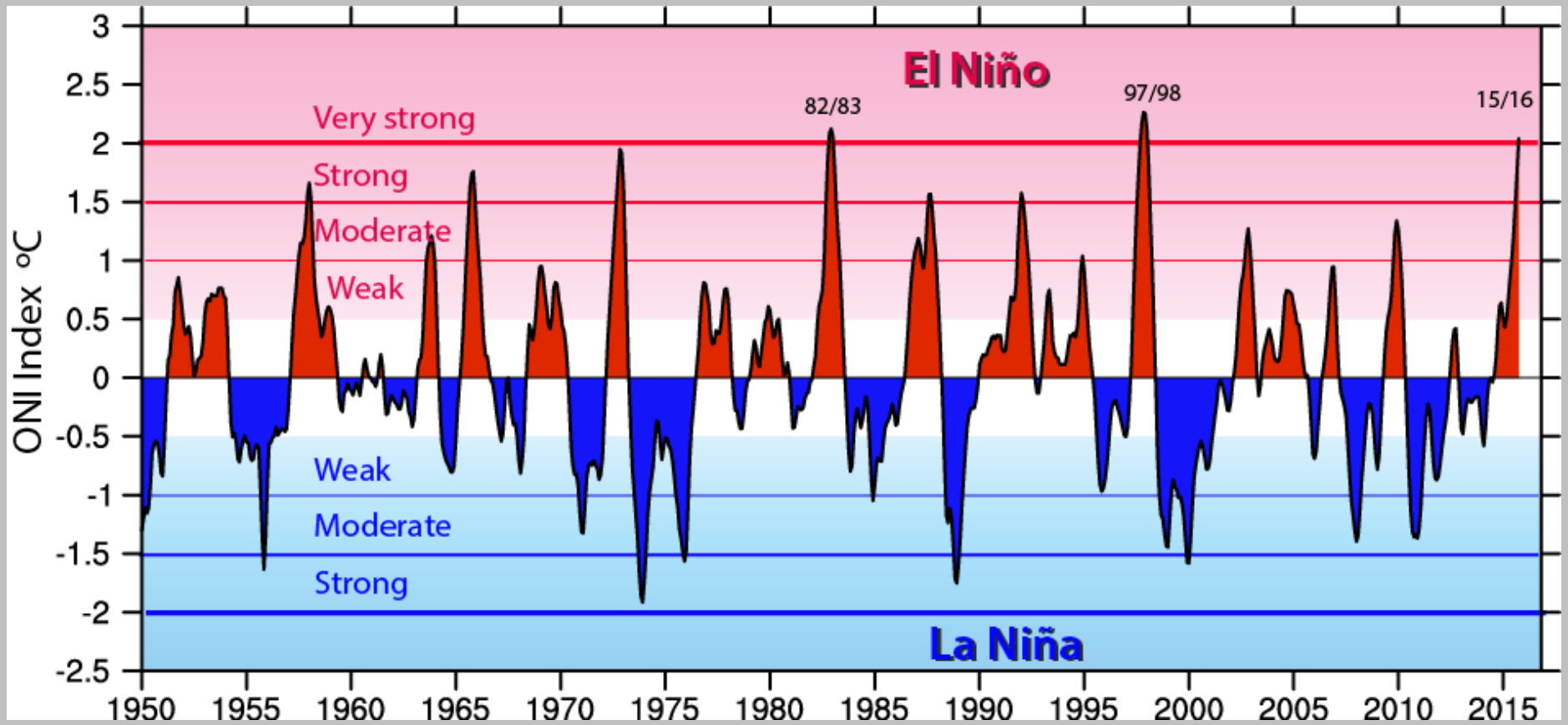
https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-sst_table

NOAA/CPC and Columbia U. IRI ENSO 2020-2021 Forecast



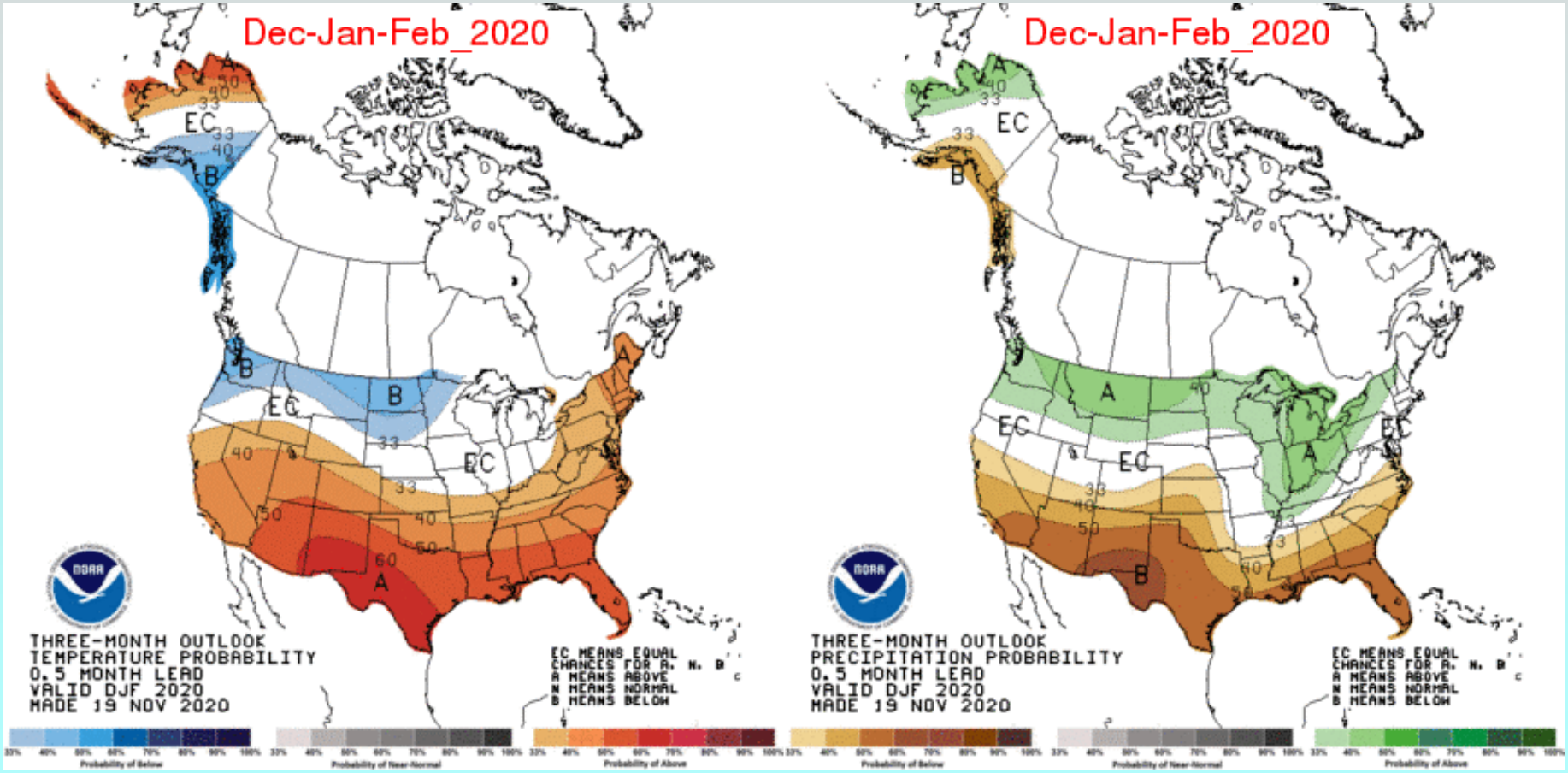
https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-sst_table

