

The Month In Review December 2023



**National Weather Service,
Pendleton, Oregon**

December 2023 Climate Conditions Summary

December was dominated by fog and low stratus clouds throughout the month in the lower elevations and adjacent valleys. Pendleton, OR & Walla Walla, WA had dense fog (visibility $\leq \frac{1}{4}$ mile) on more than half of the days of the month (21 & 18 days respectively). Frequent upper high pressure ridges caused strong temperature inversions in the lower elevations with colder temperatures. Otherwise, overall temperatures were warmer than normal across all of the forecast area, especially in fog free areas such as the mountains. December's weather conditions were induced in part by one of the top five strongest El Niño events. During such a strong El Niño event, the subtropical Jet Stream was pushed northward that resulted in more frequent storms across the southern USA. The Polar Jet Stream was also pushed further northward, leaving the northern US warmer than normal. However, this does not always result in drier than normal conditions across the Pacific Northwest, though precipitation events are more often rain events with little snow due to high snow levels, resulting in very little mountain snowpack. This will have an impact during the following spring and summer, with a higher probability of greater drought conditions and increased fire weather activity.

The most significant storms were on the 1st - 3rd, the 5th - 7th, the 9th - 10th, and the 25th - 27th. There was a significant freezing rain event over the Cascades and the valleys against the east slopes on Christmas Day and Night with local ice accumulations up to 0.25 inch. This was a result of warm, moist air moving over trapped cold air. There was also a high wind event on the 27th over the Grande Ronde Valley and the Foothills of the Northern OR Blue Mountains where wind gusts reached advisory (45-57 mph) or warning criteria (58+ mph). The highest reported wind gust was 78 mph near Mission, OR on the 27th.

Below and on the next slide are images of weather and climate conditions during the month.



First measurable snowfall in Pendleton, OR



Dense fog at night over Pendleton, OR



Photo by John Bonn Waterman

Ice on Christmas night due to freezing rain

More Images Representing December 2023 Weather/Climatic Conditions



Beautiful sunrise over northeast Oregon on a frosty morning.



Heavy wet snow in the northern Blue Mountains of Oregon.



Sunny skies, with stubborn low clouds over the Blue Mountains.



Patchy fog and low clouds hanging over Pendleton, OR.

Significant Weather Events - Local Storm Reports for December 2023

Significant Weather Events					
Date	Location	State	Event Type	Magnitude	Source
December 1, 2023	2 WNW Sisters	OR	SNOW	2	Cocorahs
December 1, 2023	29 SSW Dayville	OR	SNOW	0.5	Cocorahs
December 1, 2023	9 NW Seneca	OR	SNOW	3.8	Cocorahs
December 1, 2023	18 N White Salmon	WA	SNOW	6.5	Cocorahs
December 1, 2023	1 WNW White Salmon	WA	SNOW	5.5	Cocorahs
December 1, 2023	4 N Goldendale	WA	SNOW	3.5	Cocorahs
December 1, 2023	10 NNW Naches	WA	SNOW	1.5	Cocorahs
December 1, 2023	2 NNW Sunnyside	WA	SNOW	0.5	CO-OP Observer
December 1, 2023	4 WNW West Valley	WA	SNOW	1.1	Cocorahs
December 1, 2023	2 NNE Richland	WA	SNOW	1	Cocorahs
December 1, 2023	4 WNW Benton City	WA	SNOW	1	Cocorahs
December 1, 2023	5 S Richland	WA	SNOW	0.5	Cocorahs
December 1, 2023	4 SSE Pendleton	OR	SNOW	1.1	Cocorahs
December 1, 2023	4 NW Selah	WA	SNOW	2	Cocorahs
December 1, 2023	1 NE Sunnyside	WA	SNOW	1	Cocorahs
December 1, 2023	2 NNE Granger	WA	SNOW	1.5	Cocorahs
December 1, 2023	2 S Bend	OR	SNOW	1.2	Cocorahs
December 1, 2023	1 NW Heppner	OR	SNOW	1	CO-OP Observer
December 1, 2023	10 N Elgin	OR	SNOW	0.6	Cocorahs
December 1, 2023	2 NE Selah	WA	SNOW	1	CO-OP Observer
December 1, 2023	2 WSW Fruitvale	WA	SNOW	1.5	Cocorahs
December 1, 2023	Prosser	WA	SNOW	1.4	Cocorahs
December 1, 2023	Prairie City	OR	SNOW	2	Cocorahs
December 1, 2023	1 WNW Arlington	OR	SNOW	1.5	CO-OP Observer

Please note: Magnitude units are either inches, mph, degrees F, or miles.

Continued ->

Significant Weather Events - Local Storm Reports for December 2023

Significant Weather Events					
Date	Location	State	Event Type	Magnitude	Source
December 1, 2023	1 WSW Fruitvale	WA	SNOW	1.5	Cocorahs
December 1, 2023	2 NW Pendleton	OR	SNOW	1.3	CO-OP Observer
December 1, 2023	Pendleton	OR	SNOW	1.1	Official NWS Obs
December 2, 2023	7 SSW GOOSE PRAIRIE	WA	HEAVY SNOW	15	MESONET
December 2, 2023	Shaniko	OR	NON-TSTM WND GST	60	Dept of Highways
December 2, 2023	21 E Milton-Freewater	OR	SNOW	16	Other Federal
December 2, 2023	Lexington	OR	NON-TSTM WND GST	61	AWOS
December 2, 2023	25 SW South Cle Elum	WA	SNOW	15	Trained Spotter
December 2, 2023	2 NW South Cle Elum	WA	SNOW	4	Trained Spotter
December 2, 2023	15 E Weston	OR	SNOW	12	Public
December 2, 2023	15 SSE Dayton	WA	SNOW	14	Public
December 2, 2023	14 SW Three Rivers	OR	SNOW	3	CO-OP Observer
December 2, 2023	12 NW Tieton	WA	SNOW	3	Trained Spotter
December 2, 2023	18 SSE Dayton	WA	SNOW	12	Public
December 3, 2023	9 NNW Seneca	OR	SNOW	7	Mesonet
December 3, 2023	13 SW Mitchell	OR	SNOW	5	Mesonet
December 3, 2023	17 ENE Seneca	OR	SNOW	8	Mesonet
December 3, 2023	6 ESE Granite	OR	SNOW	10	Mesonet
December 3, 2023	13 SSW La Grande	OR	SNOW	7	Mesonet
December 5, 2023	WNW WHITE SALMON	WA	HEAVY RAIN	1.37	COCORAHS
December 5, 2023	1 NW WHITE SALMON	WA	HEAVY RAIN	1.37	COCORAHS
December 5, 2023	SSW TROUT LAKE	WA	HEAVY RAIN	2.27	COCORAHS
December 9, 2023	4 WNW West Valley	WA	SNOW	1	Trained Spotter
December 10, 2023	Cle Elum	WA	SNOW	12	Public

Please note: Magnitude units are either inches, mph, degrees F, or miles.

