# Winter 2023-2024 Weather Forecast

*31ˢᵗ Winter Weather Forecast Meeting, OMSI and Oregon AMS, Portland*

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



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

# 2022-2023 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) | 0.9 | **-1.6** | Above Normal (110 - 130%) | 110% | **93%** |
| December | Near Normal (-1.8 to + 1.8 degF) | 0.3 | **-1.8** | Near Normal (90 - 110%) | 98% | **140%** |
| January | Near Normal (-1.8 to + 1.8 degF) | -0.8 | **2.2** | Above Normal (110 - 130%) | 122% | **72%** |
| February | Near Normal (-1.8 to + 1.8 degF) | -0.8 | **-2.8** | Near Normal (90 - 110%) | 99% | **62%** |
| March | Near Normal (-1.8 to + 1.8 degF) | -1.6 | **-3** | Above Normal (110 - 130%) | 111% | **122%** |
| | average: | -0.4 | -1.4 | average: | 108% | 98% |

## ...but what about *Snow events*?!

Forecasted five events: two moderate and three minor (8.5-inch seasonal total), December to March.

Observed three snow events: Dec. 4, 22; Feb. 22... an **11-inch** seasonal total.


does it SNOW in Portland OREGON?

# 2022-2023 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) | 0.8 | **-4.5** | Near Normal (90 - 110%) | 101% | **91%** |
| December | Near Normal (-1.8 to + 1.8 degF) | 0.3 | **-3.8** | Near Normal (90 - 110%) | 108% | **90%** |
| January | Near Normal (-1.8 to + 1.8 degF) | 0.8 | **1.1** | Above Normal (110 - 130%) | 114% | **45%** |
| February | Above Normal ( > +1.8 degF) | -0.1 | **-2.2** | Near Normal (90 - 110%) | 93% | **51%** |
| March | Near Normal (-1.8 to + 1.8 degF) | -1.9 | **-4.1** | Above Normal (110 - 130%) | 124% | **115%** |
| | average: | 0.0 | -2.7 | average: | 108% | 78% |

# 2022-2023 Government Camp Climate Forecast Performance

| Month: | | Temperature: | Observed | | Precipitation: | Observed | | Snowfall | Observed | Forecast | Observed |
|---|---|---|---|---|---|---|---|---|---|---|---|
| November | | 0.8 | **-4.6** | | 113% | **114%** | | 32 | 45 | 125% | 147% |
| December | | -0.9 | **-2** | | 126% | **87%** | | 64 | 78 | 145% | 151% |
| January | | 0.2 | **-0.9** | | 134% | **40%** | | 72 | 24 | 142% | 49% |
| February | | -1.2 | **-3.2** | | 121% | **54%** | | 55 | 30 | 137% | 75% |
| March | | -2 | **-5.2** | | 122% | **80%** | | 55 | 58 | 142% | 163% |
| April | | -1.2 | **-2.1** | | 96% | **133%** | | 25 | 60 | 118% | 338% |
| May | | -0.5 | **3.7** | | 96% | **15%** | | 6 | 0 | 168% | 0% |
| average: | | -0.7 | **-2.0** | | 115% | **75%** | | 309 | 295 | 140% | 132% |

Water Supply Forecast (MEI method): Columbia R. at The Dalles, Jan.-July:
123 MAF (issued Oct. 2022), 122%. Observed: 80 MAF. Error ±54%.
111 MAF (issued April 2023), 103%. Observed: 80 MAF. Error ±39%.

# Introduction – Methods

- ➢ CRITFC forecast uses a holistic, integrated big picture view.

- ➢ Big-picture: **Solar Forcing** (e.g., sunspot cycles) <u>does</u> 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 (1950-2023) vs. historic runoff for the Columbia River at The Dalles, then compute a 2024 Water Supply Forecast.

- ➢ Select the "right" mixture of 20 past Water Years (next slide).

