

The Month In Review

March 2023

National Weather Service
Pendleton, Oregon

Low clouds hanging over the Blue Mountains

March 2023 Climate Conditions Summary

March 2023 was overall cooler than normal, with near normal precipitation. There were frequent Pacific weather systems that continued to increase mountain snowpack through most of the month. The greatest amounts of snow fell over the Northern Blue Mountains and the Cascades, especially over the WA Cascades and east slopes. Precipitation amounts were close to normal, with a nearly equal split of above or below normal average precipitation across the forecast area. The increase in mountain snowpack could lead to increased chances of flooding on rivers, streams, and creeks if there is a significant warm-up with heavy rain falling on melting mountain snow during this spring. So far flooding has not come to pass, as the warm up has been gradual, with only gradual melting of snow by the end of March.

The month also had several episodes of breezy to windy conditions. This include many Local Storm Reports where non-thunderstorm wind gusts reached or exceeded 45 mph (Wind Advisory wind speeds) or 58 mph (High Wind Warning wind speeds). Many of these wind events were southeast downslope winds off the northwest slopes of the Northern Blue Mountains to the base of the Blue Mountains into the Foothills. However, there was very little damage reported from these winds despite reaching wind advisory or high wind warning thresholds. There were also some periods of blowing dust across the drier lower elevations.

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



Low clouds hanging over the Blue Mtns.



March snowfall. Photo by: Vic DeJesus.



Brilliant sunrise over Pendleton, OR

More Images Representing March 2023 Weather/Climate Conditions



Heavy early spring rain event over Pendleton, OR



Late winter wet snow at the NWS Pendleton Forecast Office



Deep late winter snowpack near Meacham, OR



Low visibility in blowing dust over the Horse Heaven Hills, WA

Significant Weather Event Storm Reports for March 2023

Significant Weather Events					
Date	Location	State	Event Type	Magnitude	Source
March 5, 2023	24.9 NE WALLOWA	OR	HEAVY SNOW	6	COCORAHS
March 5, 2023	1 E COVE	OR	HEAVY SNOW	7.4	CO-OP OBSERVER
March 5, 2023	4 ESE PILOT ROCK	OR	HEAVY SNOW	7	TRAINED SPOTTER
March 6, 2023	TIETON	WA	SNOW	9	PUBLIC
March 8, 2023	39 SE PRINEVILLE	OR	SNOW	4.5	CO-OP OBSERVER
March 9, 2023	4 ENE MISSION	OR	NON-TSTM WND GST	60	MESONET
March 9, 2023	6 SSE MISSION	OR	NON-TSTM WND GST	62	MESONET
March 9, 2023	5 SSE MISSION	OR	NON-TSTM WND GST	59	MESONET
March 9, 2023	4 SSW MISSION	OR	NON-TSTM WND GST	51	MESONET
March 9, 2023	4 ESE WALLA WALLA EAST	WA	NON-TSTM WND GST	52	MESONET
March 10, 2023	4 W ADAMS	OR	NON-TSTM WND GST	50	MESONET
March 10, 2023	5 WNW UNION	OR	NON-TSTM WND GST	46	MESONET
March 10, 2023	7 SSE LA GRANDE	OR	NON-TSTM WND GST	45	MESONET
March 10, 2023	2 SE CITY OF THE DALLES	OR	NON-TSTM WND GST	60	MESONET
March 10, 2023	6 SSE MISSION	OR	NON-TSTM WND GST	56	MESONET
March 10, 2023	4 NW SELAH	WA	SNOW	5	COCORAHS
March 10, 2023	20 SSE PRINEVILLE	OR	NON-TSTM WND GST	48	MESONET
March 10, 2023	10 N ELGIN	OR	SNOW	5	COCORAHS
March 10, 2023	2 WNW SISTERS	OR	SNOW	4.5	COCORAHS
March 10, 2023	2 ESE BEND	OR	SNOW	2.6	COCORAHS
March 10, 2023	17 NW ROSLYN	WA	SNOW	1	COCORAHS
March 10, 2023	ELGIN	OR	SNOW	1.5	COCORAHS
March 10, 2023	6 SSE PRINEVILLE	OR	SNOW	2.8	COCORAHS
March 10, 2023	1 WSW BEND	OR	SNOW	5	COCORAHS