Continued ->

Significant Weather Events - Local Storm Reports for December 2023

Significant Weather Events					
Date	Location	State	Event Type	Magnitude	Source
December 10, 2023	South Cle Elum	WA	SNOW	11	Public
December 25, 2023	9 NE White Salmon	WA	FREEZING RAIN	0.1	Public
December 25, 2023	13 WSW Goldendale	WA	FREEZING RAIN	0.2	Public
December 25, 2023	5 SSE Mosier	OR	FREEZING RAIN	0.25	Public
December 26, 2023	7 SSE La Grande	OR	NON-TSTM WND GST	53	Mesonet
December 27, 2023	6 SSE Mission	OR	NON-TSTM WND GST	63	Mesonet
December 27, 2023	9 S Pilot Rock	OR	NON-TSTM WND GST	55	Mesonet
December 27, 2023	5 SSE Mission	OR	NON-TSTM WND GST	53	Mesonet
December 27, 2023	6 SSE Mission	OR	NON-TSTM WND GST	68	Mesonet
December 27, 2023	5 SSE Mission	OR	NON-TSTM WND GST	59	Mesonet
December 27, 2023	6 SSE Mission	OR	NON-TSTM WND GST	69	Mesonet
December 27, 2023	6 SSE Mission	OR	NON-TSTM WND GST	74	Mesonet
December 27, 2023	5 SSE Mission	OR	NON-TSTM WND GST	64	Mesonet
December 27, 2023	5 SSE Island City	OR	NON-TSTM WND GST	60	AWOS
December 27, 2023	5 SSE Island City	OR	NON-TSTM WND GST	63	AWOS
December 27, 2023	6 SSE Mission	OR	NON-TSTM WND GST	65	Mesonet
December 27, 2023	7 SSE Mission	OR	NON-TSTM WND GST	61	Mesonet
December 27, 2023	6 SSE Mission	OR	NON-TSTM WND GST	78	Mesonet
December 27, 2023	7 SSE La Grande	OR	NON-TSTM WND GST	63	Mesonet

Please note: Magnitude units are either inches, mph, degrees F, or miles.

There were a total of 67 Local Storm Reports for significant weather events, of which 44 were for snow on the 1st - 3rd, for most of the forecast area, and again on the 9th - 10th for the southern WA Cascades & east slopes. Freezing rain, up to 0.25 inch of ice, fell in the southern WA Cascade east slopes on the 25th. Advisory or warning level wind gusts speeds occurred on the 2nd, in north central OR, and again on the 26th - 27th in the Grande Ronde Valley and the Foothills of the Northern OR Blue Mountains.

Record Weather Events for December 2023

Record Weather Reports					
Event	Date	Where	Previous Record	New Record	Records Began
Max Rainfall	December 3, 2023	Redmond, OR	0.16 / 1950	0.21	1941
High Temp	December 4, 2023	Walla Walla, WA	64 / 1975	64 (tie)	1930
High Temp	December 5, 2023	Walla Walla, WA	61 / 2012	66	1930
High Temp	December 5, 2023	Pendleton, OR	66 / 1944	67	1934
High Temp	December 5, 2023	Pendleton, OR	66 / 1900	67	1934
High Temp	December 5, 2023	Redmond, OR	61 / 1962	65	1941
High Temp	December 5, 2023	Walla Walla, WA	61 / 2012	66	1930
High Temp	December 5, 2023	Yakima, WA	58 / 1991	60	1909
Max Rainfall	December 6, 2023	Yakima, WA	0.35 / 1987	0.55	1909
High Temp	December 6, 2023	Yakima, WA	55 / 1999	59	1909

There were a total of 10 record weather occurrences during December, of which 8 were for record high temperatures. These record high temperatures occurred in the Foothills of the Northern Blue Mountains of OR and WA, and also in central OR on the 4th and 5th. There was also a record high temperature in Yakima, WA on both the 5th and the 6th. One of these 8 record high temperatures was a tie, which was on the 4th, at Walla Walla, WA.

There were 2 record maximum rainfall occurrences. One of these was on the 3rd, at Redmond, OR, and the other was on the 6th in Yakima, WA.

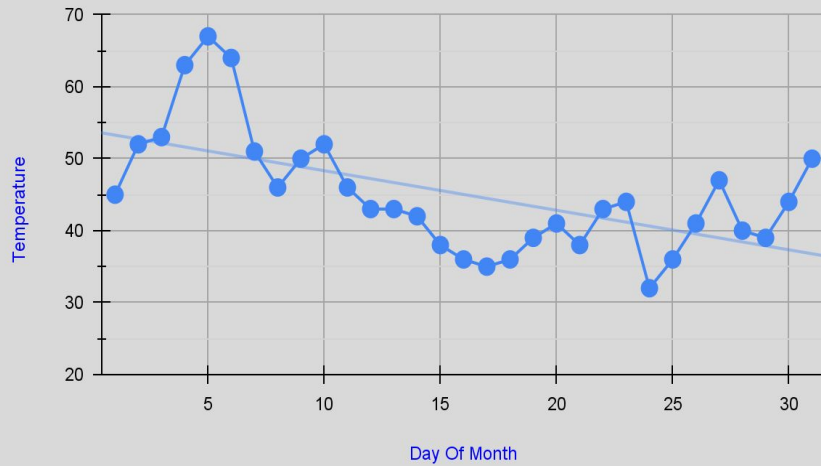
December 2023: Observed Monthly Maximum & Minimum Temperatures

Location <small>Source: airport ASOS, or otherwise stated</small>	Highest Maximum	Lowest Minimum
Pendleton, OR	67	20
Redmond, OR	65	15
Pasco, WA	53	20
Yakima, WA	60	20
Walla Walla, WA	66	22
Bend, OR CoOp	61	15
Ellensburg, WA	46	17
Hermiston, OR	60	19
John Day, OR CoOp	60	15
La Grande, OR	56	12
Dallesport, WA	58	27
Meacham, OR	50	11
MT Adams R.S., WA CoOp	52	23

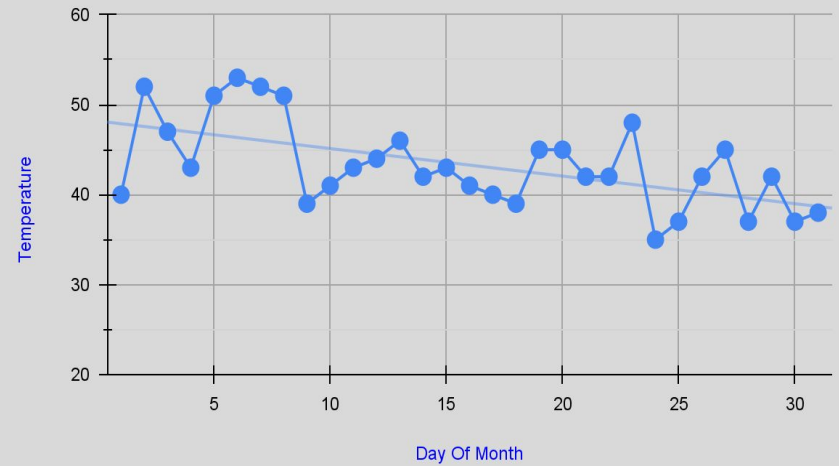
The highest maximum temperatures were mostly in the 50s and 60s. The highest maximum temperature was 67 degrees at Pendleton, OR, and the lowest was 46 degrees at Ellensburg, WA. Ellensburg, WA, a lower elevation station, had the coolest highest maximum temperature due to persistent fog and low clouds under a strong temperature inversion, without a strong enough weather system to scour out the trapped cold air. The coldest minimum temperature was 11 degrees at Meacham, OR, and the warmest was 27 degrees at Dallesport, WA.