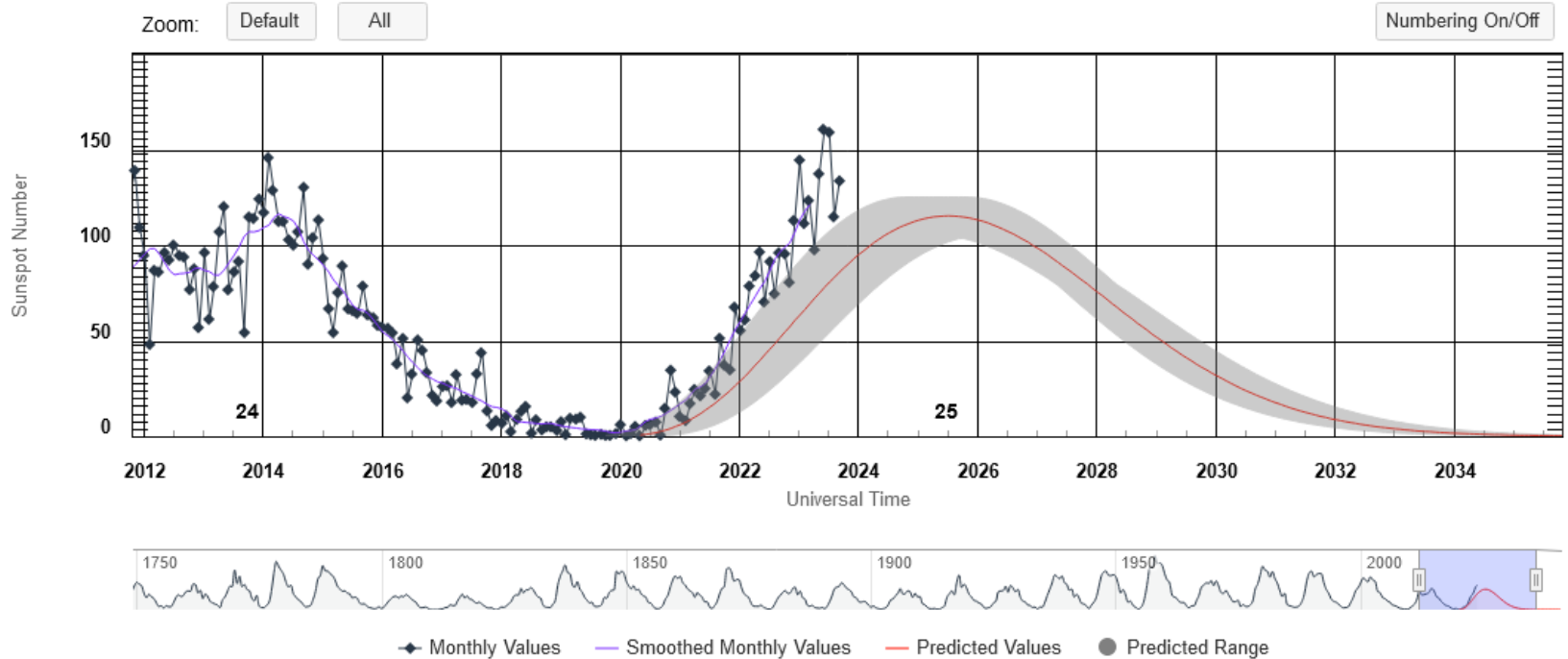- ➢ Pattern recognition is key: *El Niño* years.

# Introduction – Methods



## Ensemble forecasting – 20 past water years:

| WY2024 | TDA runoff | PDO-warm | PDO-cold | El Nino | E-neutral | La Nina |
|---|---|---|---|---|---|---|
| 1952 | 113.5 | | x | X | | |
| 1958 | 107.6 | | x | X | | |
| **1964** | 107.3 | | x | X | | |
| 1970 | 97.01 | | x | X | | |
| 1978 | 104.7 | x | | X | | |
| 1980 | 97.84 | x | | X | | |
| 1987 | 79.23 | x | | X | | |
| 1988 | 76.01 | x | | X | | |
| 1995 | 104 | x | | X | | |
| 1998 | 104.1 | x | | X | | |
| 2003 | 87.7 | | x | X | | |
| 2004 | 83 | | x | X | | |
| 2007 | 95.7 | | x | | X | |
| 2010 | 84.7 | | x | X | | |
| 2013 | 97.7 | | x | | X | |
| 2014 | 108.1 | | x | | X | |
| 2015 | 83.5 | | x | X | | |
| 2016 | 97.4 | | x | X | | |
| 2019 | 90.1 | | x | X | | |
| **2020** | 101.3 | | x | X | | |
| | (MAF) | | | | | |
| Average: | **96.0** | | El-Nino: | | | 17 |
| STDEV: | 10.5 | | ENSO-neutral: | | | 3 |