NINO SEA SURFACE TEMPERATURE INDICES



Source: https://climatedataguide.ucar.edu/climate-data/nino-sst-indices-nino-12-3-34-4-oni-and-tni

NOAA/CPC Winter Forecast



Source: https://www.cpc.ncep.noaa.gov/products/predictions/long_range/index.php

NOAA/NWS Portland Forecast

Takeaways

- La Niña is likely to persist through winter.
- Odds favor above normal precipitation.
- Odds favor below normal temperatures.
- Decent chance for a good ski season in the Cascades.
  - Lower snow levels in general
- Fewer warm, atmospheric river events to rip away snowpack.
  - Also good news for areas burned by Labor Day Firestorm.
- FOR THE LOWLANDS: TIMING WILL BE EVERYTHING!

NATIONAL WEATHER SERVICE
NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION
Portland, OR

Source: https://oregonams.files.wordpress.com/2020/11/winter-2020-21-outlook-weagle-final.pdf

NWRFC Water Supply Forecast

Home | Data/Normals | Rankings | ENSO / Runoff | Adjustments | Verification | Verify All Years | Archive | Monthly Water Supply Forecasts | Help

Choose Date: 12/01/2020 Archive: Water Year

COLUMBIA - THE DALLES DAM (TDAO3)
Forecasts for Water Year 2021

Official Water Supply

ESP with 10 Days QPF **Ensemble:** 2020-12-01 **Issued:** 2020-12-01

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	68251	85195	92	111933	92704
APR-JUL	56965	72682	91	94654	79855
APR-AUG	62930	80122	92	104801	87532
JAN-SEP	85377	104177	91	130473	114216
JAN-JUL	74614	91719	90	116155	101368
OCT-SEP	100418	119176	91	145689	130518

Experimental Water Supply

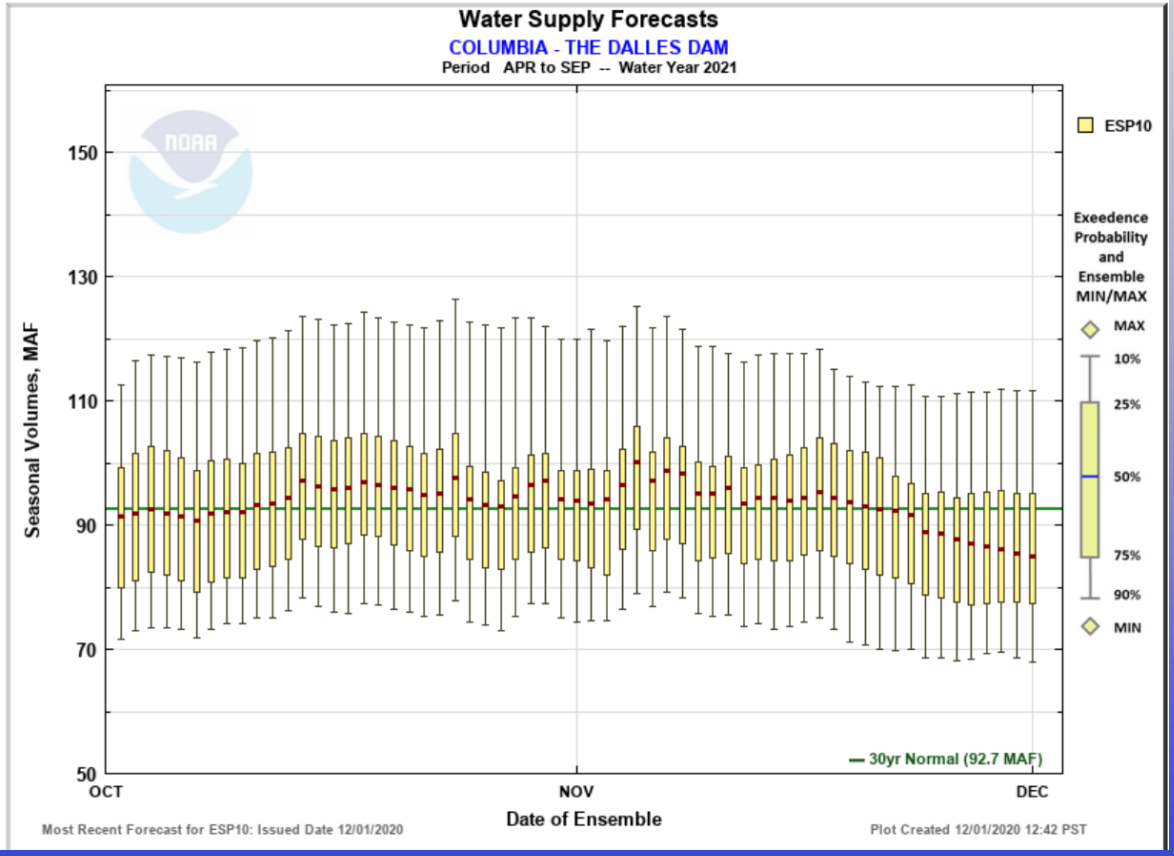
HEFS with 15 days EQPF **Ensemble:** 2020-12-01 **Issued:** 2020-12-01

APR-SEP	69546	87292	94	112247	92704
APR-JUL	58690	74264	93	96964	79855
APR-AUG	64465	81844	94	107032	87532
JAN-SEP	85598	106661	93	130806	114216
JAN-JUL	74778	93895	93	116698	101368
OCT-SEP	101354	121716	93	145985	130518