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

continued on next slide →

Significant Weather Event Storm Reports for March 2023

Significant Weather Events					
Date	Location	State	Event Type	Magnitude	Source
March 10, 2023	1 WSW TERREBONNE	OR	SNOW	1	COCORAHS
March 10, 2023	3 ESE BEND	OR	SNOW	2.1	COCORAHS
March 10, 2023	7 W REDMOND	OR	SNOW	3.5	COCORAHS
March 10, 2023	9 NW SENECA	OR	SNOW	5	COCORAHS
March 10, 2023	18 N WHITE SALMON	WA	SNOW	5.8	COCORAHS
March 10, 2023	4 WNW WEST VALLEY	WA	SNOW	3.9	COCORAHS
March 10, 2023	3 SSW WALLOWA	OR	SNOW	4.4	COCORAHS
March 10, 2023	5 NNW LA PINE	OR	HEAVY SNOW	8	TRAINED SPOTTER
March 10, 2023	4 W ROSLYN	WA	SNOW	1	CO-OP OBSERVER
March 10, 2023	2 N ELLENSBURG	WA	HEAVY SNOW	4	TRAINED SPOTTER
March 10, 2023	13 SW MITCHELL	OR	HEAVY SNOW	9	MESONET
March 10, 2023	17 ENE SENECA	OR	HEAVY SNOW	6	MESONET
March 10, 2023	1 N ELLENSBURG	WA	SNOW	2.5	TRAINED SPOTTER
March 10, 2023	7 SSW THREE RIVERS	OR	HEAVY SNOW	10	TRAINED SPOTTER
March 10, 2023	7 SSW THREE RIVERS	OR	HEAVY SNOW	10	TRAINED SPOTTER
March 10, 2023	15 E WESTON	OR	HEAVY SNOW	14	TRAINED SPOTTER
March 10, 2023	15 SSE DAYTON	WA	SNOW	8	OTHER FEDERAL
March 13, 2023	SHANIKO	OR	NON-TSTM WND GST	58	MESONET
March 13, 2023	5 W SHANIKO	OR	NON-TSTM WND GST	49	MESONET
March 13, 2023	6 SSE MISSION	OR	NON-TSTM WND GST	50	MESONET
March 13, 2023	4 SSW FOSSIL	OR	NON-TSTM WND GST	46	MESONET
March 13, 2023	1 SSW LONG CREEK	OR	NON-TSTM WND GST	47	MESONET
March 13, 2023	10 NNW BENTON CITY	WA	NON-TSTM WND GST	49	MESONET
March 13, 2023	12 NNE WARM SPRINGS	OR	NON-TSTM WND GST	45	MESONET