# SUNSPOT COUNTS – "*El Niño* winter"



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

# COLUMBIA U. IRI & NOAA's CPC ENSO FORECACST



Model Predictions of ENSO from Oct 2023
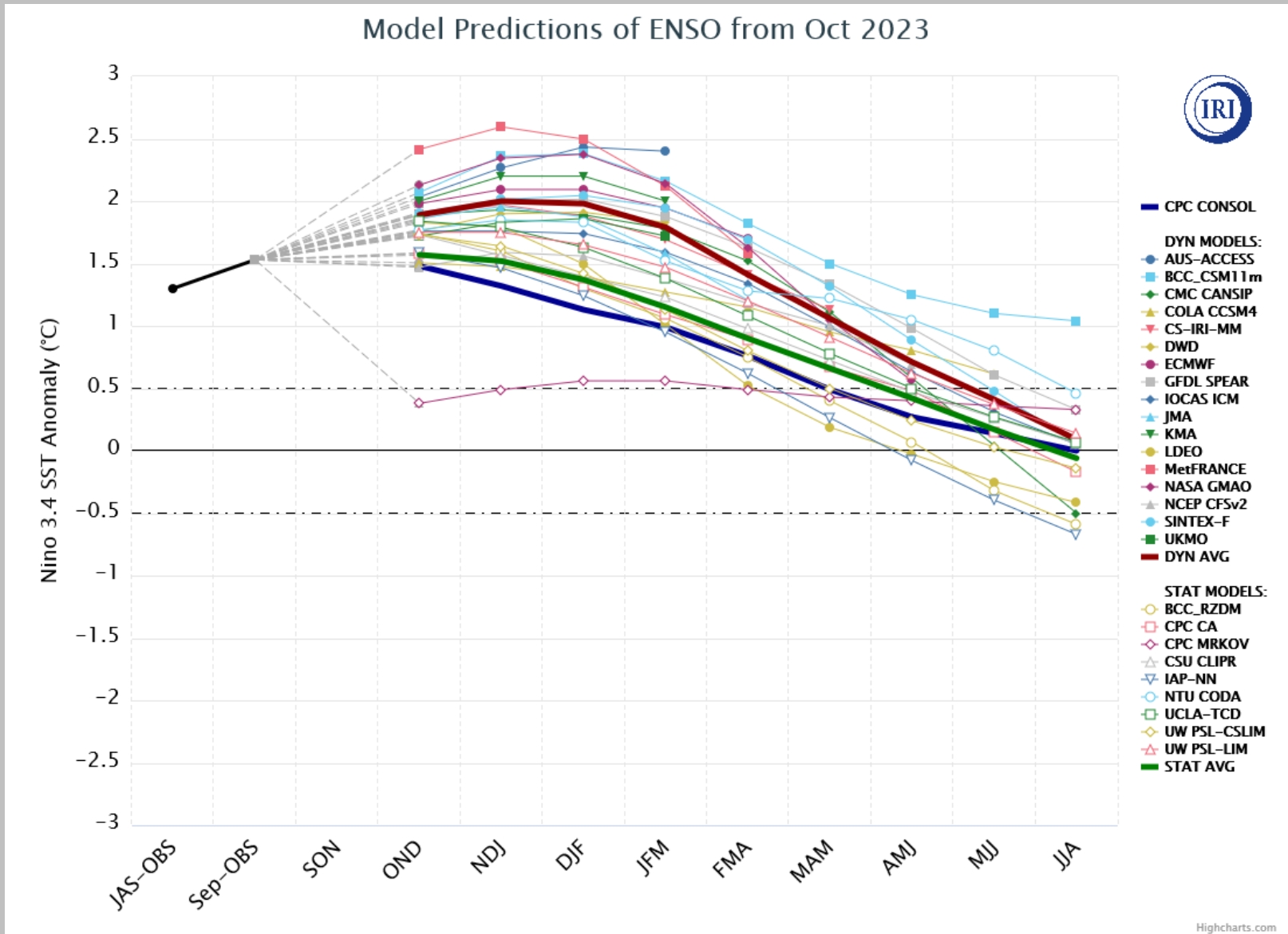
# NOAA SEA SURFACE TEMPERATURES - "*El Niño* winter"