Reference

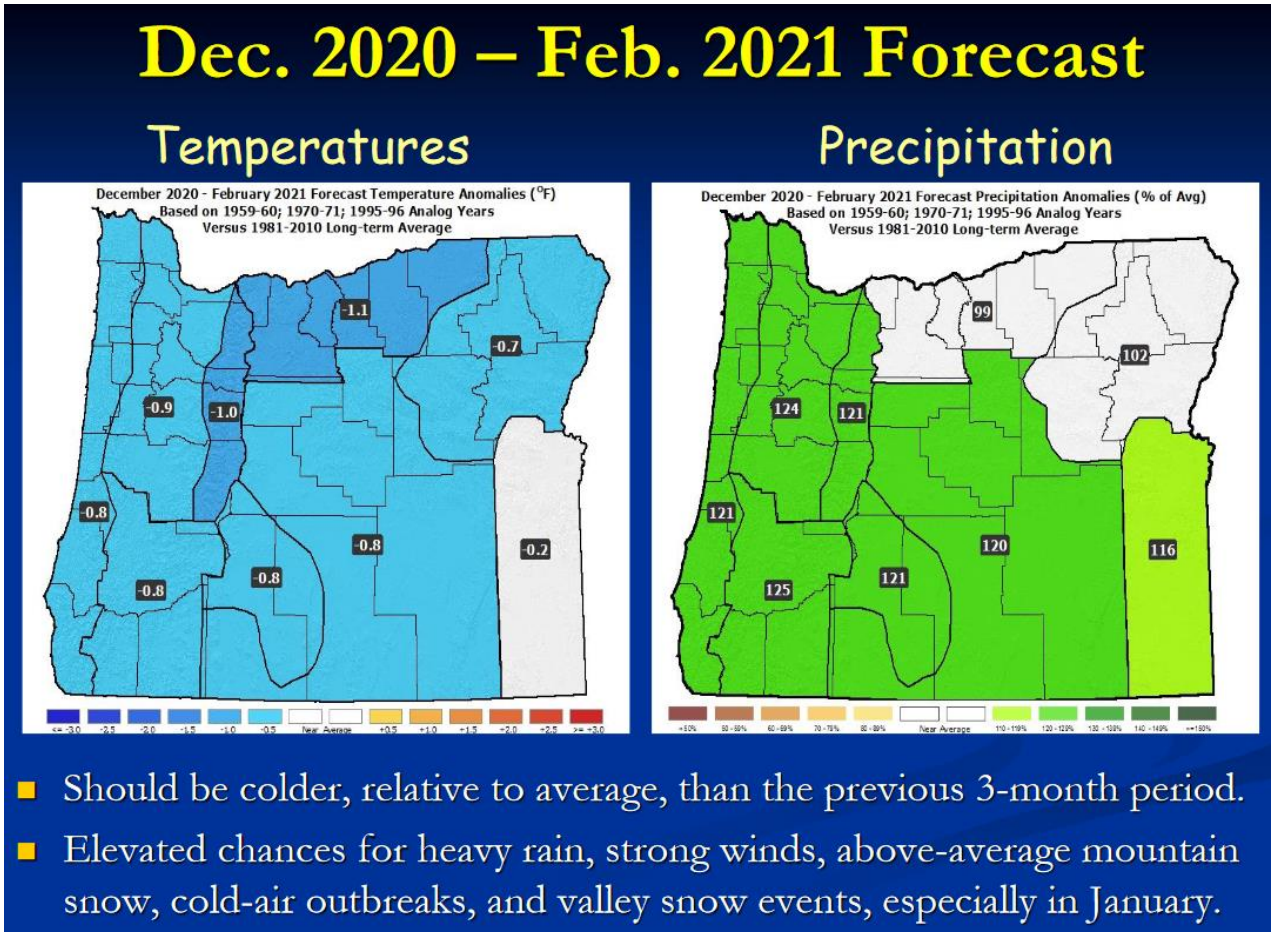
ESP with 0 Days QPF **Ensemble:** 2020-12-01 **Issued:** 2020-12-01

APR-SEP	70405	92732	100	112555	92704
APR-JUL	59514	80590	101	98134	79855
APR-AUG	65437	87121	100	107323	87532
JAN-SEP	88425	113445	99	133887	114216



Source: https://www.nwrfc.noaa.gov/ws/index.html?version=20190313v1

OREGON DEPT. AGRICULTURE



Method (Pete Parsons): Analogue, 3-year average (WY 1960, 1971, 1996)

Source: https://www.oregon.gov/ODA/programs/NaturalResources/Pages/Weather.aspx

OSU – AMS CHAPTER

The Basics

- Rain: Above Average: 37-47” for the water year.
  - Best estimate: 43”
  - Enhanced chance of a hyperactive season (25%).
- Temps: Near to below normal (up to 3°F degrees below average)
  - Best estimate: 1°F below average.
- Windstorm: Some activity, with a peak gust between 45-55 mph.
  - Does not include September 7th peak gust of 52 mph.
- Lowest Temp below 20°F.
  - Enhanced chance of an arctic blast.
  - Best Estimate: 15°F

Snow

- Mountain snowfall between 110-180% of normal.
  - Average to above average winter likely (85% chance of hitting 100% or better)
- Winter favor a slightly above average winter: 2-8 inches.
  - Best odds: 4” with 1-3 snowstorms with 1” or more.
  - Chance of 2-inch snowstorm: 60%
  - Chance of 5-inch major snowstorm: 20%
  - Chance of 8-inch snowpocalypse: 10%
  - Heightened chance of a bust winter: 35%.

Method: Analogue (26 years), Oceanic Nino Index (ONI), PDO, AMO, Sunspots

https://oregonams.files.wordpress.com/2020/11/winter-weather-predictions-2020-21-tanis-leach.pdf