continued on next slide →

Significant Weather Event Storm Reports for March 2023

Significant Weather Events					
Date	Location	State	Event Type	Magnitude	Source
March 13, 2023	1 E HERMISTON	OR	NON-TSTM WND GST	48	ASOS
March 13, 2023	9 ESE ECHO	OR	NON-TSTM WND GST	45	MESONET
March 13, 2023	2 NNW PENDLETON	OR	NON-TSTM WND GST	47	ASOS
March 13, 2023	5 ENE RUFUS	OR	NON-TSTM WND GST	45	MESONET
March 13, 2023	3 NNE WALLA WALLA EAST	WA	NON-TSTM WND GST	56	ASOS
March 13, 2023	11 E SHANIKO	OR	NON-TSTM WND GST	50	MESONET
March 13, 2023	21 ENE MILTON-FREEWATER	WA	SNOW	6	MESONET
March 13, 2023	21 SE PENDLETON	OR	SNOW	5	DEPT OF HIGHWAYS
March 24, 2023	15 E WESTON	OR	HEAVY SNOW	10	TRAINED SPOTTER
March 24, 2023	4 ESE PILOT ROCK	OR	HAIL	0.25	TRAINED SPOTTER
March 25, 2023	17 SSE DAYTON	WA	HEAVY SNOW	10	TRAINED SPOTTER
March 28, 2023	2.1 ESE BEND	OR	SNOW	2.4	COCORAHS
March 28, 2023	6.2 SSE PRINEVILLE	OR	SNOW	2.5	COCORAHS
March 28, 2023	7 SSW THREE RIVERS	OR	HEAVY SNOW	9	TRAINED SPOTTER
March 28, 2023	2 SW BEND	OR	HEAVY SNOW	4	OTHER FEDERAL
March 28, 2023	1 S CAMP SHERMAN	OR	HEAVY SNOW	7.5	TRAINED SPOTTER
March 28, 2023	2 SW BEND	OR	HEAVY SNOW	5	COCORAHS
March 28, 2023	1 NNW THREE RIVERS	OR	SNOW	7	TRAINED SPOTTER

Record Weather Events for March 2023

Record Weather Reports					
Event	Date	Where	Previous Record	New Record	Records Began
Low Temperature	March 7, 2023	Walla Walla, WA	26 / 1952	25	1930
Maximum Rainfall	March 10, 2023	Pasco, WA	0.25 / 1989	0.34	1942
Low Temperature	March 26, 2023	Yakima, WA	21 / 2020	21 (tie)	1909

see
next
slide →

Significant Weather Event Storm Report Summary for March 2023

In total, there were 66 Local Storm Reports of significant weather events over the forecast area. All of these reports were either for non-thunderstorm wind gusts or snow, including heavy snow. These events were distributed throughout March, occurring between the 5th to the 13th, and from the 24th to the 28th. Both time periods had reports of both strong wind gusts and snow or heavy snow. Most of the snow reports were in the mountains, but there were also reports of snow at lower elevations. The low elevation snow events were mostly in central Oregon, or in the Yakima/Kittitas Valleys. Pendleton had some light snow in March, but it was too warm and the snow did not stick well to surfaces. Most of the snow accumulations were in the 5 to 10 inch range.

Record Weather Event Summary for March 2023

There were only three reports of record weather during March: two record low temperatures and one maximum rainfall event. The record maximum rainfall event occurred in Pasco, WA, and the two temperature records occurred in Walla Walla, WA, and Yakima, WA (low elevation stations). The Pasco airport received 0.34 inch of rain, and the two record low temperature reports were 21 (a tie) in Yakima, WA, and the other was in Walla Walla, WA, with a broken record low of 25 degrees.