https://www.cpc.ncep.noaa.gov/products/CFSv2/htmls/glbSSTe3MonMask.html
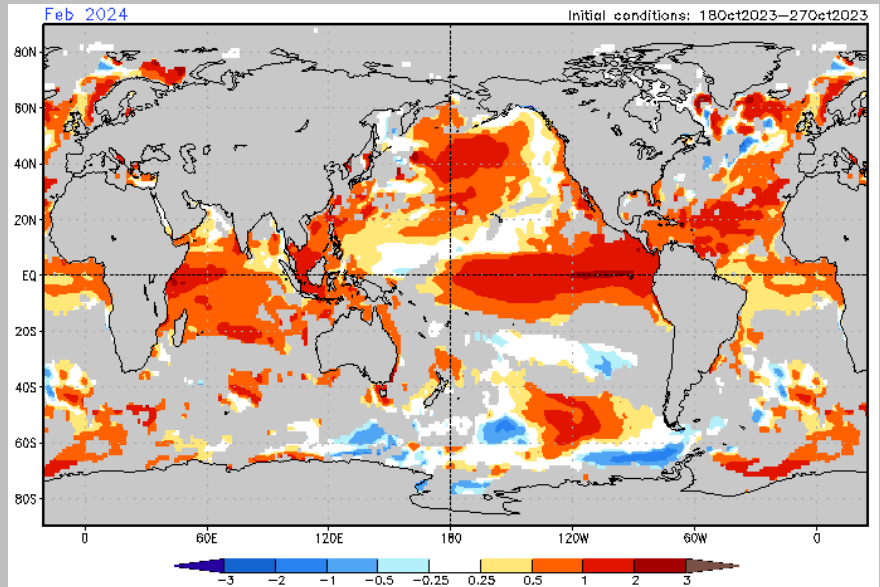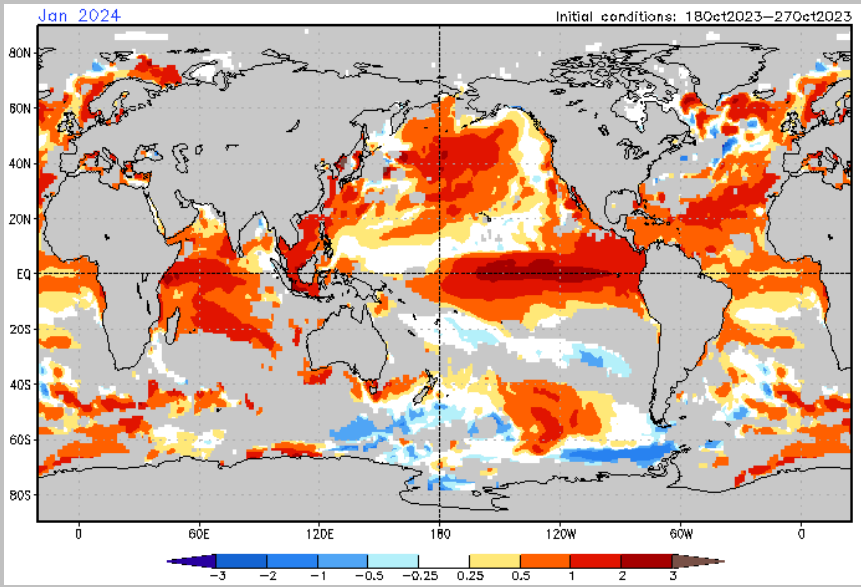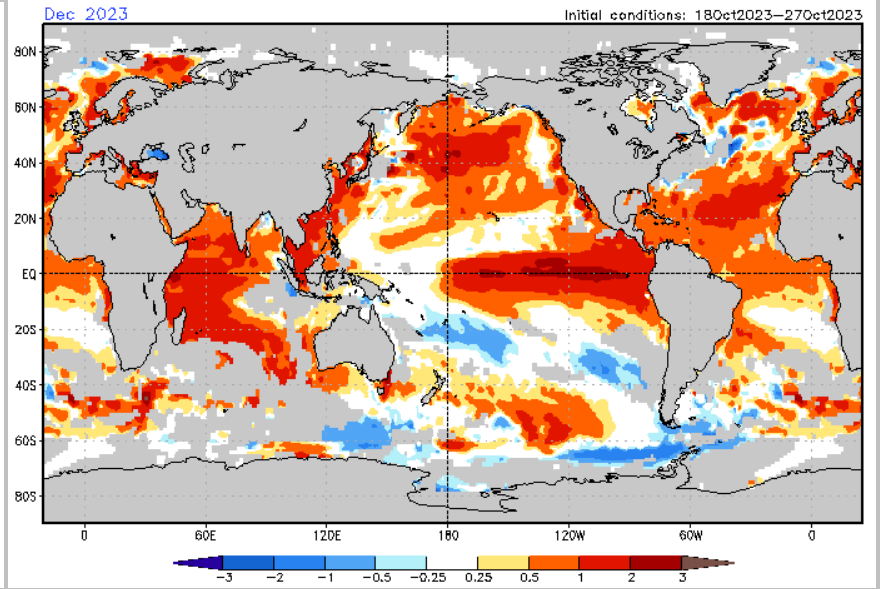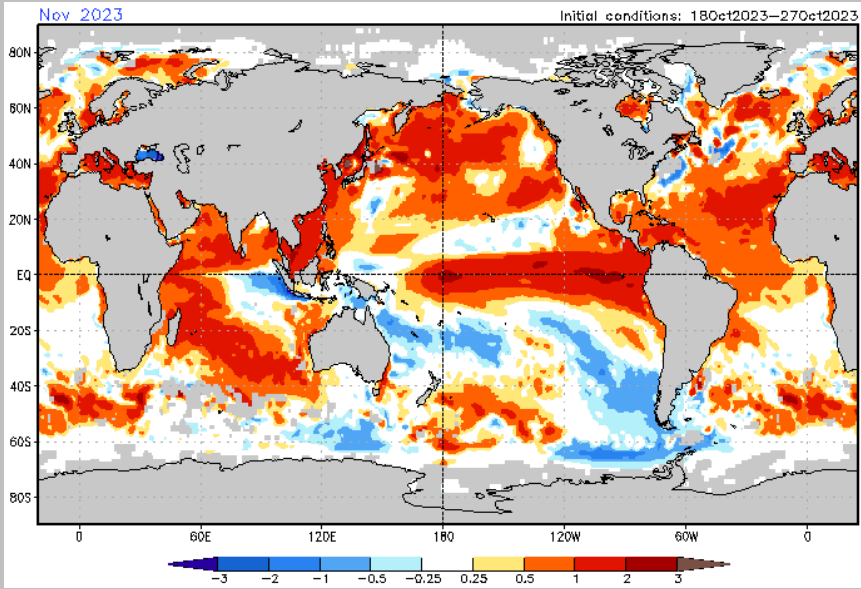
# NINO SEA SURFACE TEMPERATURE INDICES
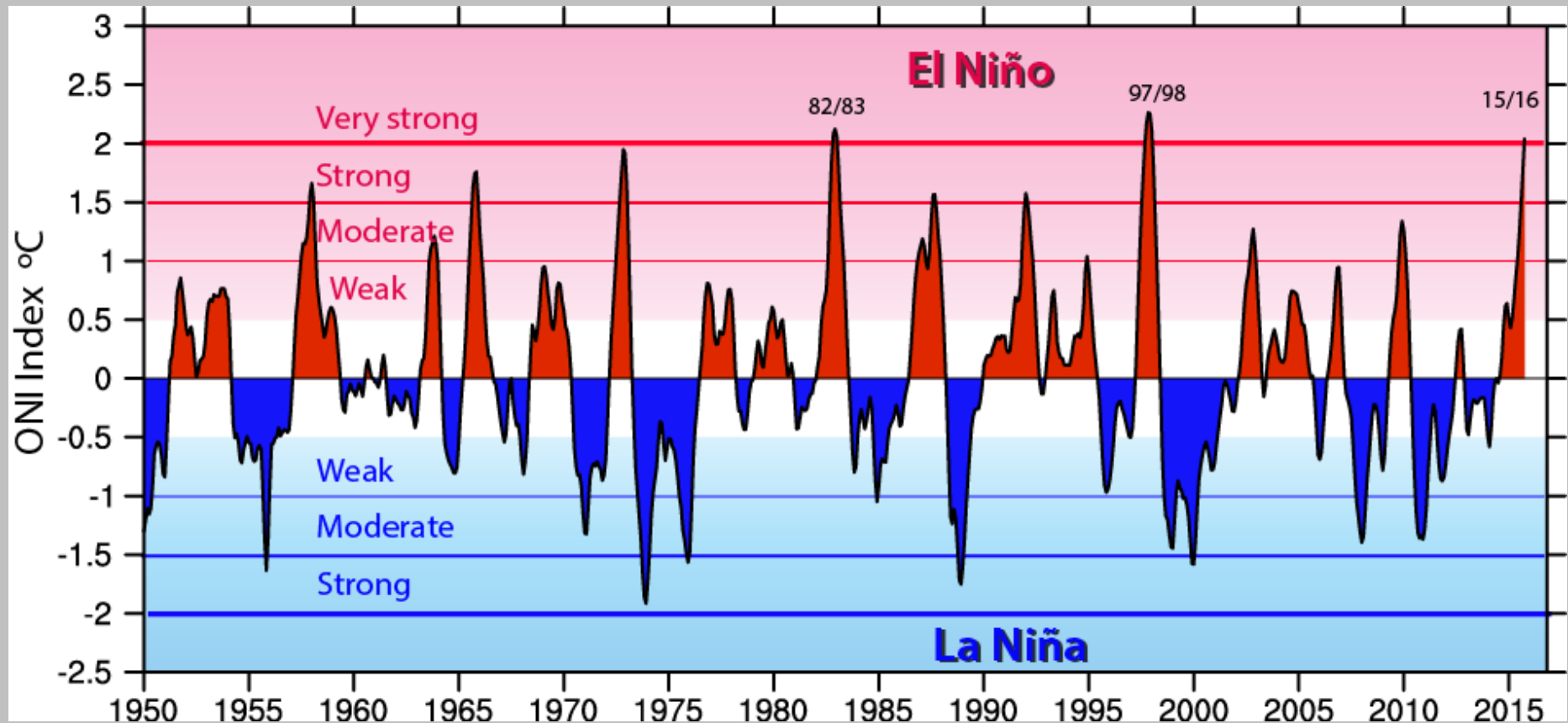
# WHAT TYPE OF *El Niño* EVENT CAN WE EXPECT?