Introduction – CRITFC Methods

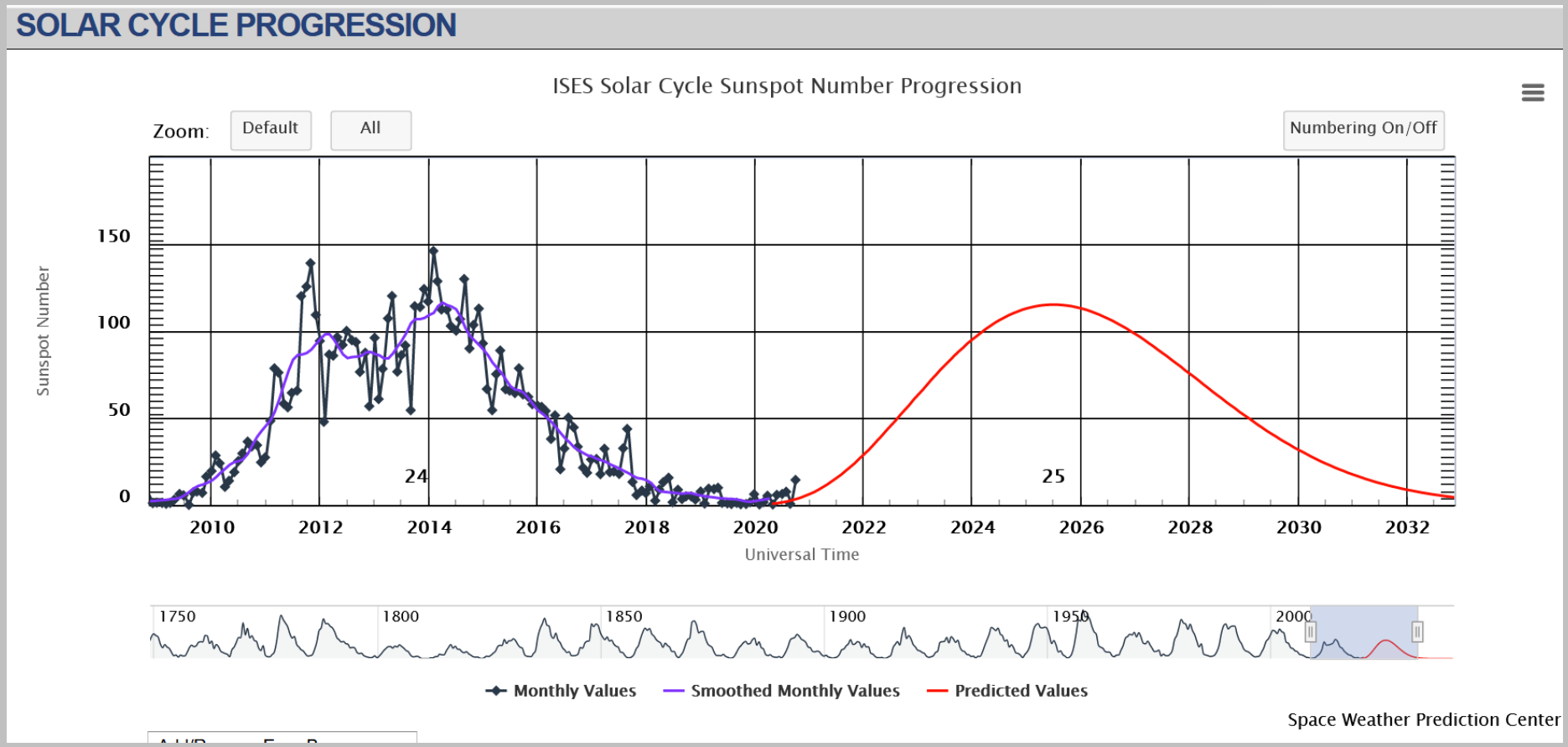
- CRITFC forecast uses a holistic, integrated big picture view.
- Big-picture: **Solar Forcing** (e.g., sunspot cycles) does influence our global weather patterns over the long term (decades). *In memoriam:* Dr. Landscheidt, of Germany (1922 – 2004).
- Track ENSO with the Multi-variable ENSO Index: **MEI**.
- NOAA's Sea-Surface Temperature Departure Forecasts.
- Hydro-Climate approach: Use a regression: Multi-variable ENSO Index (1950-2020) vs. historic runoff for the Columbia River at The Dalles, then compute a WY2021 Water Supply Forecast.
- Select the "right" mixture of 20 past Water Years (next slide).
- Pattern recognition is key: ENSO-Neutral and *La Niña* years.

Introduction – Analogue Years

Ensemble forecasting – 20 past water years:

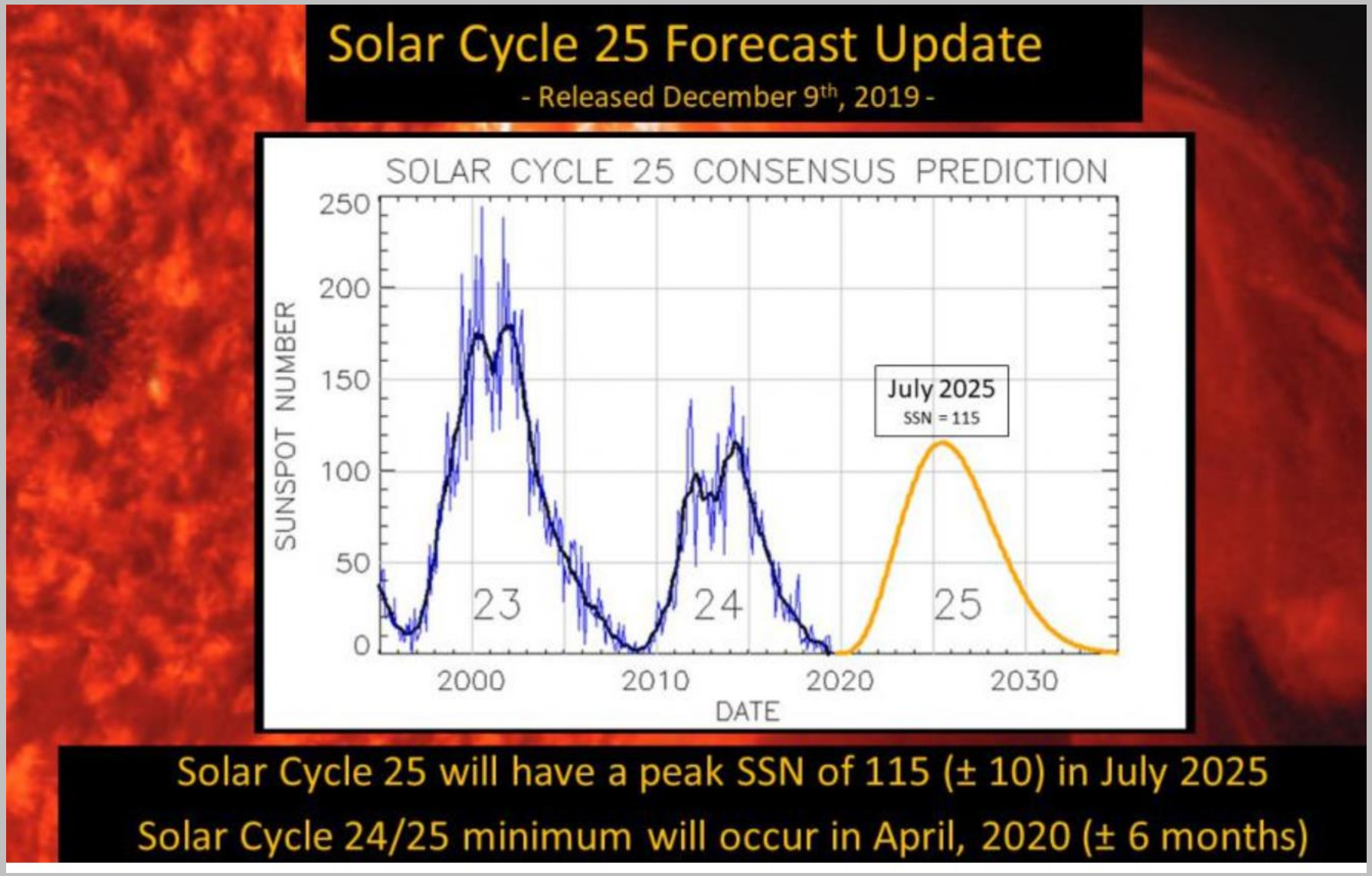
WY2021	TDA runoff	PDO-warm	PDO-cold	El Nino	E-neutral	La Nina
1951	125		x			X
1953	106.8		x		X	
1955	96.9		x			X
1960	102.5		x		X	
1965	126.1		x			X
1968	95.54		x			X
1975	111.9		x			X
1976	122.7		x			X
1985	90.48	x				X
1996	139.3	x				X
1997	159	x				X
2002	103.8		x		X	
2006	114.7		x			X
2008	99.2		x			X
2009	90.2		x			X
2011	141.9		x			X
2012	129.4		x			X
2013	97.7		x		X	
2017	136.8		x			X
2018	118.5		x			X
	(MAF)					
Average:	**115.4**		LaNina:			16
STDEV:	18.8		Solar minimums:			9
			ENSO-neutral/LaNina border:			3
			High Water years (>120 MAF)			8