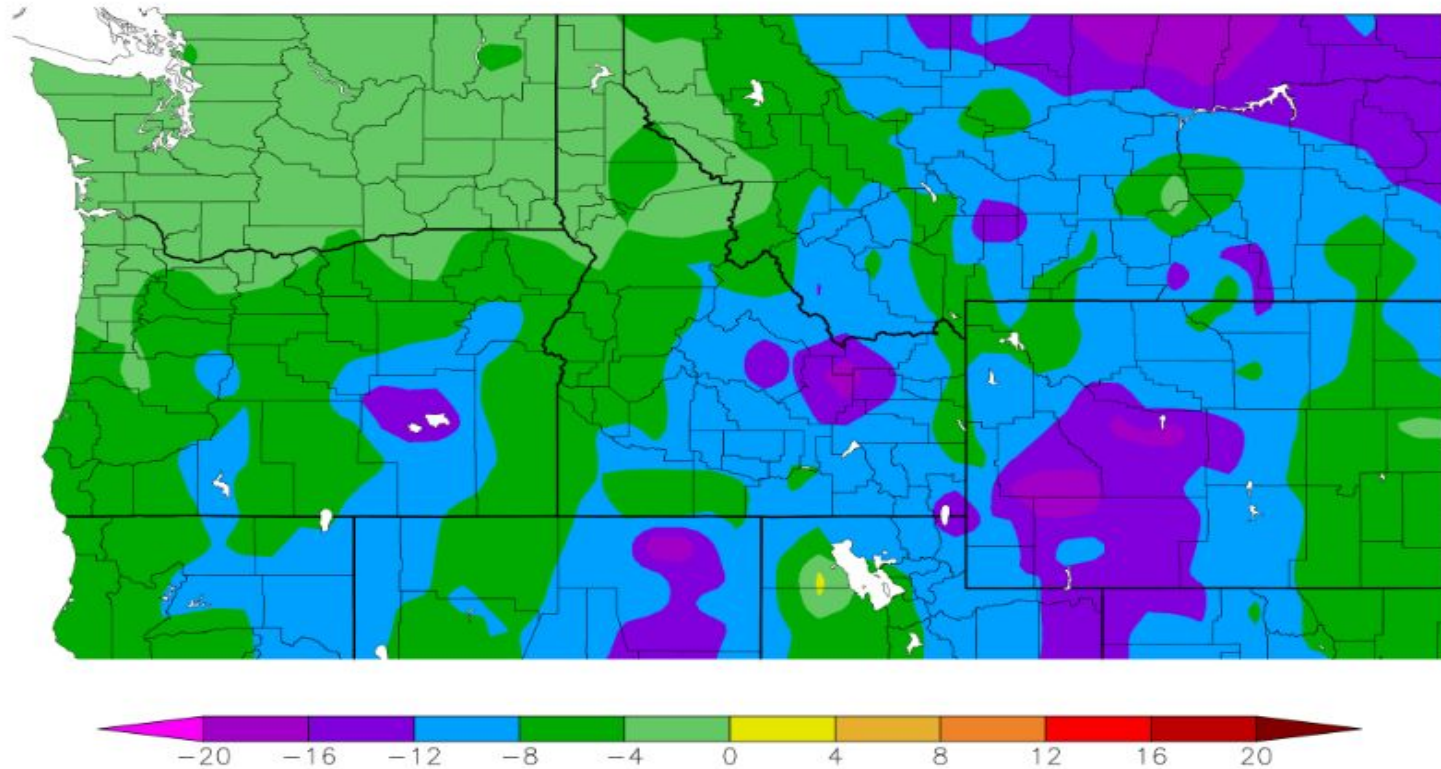
March 2023: Observed Monthly Maximum & Minimum Temperatures

Location	Highest Maximum	Lowest Minimum
Pendleton, OR	66	25
Redmond, OR	62	17
Pasco, WA	66	21
Yakima, WA	62	17
Walla Walla, WA	62	25
Bend, OR Co-Op	58	18
Ellensburg, WA	60	19
Hermiston, OR	71	21
John Day, OR	61	17
La Grande, OR	55	17
The Dalles, OR	66	26
Meacham, OR	47	4
MT Adams RS, WA	56	16

The table above indicates most of the highest maximum temperatures recorded during the month were in the 60s. The highest was at Hermiston, OR, reaching 71 degrees, while the coolest was recorded in Meacham, OR at 47 degrees. Most of the lowest temperature recordings were in the teens. Nevertheless, the highest minimum temperature was 26 degrees at The Dalles, OR (Dallesport, WA), and the lowest was recorded in Meacham, OR, at 4 degrees above zero. These temperatures fall within the typical range of extremes for March.