VERY STRONG
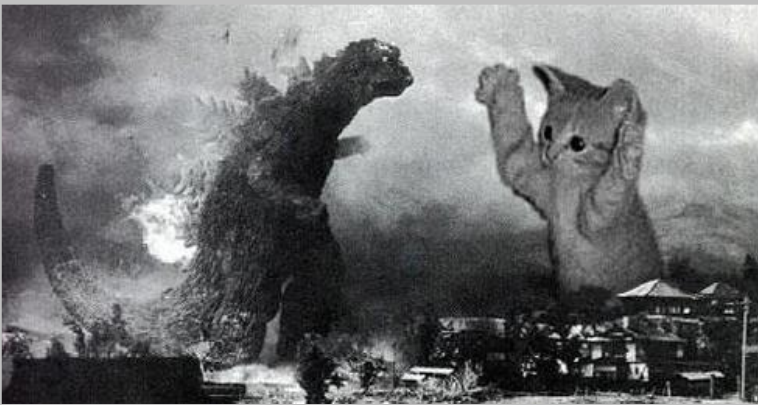


WEAK (AS A KITTEN)

NOAA guidance: 8-of-10 models suggest "Moderate"



Goldilocks
and the three bears
by Andrea Petrlik
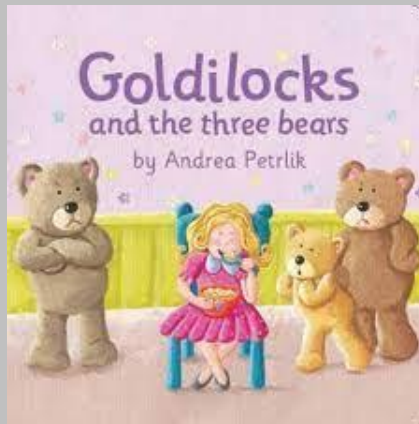
"NOT TOO STRONG...
NOT TOO WEAK...
BUT JUST RIGHT"

# MEI SIGNAL SUGGESTS "*El Niño* winter"


MEI.v2 Evolution of Current ENSO Event in Historical Context
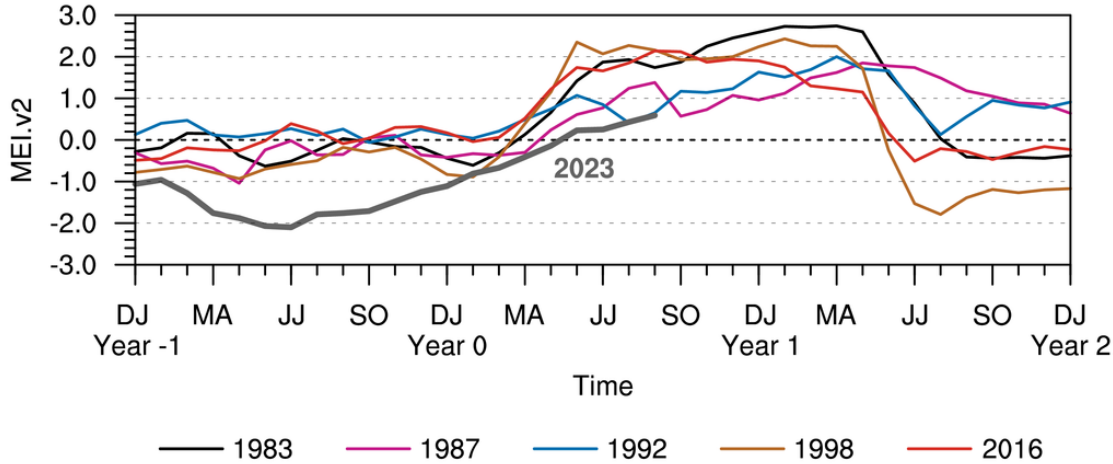
**MEI** – one index that tracks:

➢ Sea-Level Pressure

➢ Surface winds (2D)

➢ Sea-surface Temperature

➢ Surface Air Temperature

➢ Fraction of Cloud cover


Multivariate ENSO Index Version 2
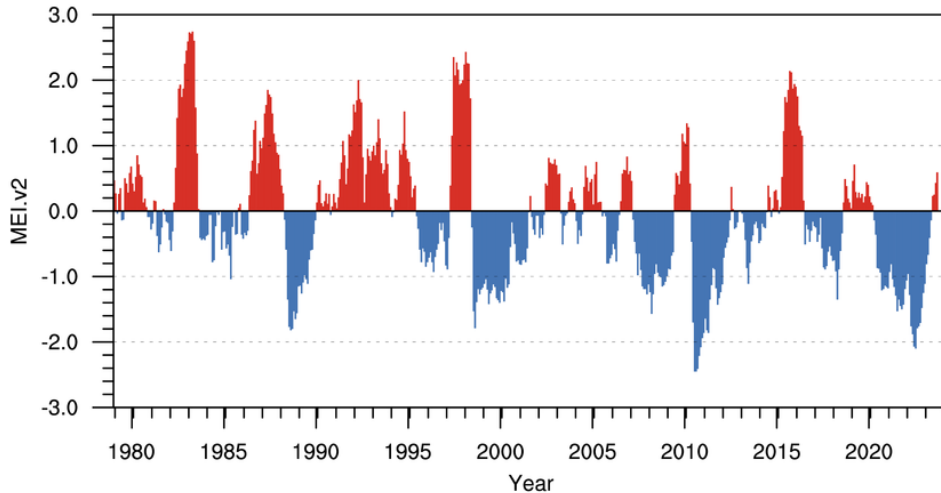

ENSO indexes
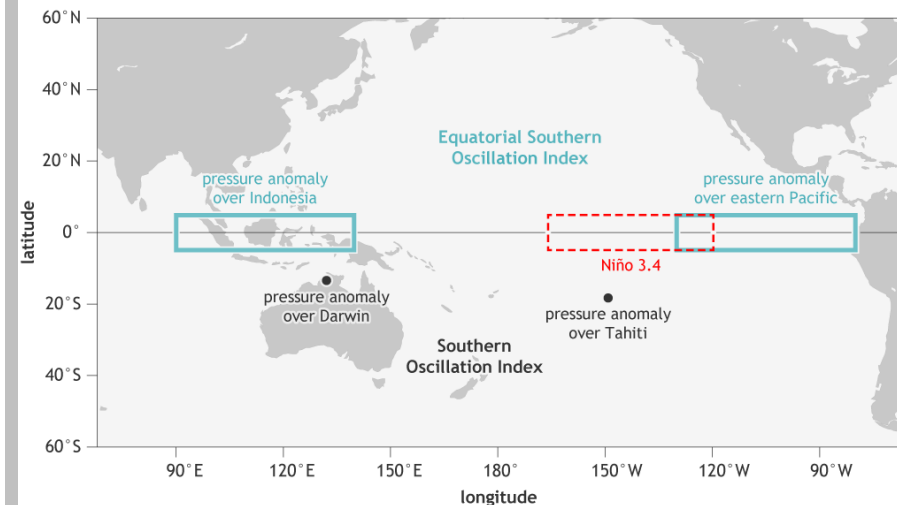
# PDO SIGNAL: COLD PHASE...MORE NEGATIVE



## PACIFIC DECADAL OSCILLATION (PDO), v.5

Source: Dr. Nate Mantua, NOAA (formerly UW-Climate Impacts Group)