SUNSPOT COUNTS – "*La Niña* winter"



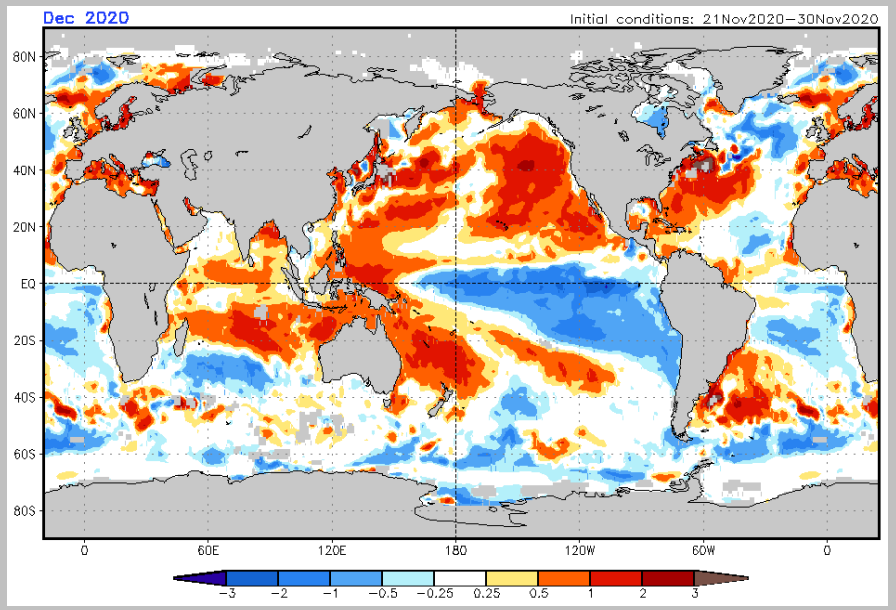
Source: https://www.swpc.noaa.gov/products/solar-cycle-progression