December 2023 - Daily Maximum Temperatures For Select Cities

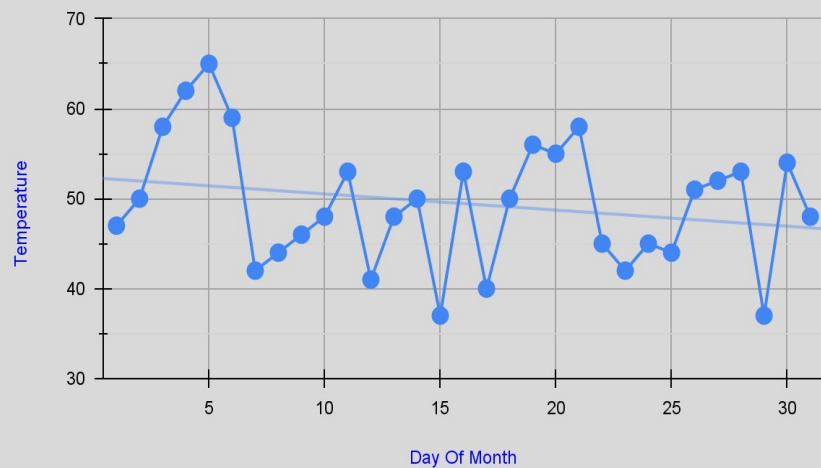
Pendleton, OR - December 2023 Daily Maximum Temperatures



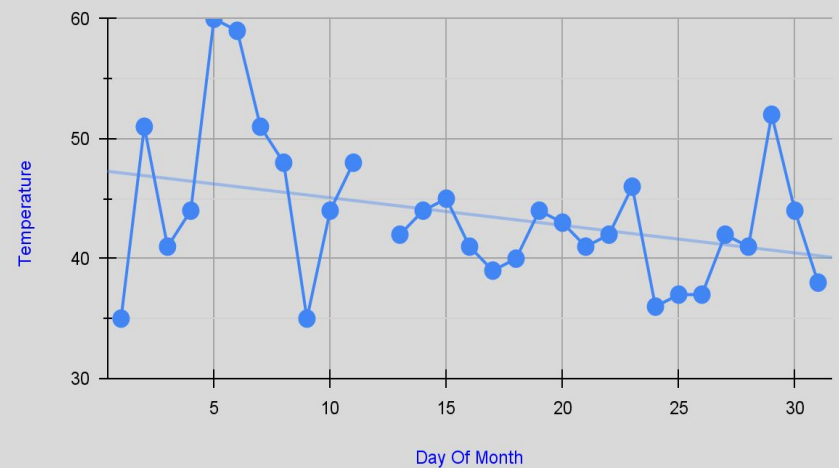
Pasco, WA - December 2023 Daily Maximum Temperatures



Redmond, OR - December 2023 Daily Maximum Temperatures



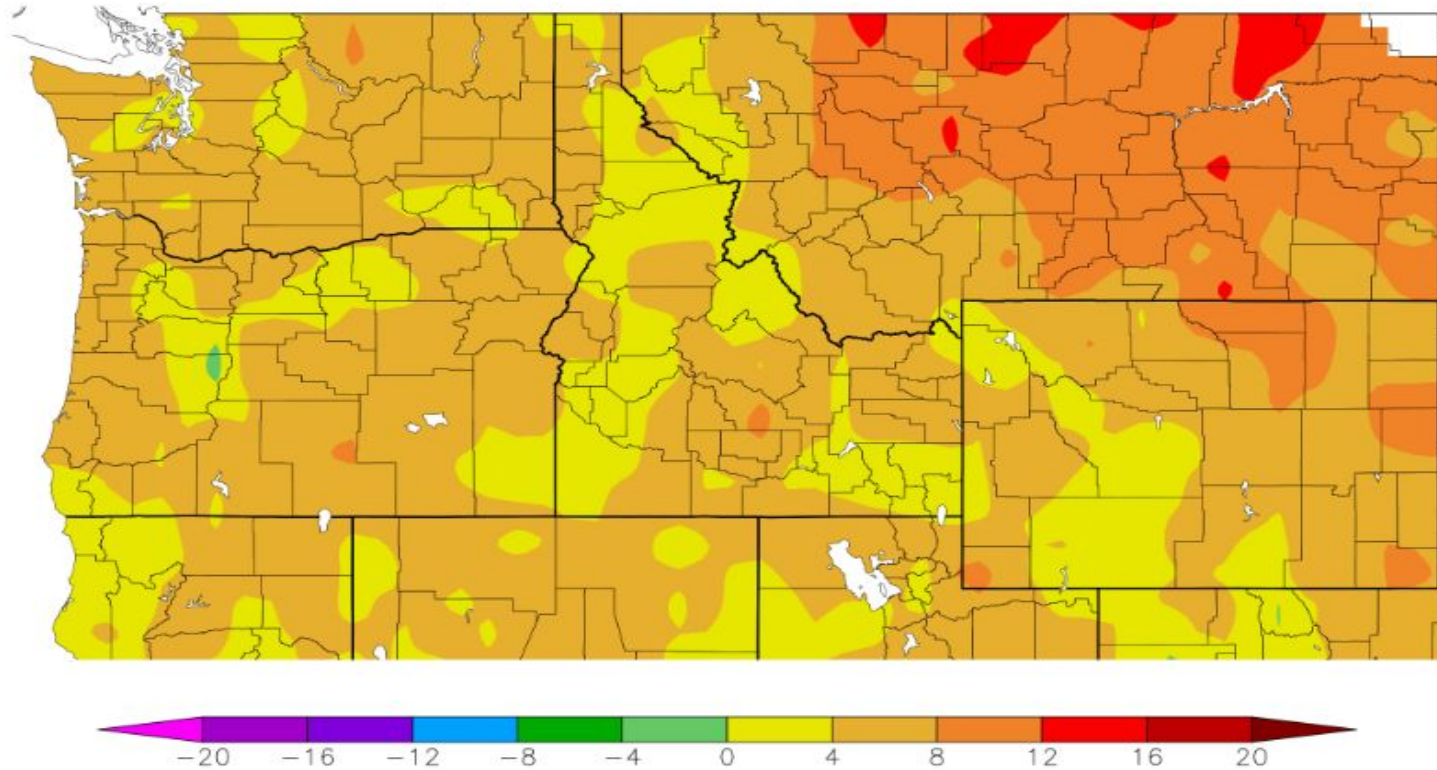
Yakima, WA - December 2023 Daily Maximum Temperatures



The graphs above show that the overall high temperatures trended downward through the month, which would still be expected in December. However, the downward trend steepness has lessened.