March 2023: Departure from Normal of Average Temperatures

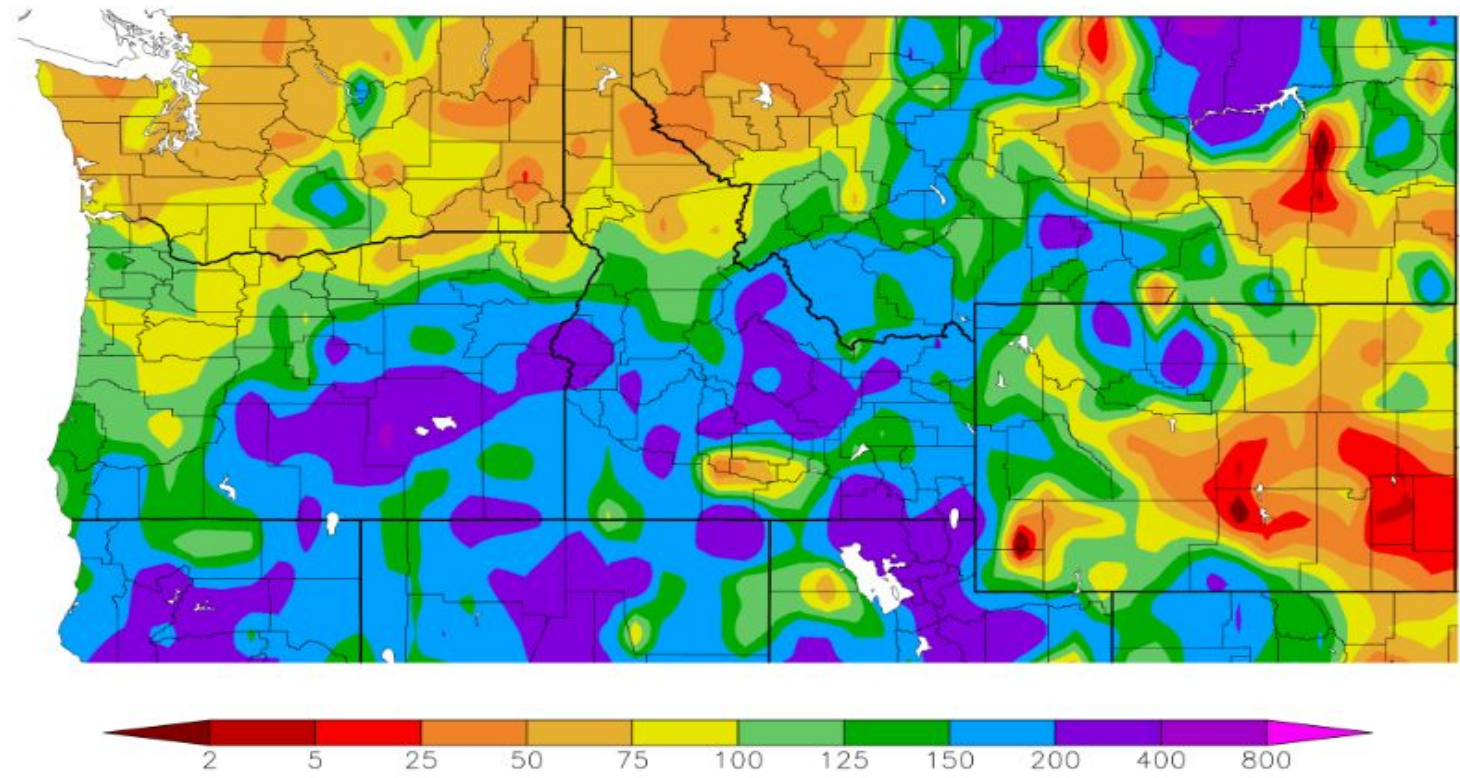
Departure from Normal Temperature (F)
3/1/2023 – 3/31/2023



The image above shows that all of the forecast area had departures of normal temperatures less than 0 (cooler than normal). The departures ranged from -8 to -12 over the Ochoco-John Day highlands to -1 to -8 degrees elsewhere. There were no areas with warmer than normal average temperatures in either in OR or WA. OR had the greatest departures from normal, while WA had the least departures from normal of the average temperatures.

March 2023: Percent of Normal of Precipitation

Percent of Normal Precipitation (%)
3/1/2023 – 3/31/2023



The percent of normal precipitation was the driest over WA (mostly less than 100 percent of normal), while OR had wetter conditions with percent of normal values exceeding 100 percent. This could be attributable in part to most of the storm systems affecting our area taking a more southerly track.