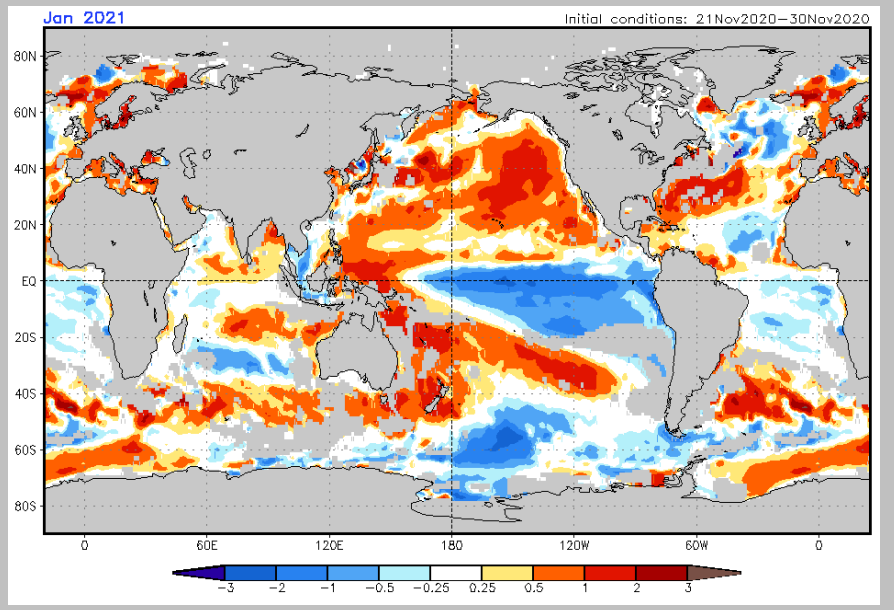
SUNSPOT COUNTS – long term view

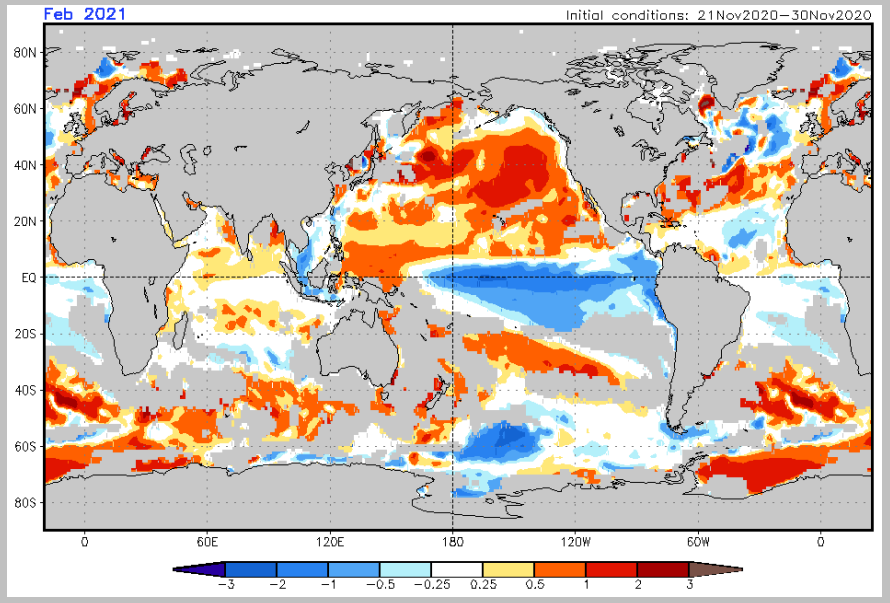


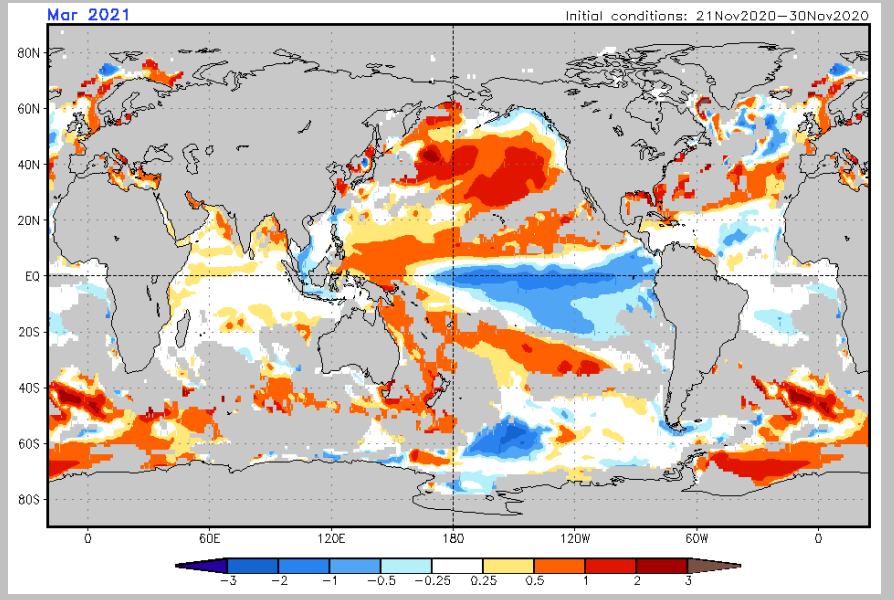
Source: https://www.swpc.noaa.gov/news/solar-cycle-25-forecast-update

NOAA/CPC SEA SURFACE TEMPERATURES - "*La Niña* winter"



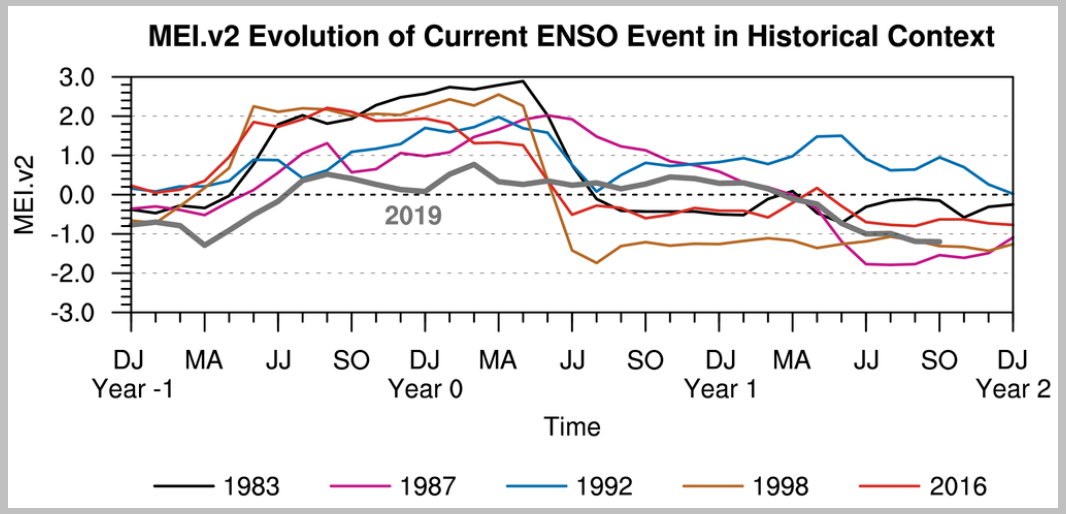






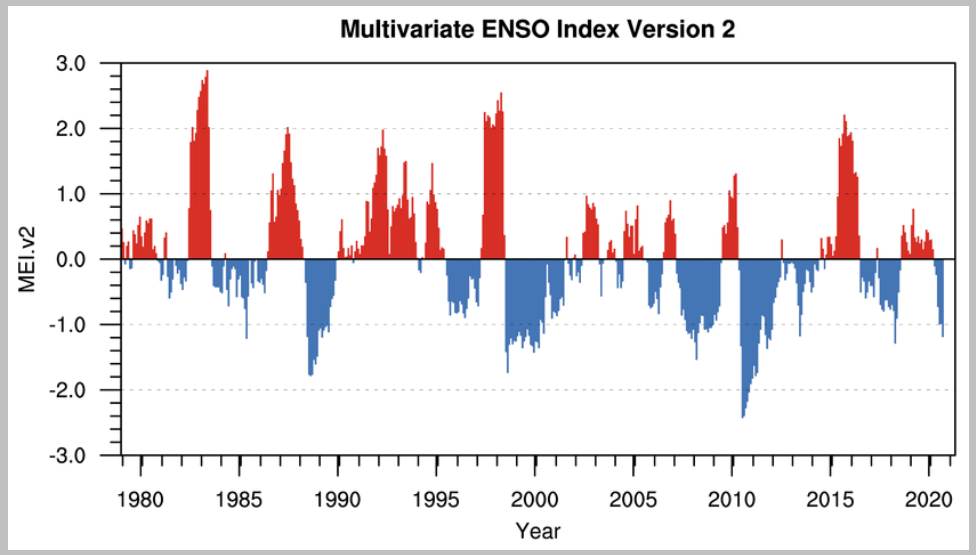
Source: https://www.cpc.ncep.noaa.gov/products/CFSv2/htmls/glbSSTe3MonMask.html