December 2023: Departure from Normal of Average Temperatures

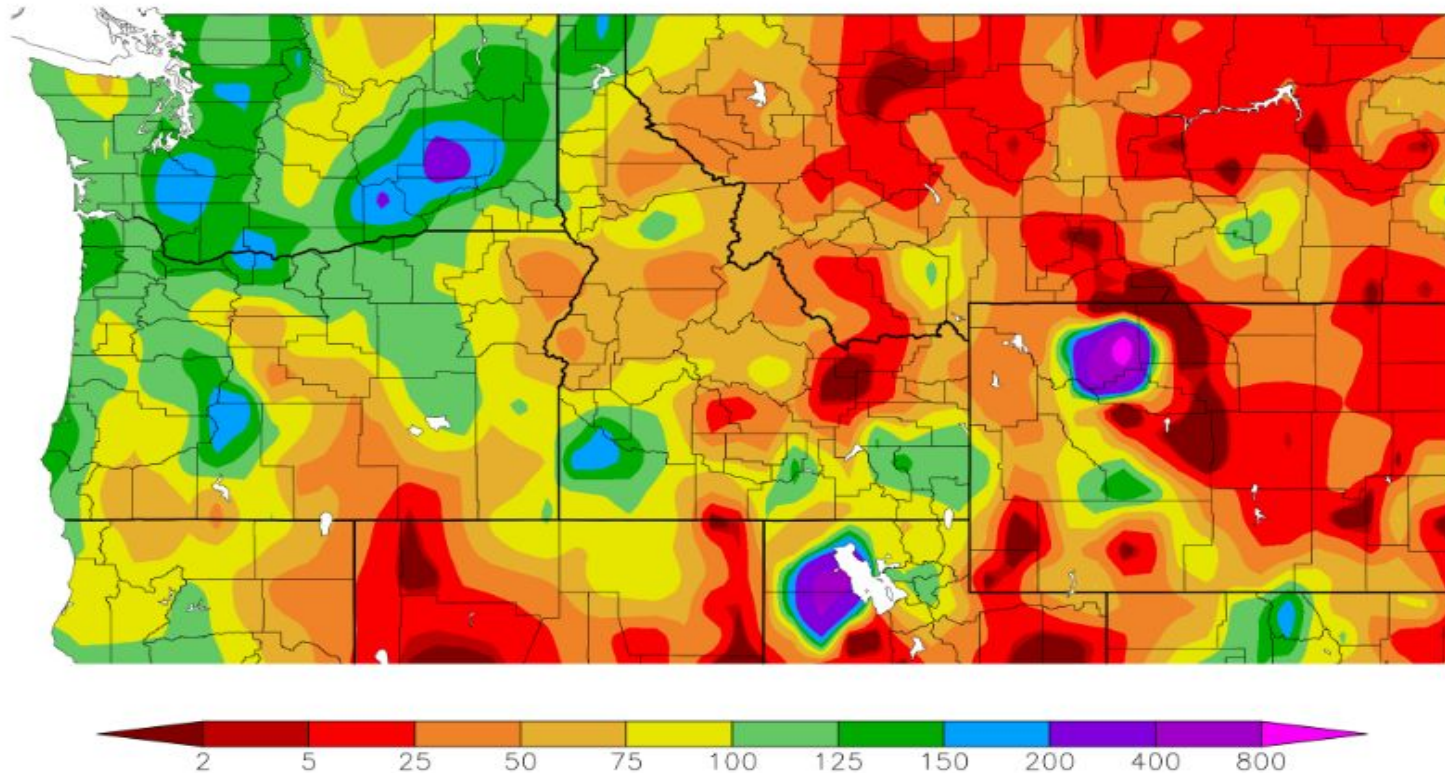
Departure from Normal Temperature (F)
12/1/2023 – 12/31/2023



The entire region, including the forecast area (northeast OR and south central to southeast WA) were warmer than normal during December. The range of departures from normal was as much as 4 to 8 degrees above normal. Much of the reason was due to a moderate to strong El Niño event, which pushed the subtropical jet stream and the polar jet stream northward, allowing warmer than normal temperatures to persist over the northern USA.

December 2023: Percent of Normal Precipitation

Percent of Normal Precipitation (%)
12/1/2023 – 12/31/2023



The wettest locations were in south central/southeast WA and north central OR, with a range of 125 to 400 percent of normal precipitation. Central OR, the northeast mountains, and areas just east of the WA Cascades had precipitation percentages of normal that ranged from 75 percent to as low as 25 percent of normal. The areal coverage of the greater than or less than 100 percent of normal (positive and negative anomalies) were about the same across the forecast area.

December 2023: Departures from Normal Means/Sums for Select Cities

	Max T	Max T D	Min T	Min T D	Ave T	Ave T D	PCPN	PCPN D
Yakima	43.7	5.5	32.2	9.1	37.9	7.3	1.42	-0.02
Kennewick CoOp	44.2	2.7	34.5	4.9	39.3	3.7	1.41	0.33
Walla Walla	43.7	2.7	33.7	3.5	38.7	3.1	2.26	0.03
The Dalles	45.5	4.1	37.4	6.4	41.4	5.2	3.18	0.50
Redmond	49.5	7.2	30.6	7.3	40.0	7.2	0.68	-0.29
Pendleton Airport	45.0	4.2	33.8	6.3	39.4	5.2	1.58	0.08
La Grande Airport	42.6	3.9	31.6	7.2	37.1	5.6	1.19	-0.69
John Day CoOp	44.5	5.5	26.5	5.7	35.5	5.6	1.27	0.13

The above table shows that all of the mean maximum, mean minimum and mean average temperatures were all above normal for every station in the list. The greatest departure from normal mean maximum temperature was 7.2 degrees above normal at Redmond, OR, and the greatest departure from normal mean minimum temperature was 9.1 degrees above normal at Yakima, WA. The greatest departure from normal of the mean average temperatures was 7.3 degrees above normal, also at Yakima, WA. Precipitation anomalies, however, had a more even distribution, but more stations with above normal precipitation than below normal. The greatest departure was at the La Grande, OR airport with -0.69 of an inch below normal. The greatest departure of above normal precipitation was at The Dalles (Dallesport, WA), with +0.50 of an inch above normal.

The greatest departures are outlined in black boxes.

December 2023: Observed Total Precipitation and Total Snowfall / Hail

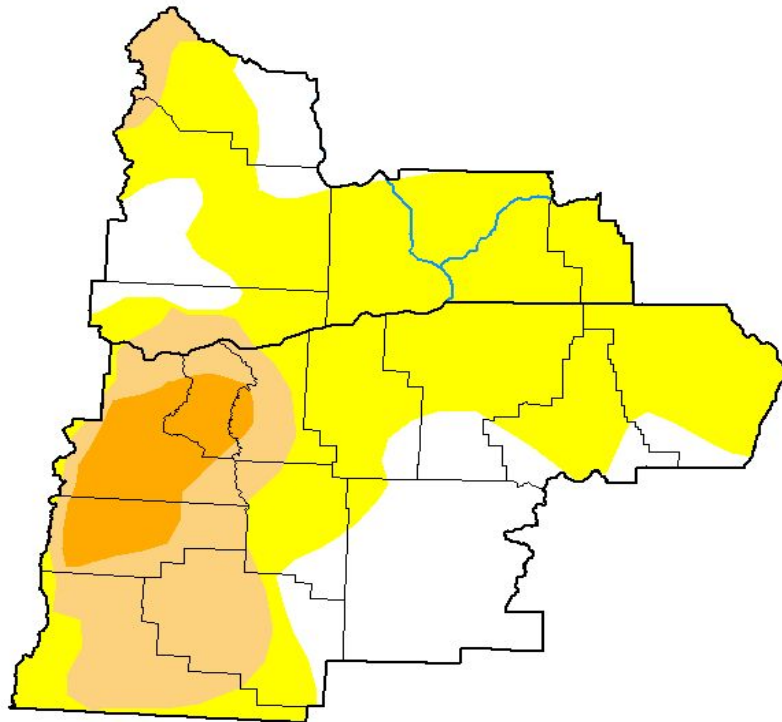
Location <small>Source: airport ASOS, or otherwise stated</small>	Total Precipitation (inches)	Total Snow/Hail (inches)
Pendleton, OR	1.58	T
Redmond, OR	0.68	M
Pasco, WA	1.44	M
Yakima, WA	1.42	M
Walla Walla, WA	2.26	M
Bend, OR CoOp	0.36	0.0
Ellensburg, WA	1.46	M
Hermiston, OR	1.36	M
John Day, OR CoOp	1.27	T
La Grande, OR	1.19	M
Dallesport, WA	3.18	M
Meacham, OR	5.25	M
MT Adams R.S., WA CoOp	5.91	10.0

The greatest total precipitation for December was at the Mt. Adams Ranger Station with 5.91 inches and the lowest precipitation amount in this list was at the Bend, OR CoOp station, with only 0.36 of an inch. Most stations had between 1 and 2 inches of precipitation. Of the stations that had a report of total snowfall, the Mt. Adams Ranger station had the most with 10.0 inches of snow, and the least was at the Bend, OR CoOp station with zero inches of snow. Pendleton, OR and the John Day, OR CoOp station each had a trace of snow.