# ENSEMBLE STREAMFLOW FORECAST – Water Year 2024



**Columbia River at The Dalles (red line WY 2024)**
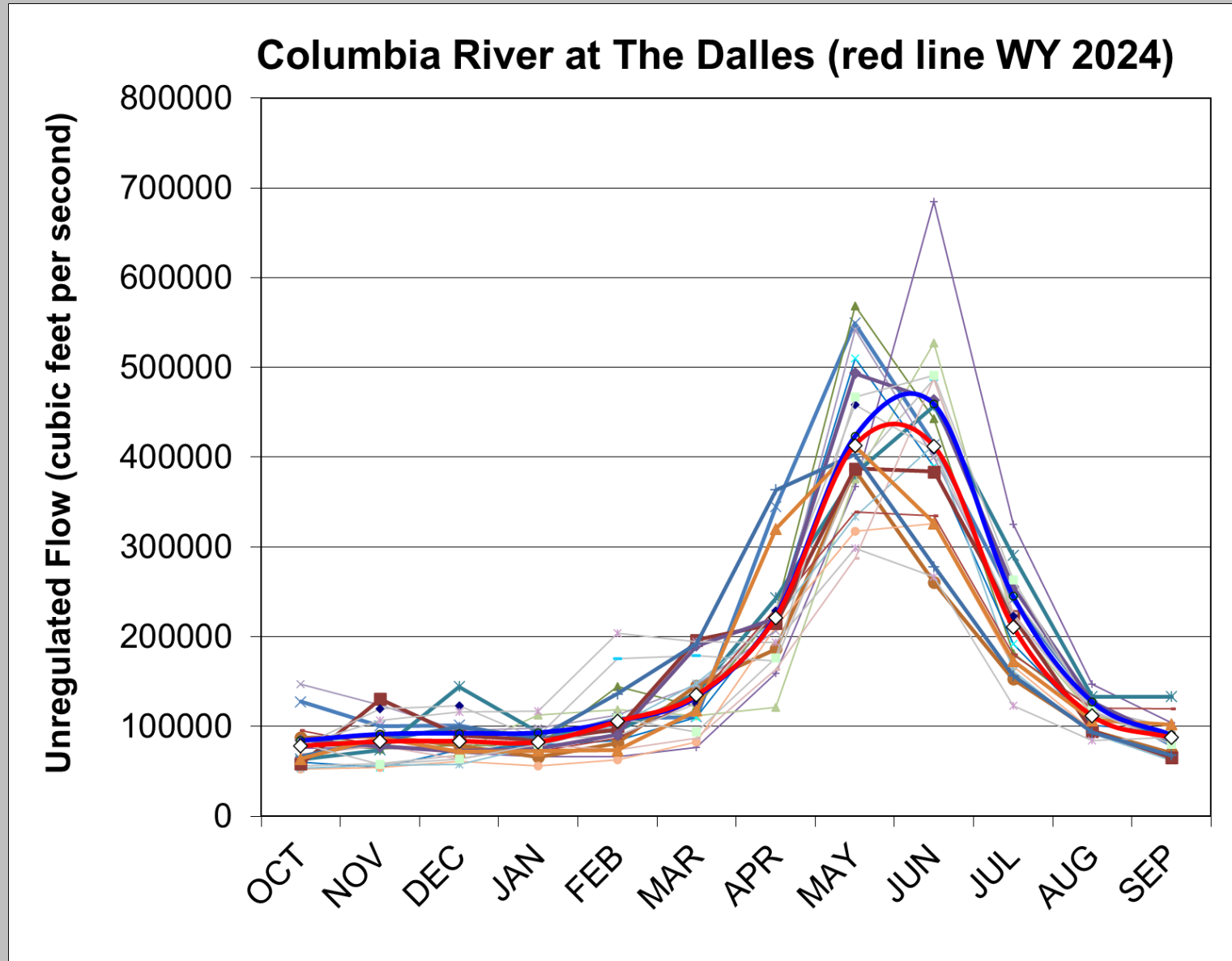
Blue line = long-term average (WY 1929-2023)