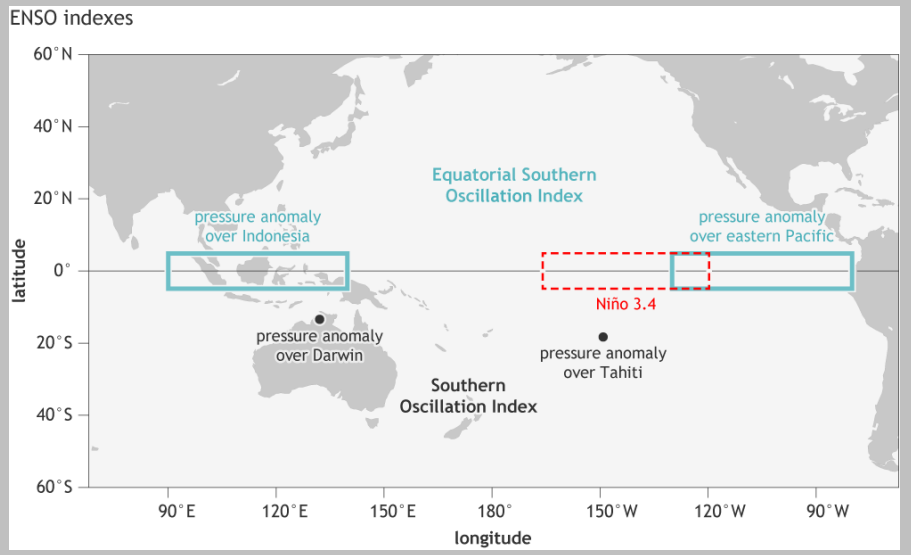
MEI SIGNAL SUGGESTS "*La Niña* winter"



MEI – one index that tracks:

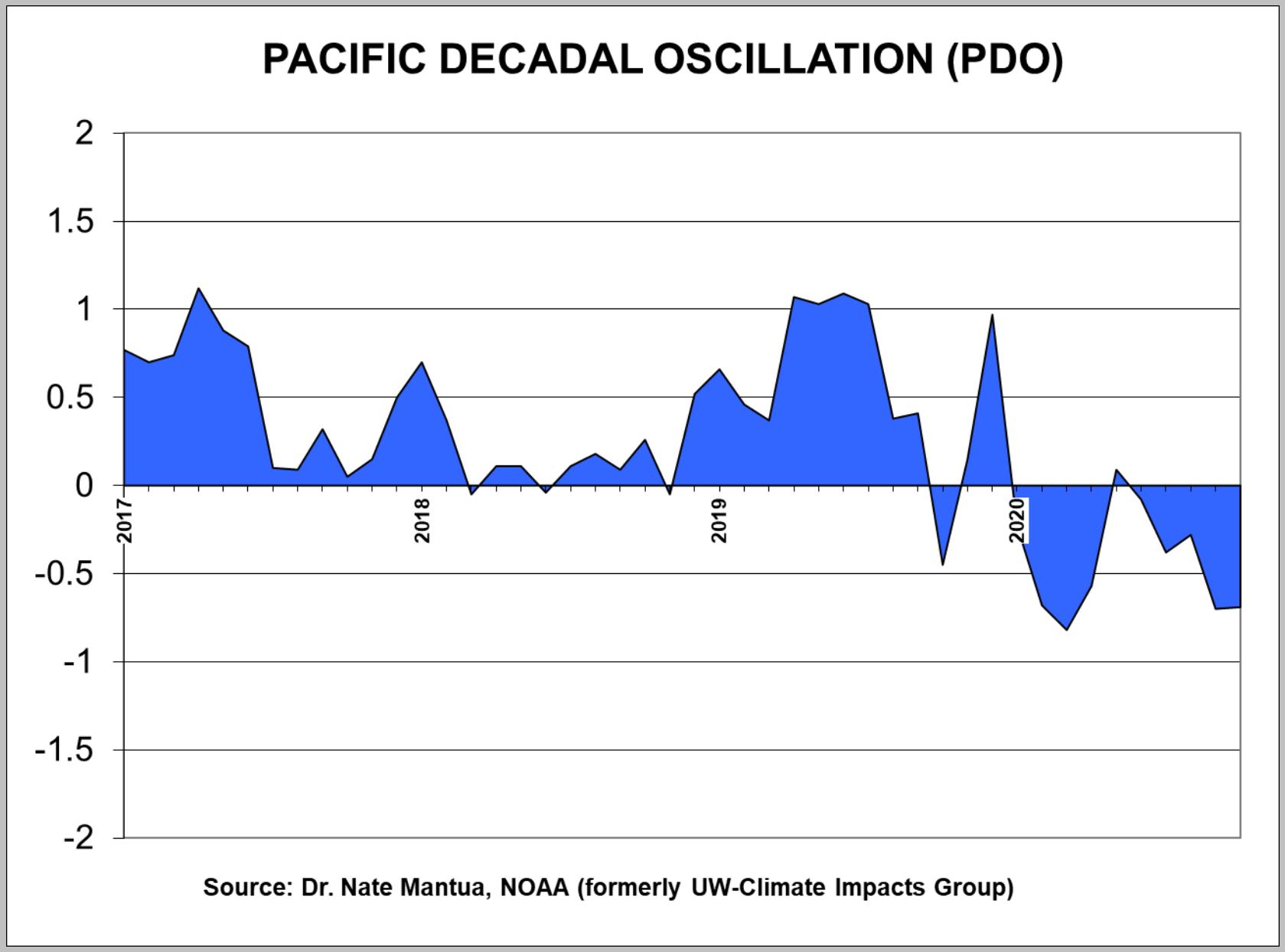
- Sea-Level Pressure
- Surface winds (2D)
- Sea-surface Temperature
- Surface Air Temperature
- Fraction of Cloud cover