December 2023 - Drought Monitor – Pendleton Forecast Area

U.S. Drought Monitor Pendleton, OR WFO

January 2, 2024
(Released Thursday, Jan. 4, 2024)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	23.75	76.25	24.81	7.08	0.00	0.00
Last Week 12-26-2023	23.75	76.25	24.81	7.08	0.00	0.00
3 Months Ago 10-03-2023	1.51	98.49	71.23	31.58	1.09	0.00
Start of Calendar Year 01-02-2024	23.75	76.25	24.81	7.08	0.00	0.00
Start of Water Year 09-26-2023	1.51	98.49	71.11	31.58	1.09	0.00
One Year Ago 01-03-2023	29.80	70.20	39.93	22.93	15.24	3.17

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:

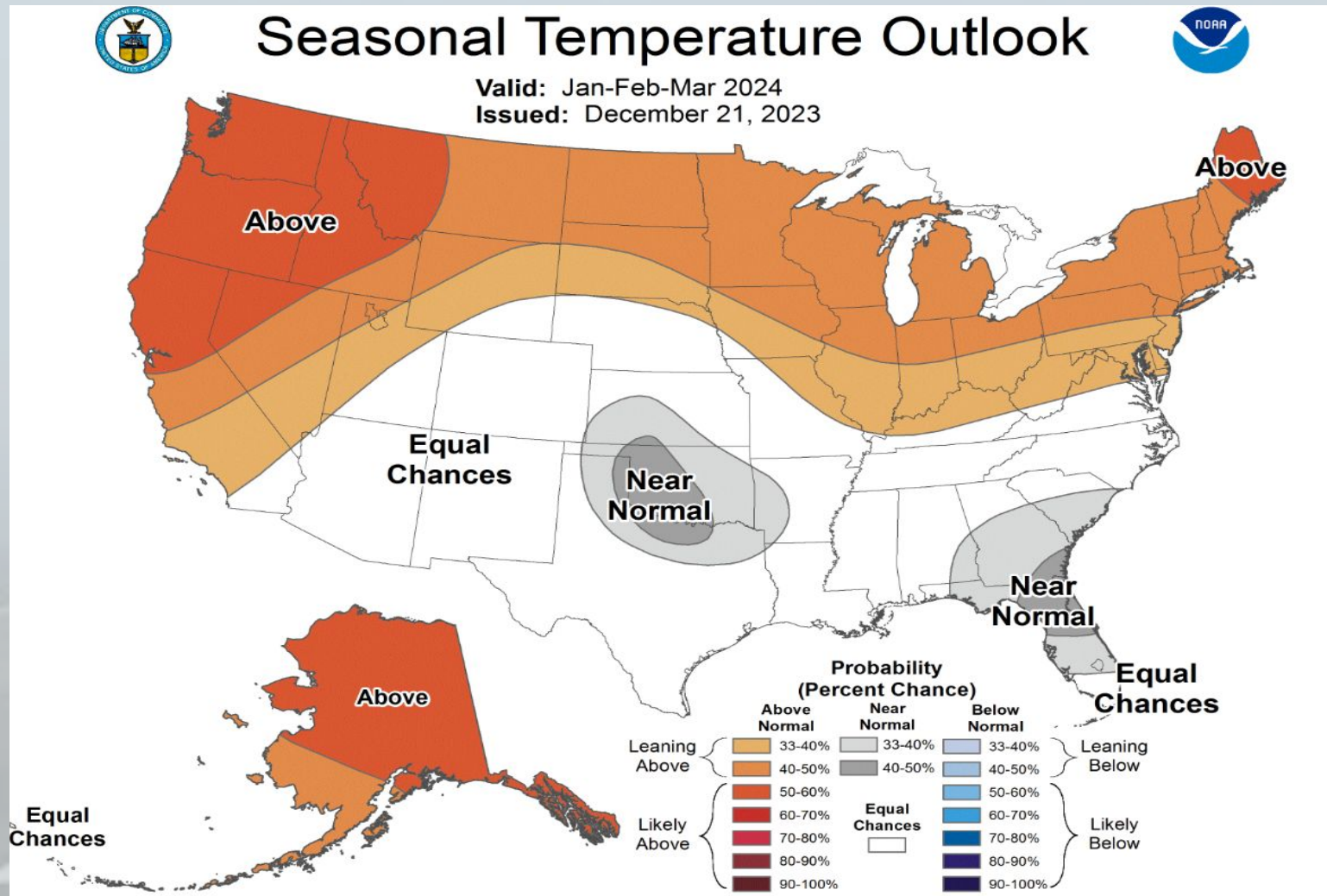
Lindsay Johnson
National Drought Mitigation Center