# Summary: Columbia R. Gorge

## Hood River, Oregon

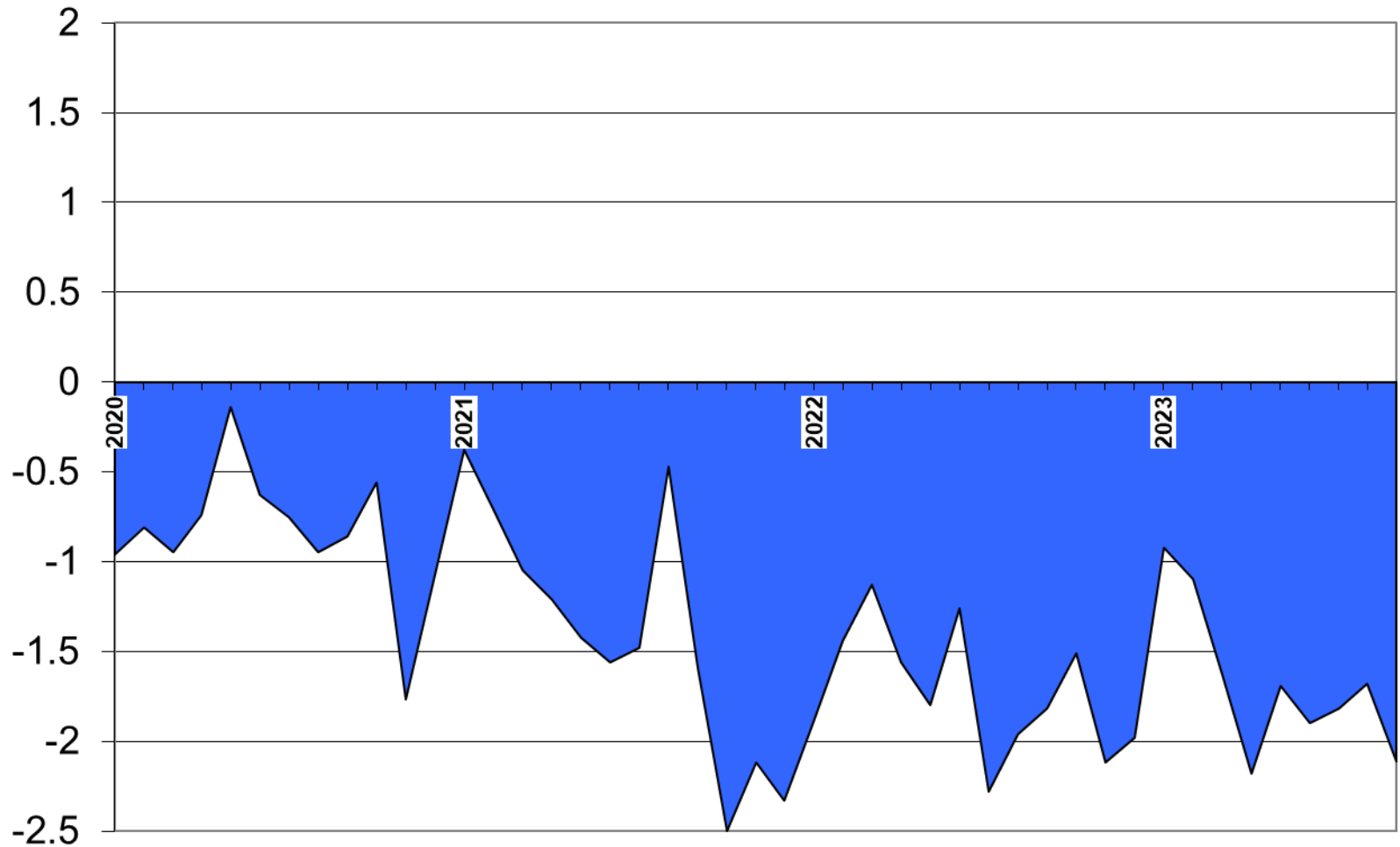| Month: | Temperature (mean monthly): | Avg. (n=20) | Precipitation (% normal): | Avg. (n=20) |
|---|---|---|---|---|
| November | Near Normal (-1.8 to + 1.8 degF) | -0.2 | Below Normal (70 - 90%) | 84% |
| December | Near Normal (-1.8 to + 1.8 degF) | 0.4 | Near Normal (90 - 110%) | 105% |
| January | Near Normal (-1.8 to + 1.8 degF) | 0.7 | Above Normal (110 - 130%) | 113% |
| February | Near Normal (-1.8 to + 1.8 degF) | 1.5 | Below Normal (70 - 90%) | 83% |
| March | Near Normal (-1.8 to + 1.8 degF) | 0.4 | Below Normal (70 - 90%) | 86% |

Expect <u>many</u> snow events: **81%** of normal (NOV-MAR); seasonal total 26-inches.

NOV 2-inch (up to 8), DEC 4-inch (up to 7), JAN 15-inch (up to 35), FEB 5-inch (up to 14), MAR 0.5-inch

# Summary: the 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) | -0.1 | Near Normal (90 - 110%) | 96% | 30 | 113% |
| December | Near Normal (-1.8 to + 1.8 degF) | -0.1 | Near Normal (90 - 110%) | 96% | 43 | 97% |
| January | Above Normal (> + 1.8 degF) | 2.1 | Near Normal (90 - 110%) | 104% | 50 | 97% |
| February | Near Normal (-1.8 to + 1.8 degF) | 1 | Near Normal (90 - 110%) | 90% | 35 | 89% |
| March | Below Normal (< -1.8 degF) | 0.7 | Near Normal (90 - 110%) | 94% | 35 | 86% |
| April | Near Normal (-1.8 to + 1.8 degF) | 0.7 | Near Normal (90 - 110%) | 100% | 21 | 97% |
| May | Near Normal (-1.8 to + 1.8 degF) | 0.7 | Near Normal (90 - 110%) | 97% | 3 | 60% |

Expect a seasonal snow total: **216**-inches or **91%** of normal (NOV-MAY).



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TIMBERLINE

# 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) | 0.7 | Below Normal (70 - 90%) | 82% |
| December | Near Normal (-1.8 to + 1.8 degF) | 0.5 | Near Normal (90 - 110%) | 104% |
| January | Near Normal (-1.8 to + 1.8 degF) | 1.3 | Above Normal (110 - 130%) | 111% |
| February | Near Normal (-1.8 to + 1.8 degF) | 1.2 | Below Normal (70 - 90%) | 80% |
| March | Near Normal (-1.8 to + 1.8 degF) | 0.9 | Near Normal (90 - 110%) | 92% |

EXPECT LOW VARIABILITY – HARD RAIN EVENTS, MORE/LONGER DRY-SPELLS, FOG, FEW GORGE WIND EVENTS, etc.

WATER SUPPLY FORECAST: **96 MAF** (±10 MAF) or **94%**, COLUMBIA RIVER AT THE DALLES, JANUARY - JULY.

## *...but what about Snow events?!*

Expect **TWO** events: 1 moderate (2 inch), 1 minor (1 inch or less).

NOV 0.5-inch, DEC 0.75-inch (up to 2), JAN 2.5-inch (up to 7), FEB 0.5-inch (up to 2), and MAR 0.25-inch (up to 0.75).

(35% - 70% likely) Season: **4.5**-inches