March 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	52.1	-4.1	27.6	-2.5	39.9	-3.3	1.12	0.50
Kennewick	55.5	-2.9	33.5	-2.9	44.5	-2.9	0.49	-0.24
Walla Walla	51.0	-4.2	34.2	-3.2	42.6	-3.7	1.43	-0.87
The Dalles	52.9	-4.1	32.5	-4.1	42.7	-4.1	0.79	-0.37
Redmond	47.4	-6.4	23.7	-2.3	35.6	-4.3	0.68	0.02
Pendleton Airport	52.5	-2.7	32.9	-2.1	42.7	-2.4	0.89	-0.43
La Grande Airport	43.5	-7.7	27.0	-3.4	35.3	-5.5	1.89	0.43
John Day	47.6	-6.7	29.3	0.2	38.4	-3.3	1.72	0.45

All of the eight key stations listed above experienced below normal mean maximum temperatures (departures from normal less than zero), and all but one of these stations had below normal mean minimum temperatures (departures from normal less than zero). The one station that had a departure greater than zero (above normal) for the mean minimum temperature was at John Day, OR (only +0.2 degrees). Additionally, all of the departures from normal for the mean average temperatures were also less than zero (cooler than normal). There was an even split in the percentages of normal for precipitation. The greatest was at Walla Walla, WA with -0.87 inches below normal, and the least was at Redmond, OR with a departure from normal of only 0.02 inch. *The greatest departures are outlined in black boxes.*

March 2023: Observed Total Precipitation and Total Snowfall/Hail

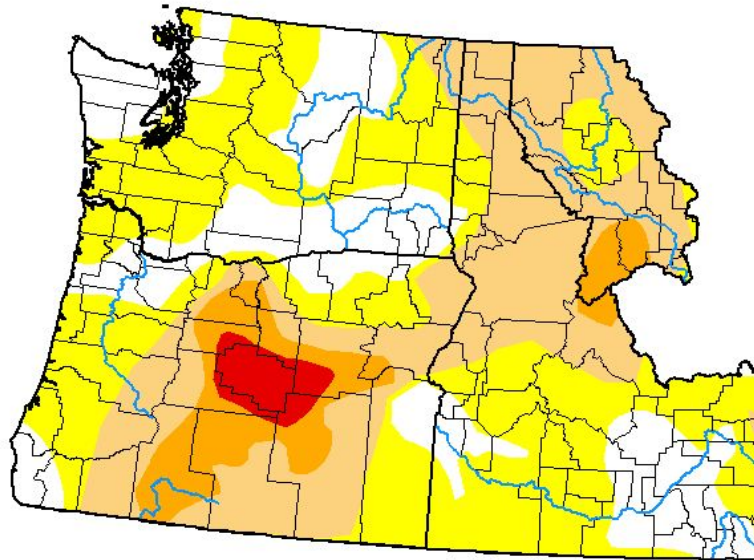
Location	Total Precipitation (inches)	Total Snow/Hail (inches)
Pendleton, OR	0.89	T
Redmond, OR	0.68	M
Pasco, WA	0.60	M
Yakima, WA	1.12	M
Walla Walla, WA	1.43	M
Bend, OR Co-Op	0.68	5.1
Ellensburg, WA	0.51	M
Hermiston, OR	0.63	M
John Day, OR	1.72	M
La Grande, OR	1.89	M
The Dalles, OR	0.79	M
Meacham, OR	5.10	M
Mt. Adams RS, WA	1.09	7.0

The greatest precipitation amount in the list above was at Meacham, OR with 5.10 inches. However, most precipitation totals were in the 0.5 to 1.5 inch range. The least amount of precipitation was at Ellensburg, WA with 0.51 inch. Of the three available snowfall reports, the Mt. Adams Ranger Station had 7.0 inches of snow, followed by the Bend, OR Co-Op station with 5.1 inches, and Pendleton, OR receiving only a trace amount of snow. While Meacham, OR probably had the greatest amount of snow, snow reports were not available.