droughtmonitor.unl.edu

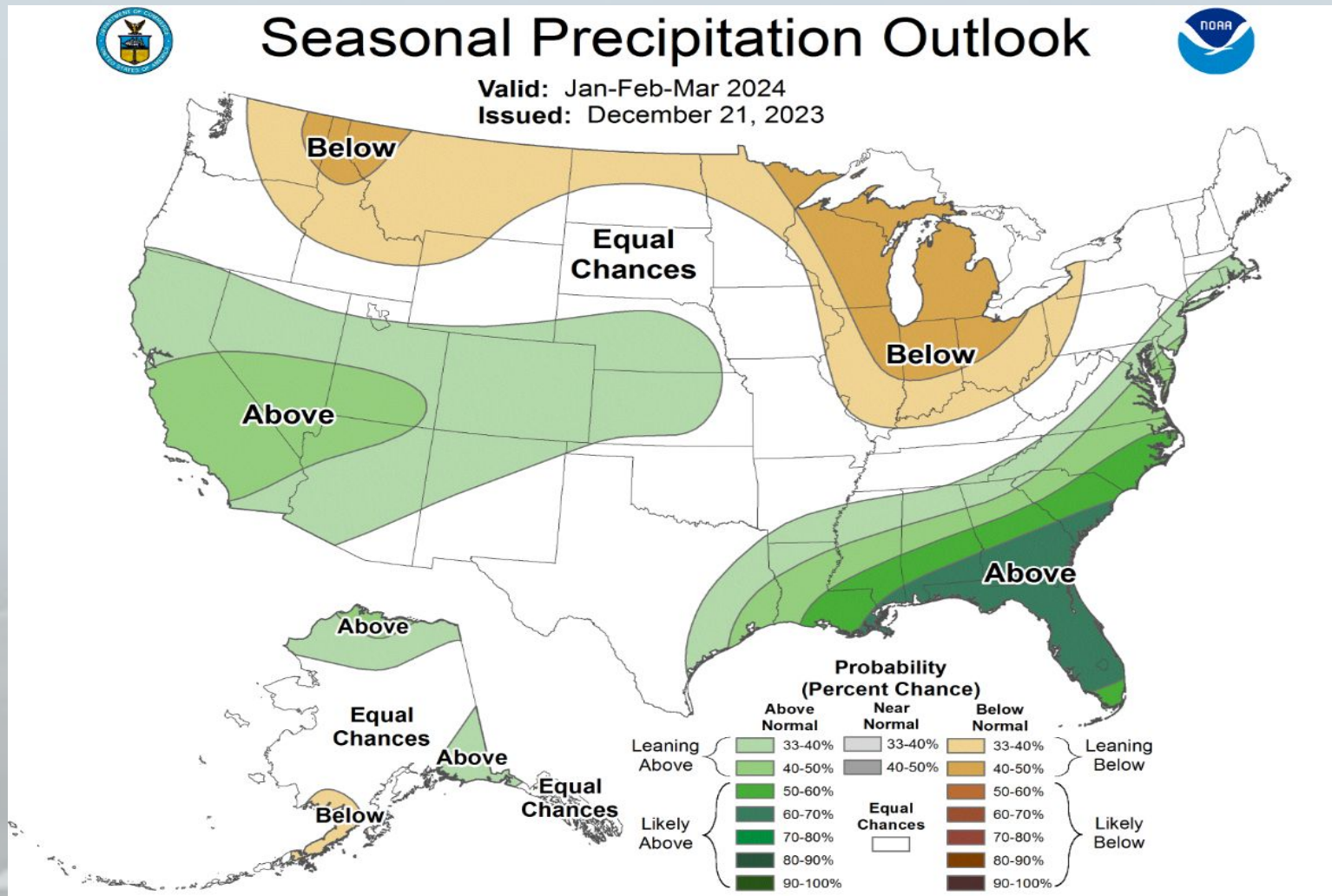
The greatest drought conditions at the end of December, as of January 2, 2024 was in the northern portion of central OR, and in north central OR from the Cascade east slopes to the lower elevations just east of the Cascades with a drought index of D2 (Severe Drought). Most of the rest of the forecast area had a drought index of between D0 to D1 (Abnormally Dry to Moderate drought). The southeast portion of the forecast area, and areas along the southern WA Cascades had a drought index of “None”. Drought conditions have been easing each month for the last several months.

USA Three Month Temperature Outlook



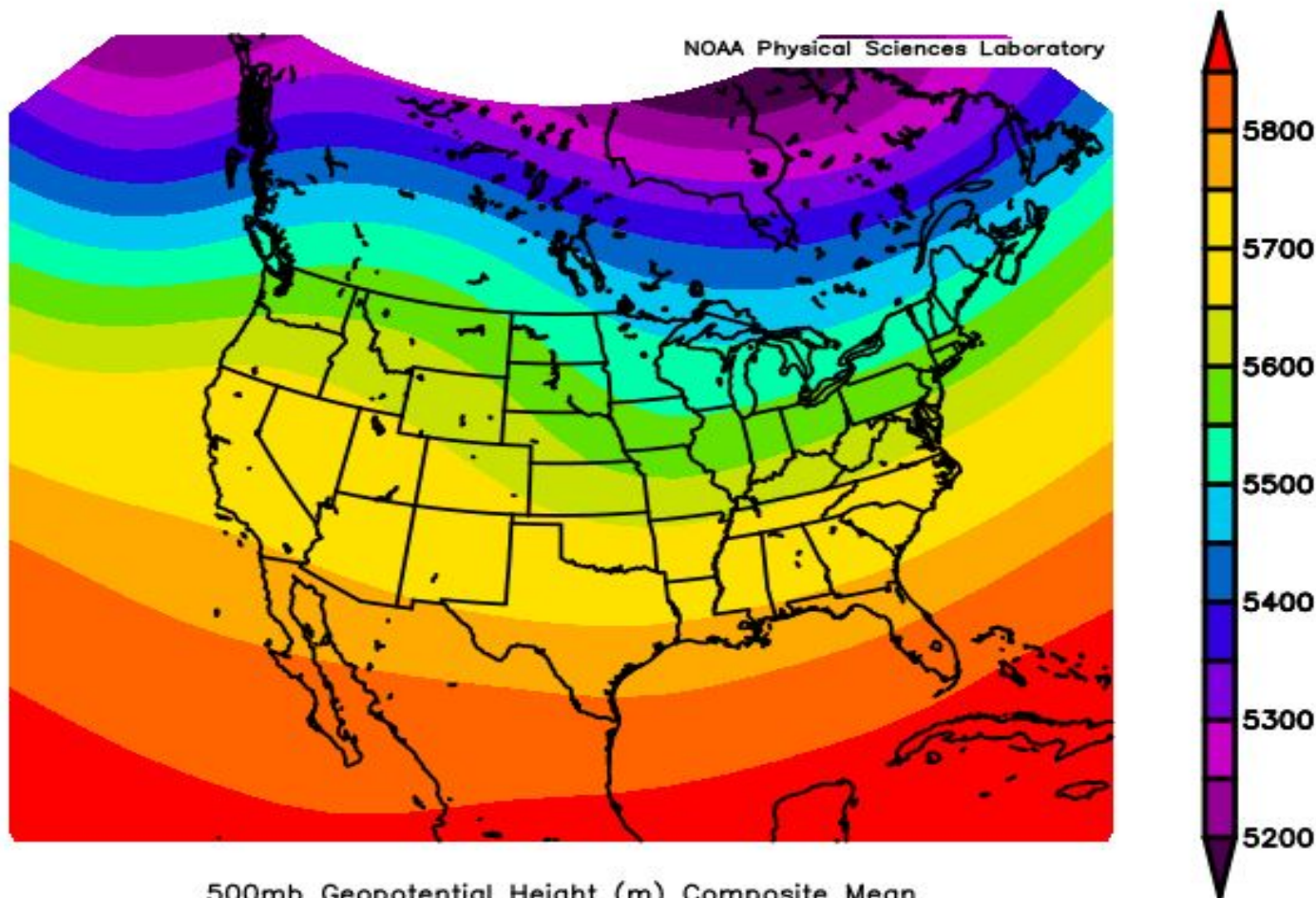
The three month temperature outlook for the period January through March 2024 over the Pacific Northwest shows temperature probabilities are leaning towards above normal (50-60% probability). This is about the same probability for temperatures as the previous 3 month outlook in November. It should be noted that warmer than normal conditions are typically seen over the Pacific Northwest during a moderate to strong El Niño event during the winter months, of which one is currently ongoing.

USA Three Month Precipitation Outlook



The three month precipitation outlook for the period January through March 2024, over the Pacific Northwest shows that precipitation probabilities are leaning mostly towards equal chances, except for the northeast portions of the forecast area, which are leaning towards slightly below normal precipitation (33 - 40% probability). Precipitation is typically lower than normal in the Pacific Northwest during a moderate to strong El Niño event during the winter, of which one is currently ongoing.