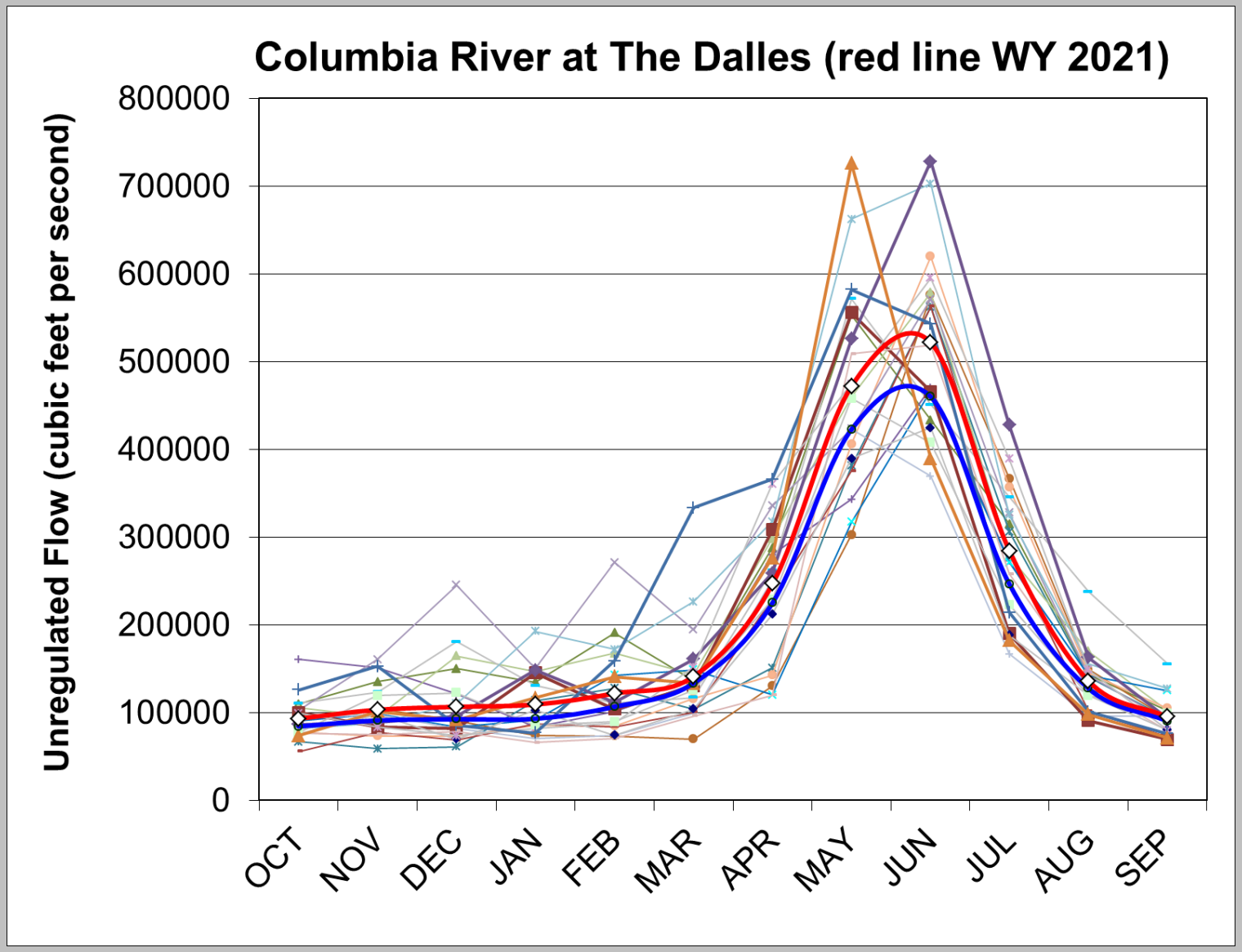


Source: https://www.esrl.noaa.gov/psd/enso/mei

PDO SIGNAL: COLD PHASE…BUT NEAR NEUTRAL



CRITFC ENSEMBLE STREAMFLOW FORECAST



Blue line = long-term average (WY 1929-2020)

Summary: Columbia R. Gorge

Hood River, Oregon

Month:	Temperature (mean monthly):	Avg. (n=20)	Precipitation (% normal):	Avg. (n=20)
November	Near Normal (-1.8 to + 1.8 degF)	0.3	Near Normal (90 - 110%)	106%
December	Near Normal (-1.8 to + 1.8 degF)	-0.3	Above Normal (110 - 130%)	113%
January	Near Normal (-1.8 to + 1.8 degF)	1	Near Normal (90 - 110%)	103%
February	Near Normal (-1.8 to + 1.8 degF)	0	Near Normal (90 - 110%)	96%
March	Near Normal (-1.8 to + 1.8 degF)	-1.5	Above Normal (110 - 130%)	124%

Expect many snow events: **134%** of normal (NOV-MAR); seasonal total 31-inches.

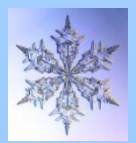
DEC 11-inch (up to 23), JAN 9-inch (up to 19), FEB 6-inch (up to 15), MAR 3-inch (up to 9)

Summary: Cascade Mountains

Government Camp, Oregon

Month:	Temperature (mean monthly):	Avg. (n=20)	Precipitation (% normal):	Avg. (n=20)	Snowfall	% Normal
November	Near Normal (-1.8 to + 1.8 degF)	0.8	Near Normal (90 - 110%)	106%	32	93%
December	Near Normal (-1.8 to + 1.8 degF)	-1	Above Normal (110 - 130%)	128%	62	135%
January	Near Normal (-1.8 to + 1.8 degF)	1.1	Above Normal (110 - 130%)	116%	62	95%
February	Near Normal (-1.8 to + 1.8 degF)	-1.2	Near Normal (90 - 110%)	104%	49	151%
March	Near Normal (-1.8 to + 1.8 degF)	-1.7	Way Above Normal (130 - 150%)	147%	57	153%
April	Near Normal (-1.8 to + 1.8 degF)	-1.1	Above Normal (110 - 130%)	122%	29	133%
May	Near Normal (-1.8 to + 1.8 degF)	-0.6	Near Normal (90 - 110%)	93%	6	74%

Expect a seasonal total of: **297**-inches or **119%** of normal (NOV-MAY).



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)	0.6	Above Normal (110 - 130%)	112%
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February	Near Normal (-1.8 to + 1.8 degF)	-0.6	Near Normal (90 - 110%)	94%
March	Near Normal (-1.8 to + 1.8 degF)	-1.5	Near Normal (90 - 110%)	106%

EXPECT **HIGH** VARIABILITY – INTENSE RAIN EVENTS, FLOODS, FOG, WIND STORMS, GORGE WIND, FREEZING RAIN, etc.

WATER SUPPLY FORECAST (JANUARY - JULY): **115 MAF** (±19 MAF) or 114%, COLUMBIA RIVER AT THE DALLES.

…but what about Snow events?!

Expect **FIVE** events: 2 moderate (2-3 inch), 3 minor (0.25-0.5 inch).

DEC 2-inch (up to 7), JAN 2-inch (up to 5), FEB 1-inch (up to 2.5), and MAR 1-inch (up to 4).

(75%- 85% likely) Season: **6**-inches