December 2023 Average 500 MB Pattern



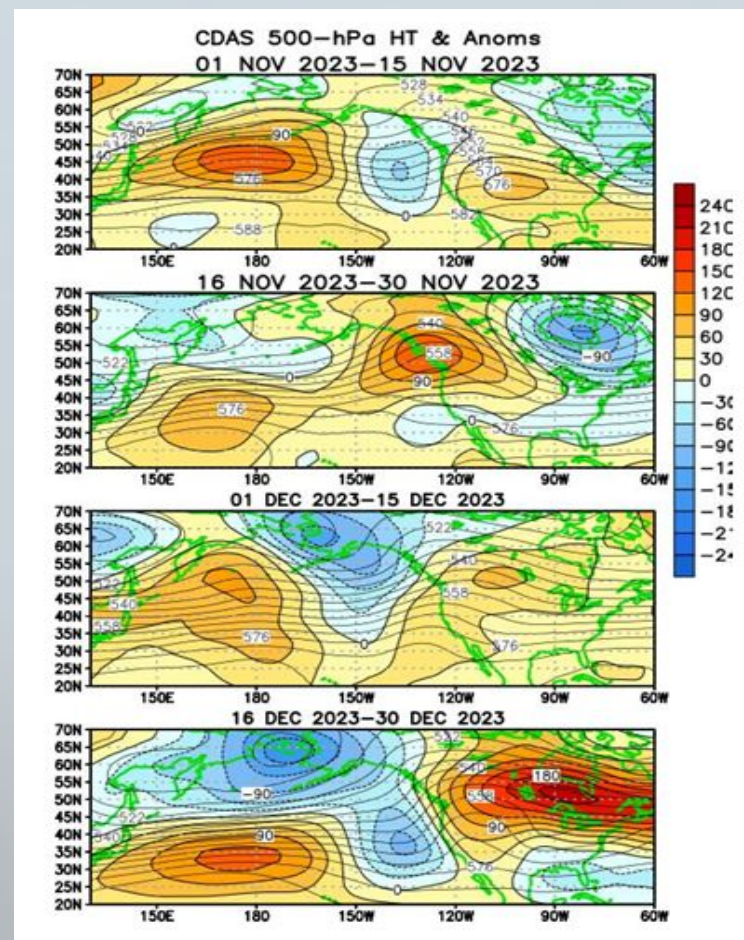
500mb Geopotential Height (m) Composite Mean
12/1/23 to 12/31/23
NCEP/NCAR Reanalysis

The average 500 mb flow pattern for December 2023 was an overall southwest flow on the backside of an upper ridge centered over the northern Rocky Mountains. The upper ridge pattern with a southwest flow aloft over the region has resulted in warmer than normal conditions for the month. However, there were weather events that brought significant rain (and some mountain snow).

Two Month, average Bi-weekly 500 MB Plots for October - November 2023

These are more detailed bi-weekly average 500 mb pattern plots that were sampled from the beginning of November through the end of December. These images are updated on the 2nd Thursday of each month.

The area of focus is the Pacific Northwest (OR & WA). The land boundaries are shown by the green lines. Yellow and orange colored areas represent areas of high pressure or ridges at 500 mb. The blue colors show areas of low pressure systems or troughs at 500 mb.

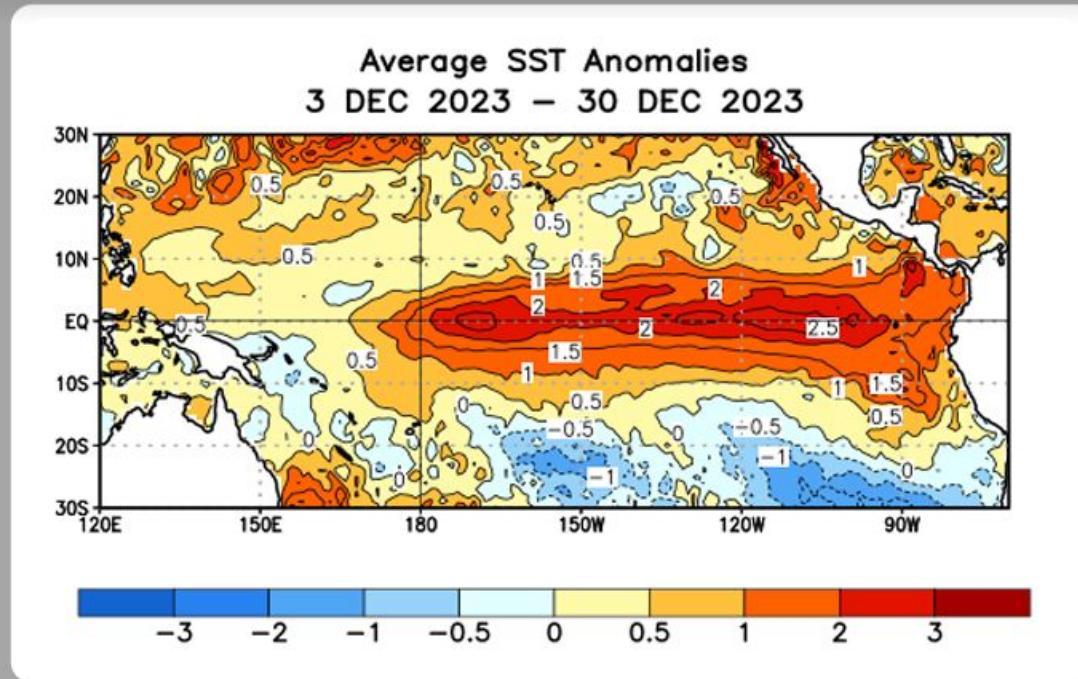


There was an average southwest flow from November 1st - 15th (top image). Then there was a strong upper ridge over the Pacific Northwest from November 16th - 30th (second image from the top). From December 1st - 15th, there was an overall upper ridge pattern again (third image from the top), and then an average southwest flow from December 16th - 30th (bottom image), with a strong upper ridge over the Rocky Mountains, and an upper trough off the coast. These patterns, which were mostly a southwest flow, resulted in warmer than normal conditions during December. This is also typical of a moderate to strong El Niño event during the winter.

Sea Surface Temperature (SST) Anomalies for December 2023

SST Departures (°C) in the Tropical Pacific During the Last Four Weeks

In the last four weeks, equatorial SSTs were above average across most of the Pacific Ocean, with near-average SSTs in the western Pacific Ocean.



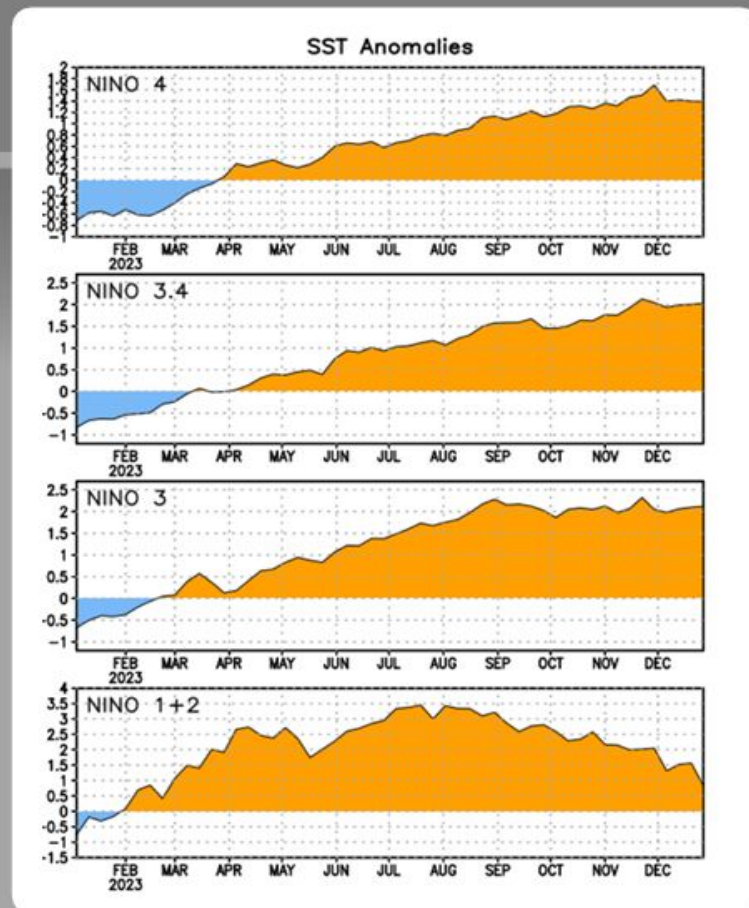
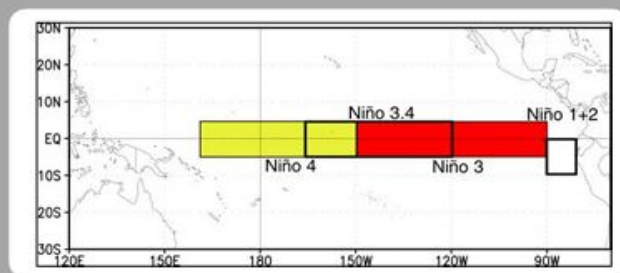
During the last four weeks, equatorial Sea Surface Temperatures (SSTs) continued to be above average over most of the Pacific Ocean (mainly across the central and eastern equatorial Pacific), while the far western equatorial Pacific was near average. These persistent, above normal SSTs continue to show the ongoing El Niño event, which is forecast to continue through the winter and early spring of 2024. ENSO conditions are forecast to become neutral by late spring 2024.

ENSO Niño Regions SST Anomalies Ending in December 2023

Niño Region SST Departures (°C) Recent Evolution

The latest weekly SST departures are:

Niño 4	1.4°C
Niño 3.4	2.0°C
Niño 3	2.1°C
Niño 1+2	0.8°C



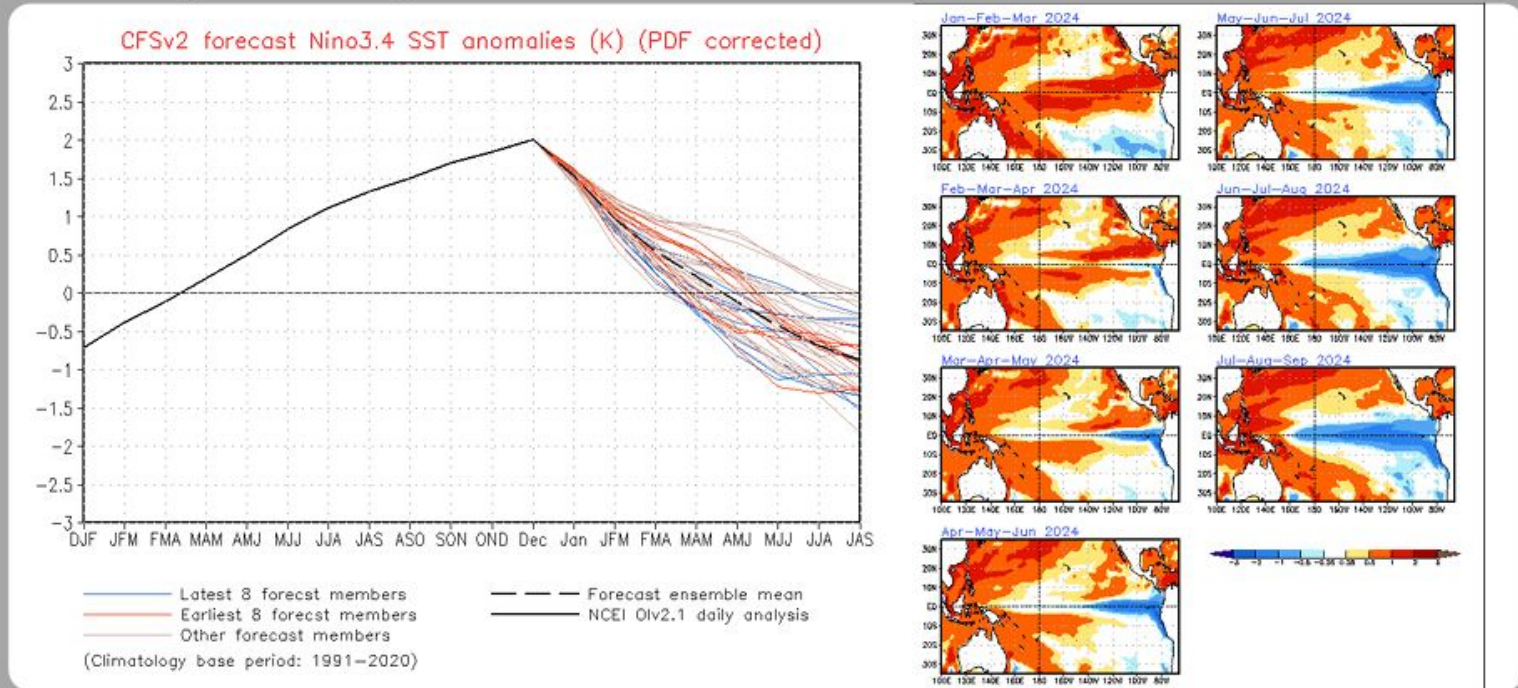
Niño Region 1+2 (bottom image) has been showing a consistent decline in positive anomaly SSTs (orange shaded areas) during the past 4 to 5 months. The other 3 Niño regions showed little to no change during December. Nevertheless, SST conditions are still consistent with the ongoing El Niño event with positive SST anomalies. El Niño conditions are forecast to persist through the winter into early spring of 2024, and then ENSO neutral conditions are expected.

Sea Surface Temperature (SST) NCEP CFS.v2 Ensemble Mean Outlook

SST Outlook: NCEP CFS.v2 Forecast (PDF corrected)

Issued: 1 January 2024

The CFS.v2 ensemble mean (black dashed line) indicates El Niño will continue through the Northern Hemisphere winter 2023-24 and then transition to ENSO-neutral by March-May 2024.



The CFS.v2 ensemble mean for Niño Region 3.4 (our most influential Niño Region) will continue warmer than normal through the Northern Hemisphere winter and early spring of 2024, and then transition to ENSO neutral conditions by late spring. The bold black line indicates El Niño has peaked during December, and is now trending downward to ENSO neutral, which is expected by late spring. The thumbnail images show that eastern equatorial SSTs are expected to cool through late spring.

Current ENSO (El Niño Southern Oscillation) Alert System Status

Summary

ENSO Alert System Status: **El Niño Advisory**

El Niño conditions are observed.*

Equatorial sea surface temperatures (SSTs) are above average across the central and eastern Pacific Ocean.

The tropical Pacific atmospheric anomalies are consistent with El Niño.

El Niño is expected to continue through the Northern Hemisphere winter, with a transition to ENSO-neutral favored during April-June 2024 (60% chance).*

The current ENSO Alert System Status is still **“El Niño Advisory”**. El Niño conditions are still observed with equatorial SSTs above average across the central and eastern Pacific Ocean. The tropical Pacific atmospheric anomalies remain consistent with El Niño. El Niño is expected to continue through the Northern Hemisphere winter of 2024, with a 60% chance of ENSO conditions transitioning to ENSO-neutral during April - June 2024.



Thank You!