March 2023 - Drought Monitor – Western USA

U.S. Drought Monitor Pacific Northwest DEWS

April 4, 2023
(Released Thursday, Apr. 6, 2023)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	22.08	77.92	38.16	9.86	2.20	0.00
Last Week 03-28-2023	17.76	82.24	36.91	12.83	2.20	0.50
3 Months Ago 01-03-2023	14.80	85.20	48.85	24.03	9.29	0.50
Start of Calendar Year 01-03-2023	14.80	85.20	48.85	24.03	9.29	0.50
Start of Water Year 09-27-2022	2.06	97.94	62.50	24.12	11.86	0.50
One Year Ago 04-05-2022	20.44	79.56	70.70	55.62	23.34	5.33

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:

David Simeral
Western Regional Climate Center



droughtmonitor.unl.edu

While drought conditions were similar to last month, they have lessening slightly. Exceptional Drought (D4) has been removed from Central OR with severe drought (D2) to extreme drought (D3) still present. The Lower Columbia Basin, parts of south central WA, and parts of the foothills of the Blues (mostly in WA) had drought conditions of “none”. Drought conditions were in the D0 (“Abnormally dry”) category across across parts of south central WA.

March 2023 - Drought Monitor – Pendleton Forecast Area

U.S. Drought Monitor Pendleton, OR WFO

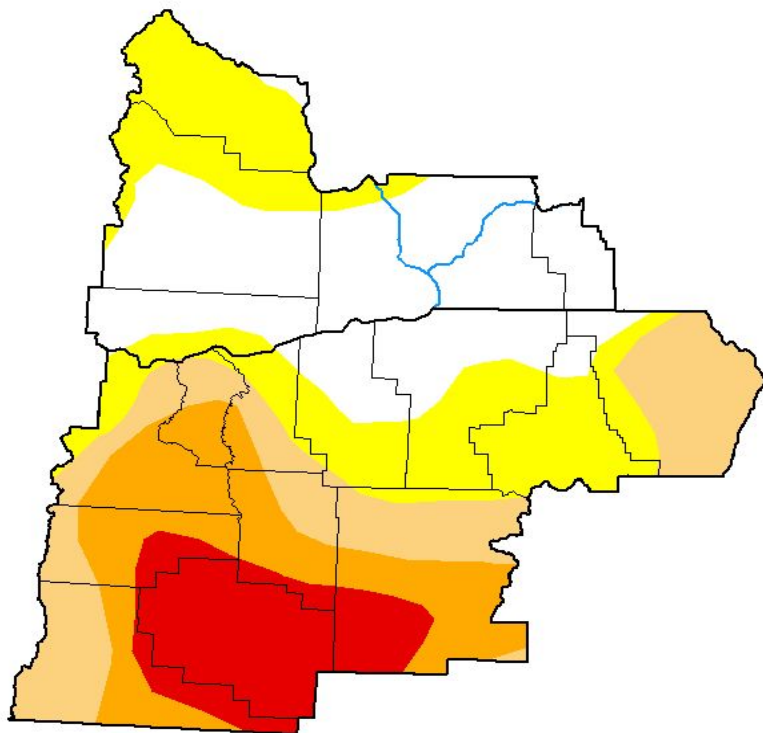
April 4, 2023

(Released Thursday, Apr. 6, 2023)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	29.49	70.51	45.64	27.56	12.26	0.00
Last Week 03-28-2023	29.49	70.51	45.64	27.56	12.26	3.17
3 Months Ago 01-03-2023	29.80	70.20	39.93	22.93	15.24	3.17
Start of Calendar Year 01-03-2023	29.80	70.20	39.93	22.93	15.24	3.17
Start of Water Year 09-27-2022	0.00	100.00	46.03	24.98	17.46	3.17
One Year Ago 04-05-2022	4.50	95.50	90.30	75.98	50.67	19.08



Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate 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:

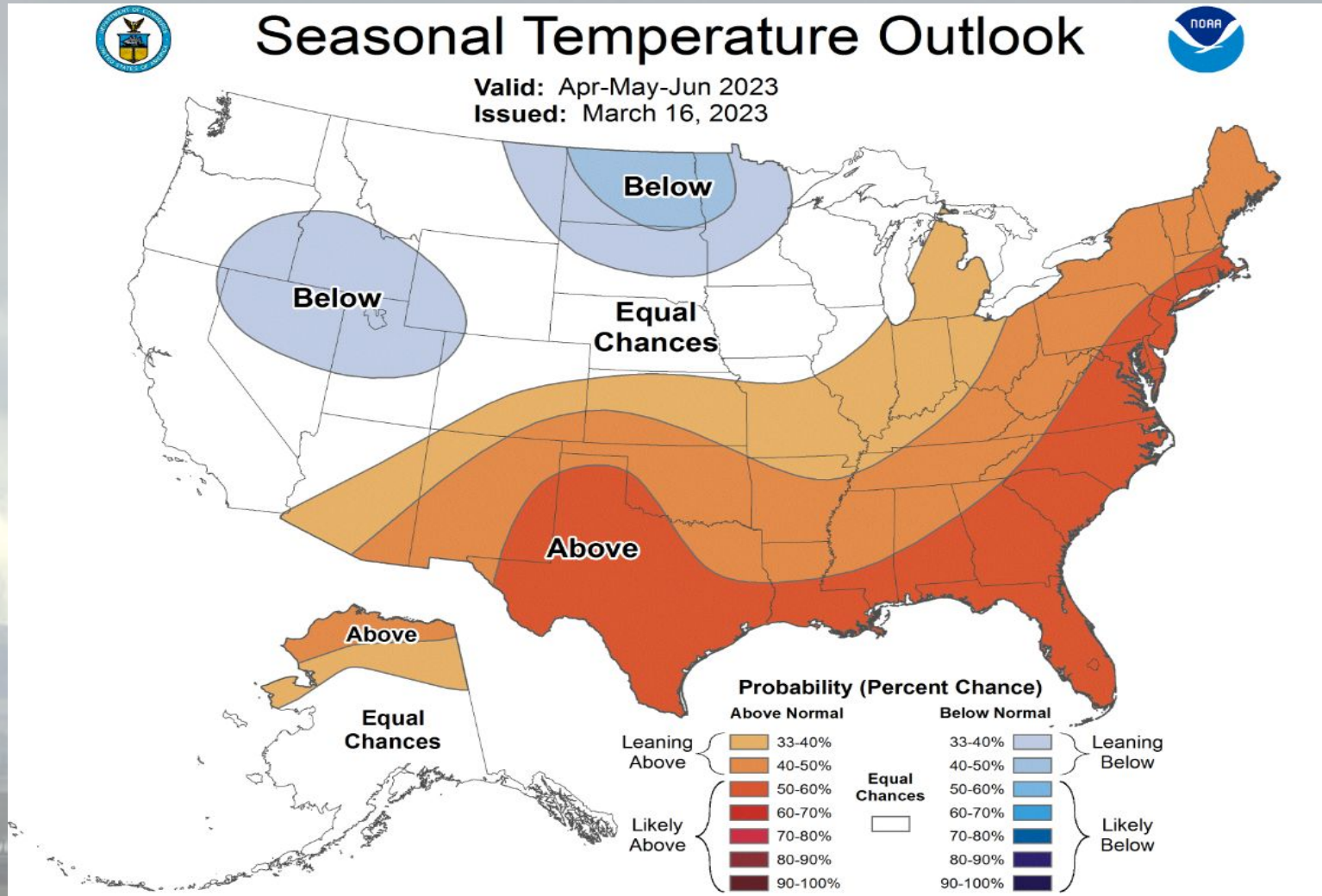
David Simeral
Western Regional Climate Center



droughtmonitor.unl.edu

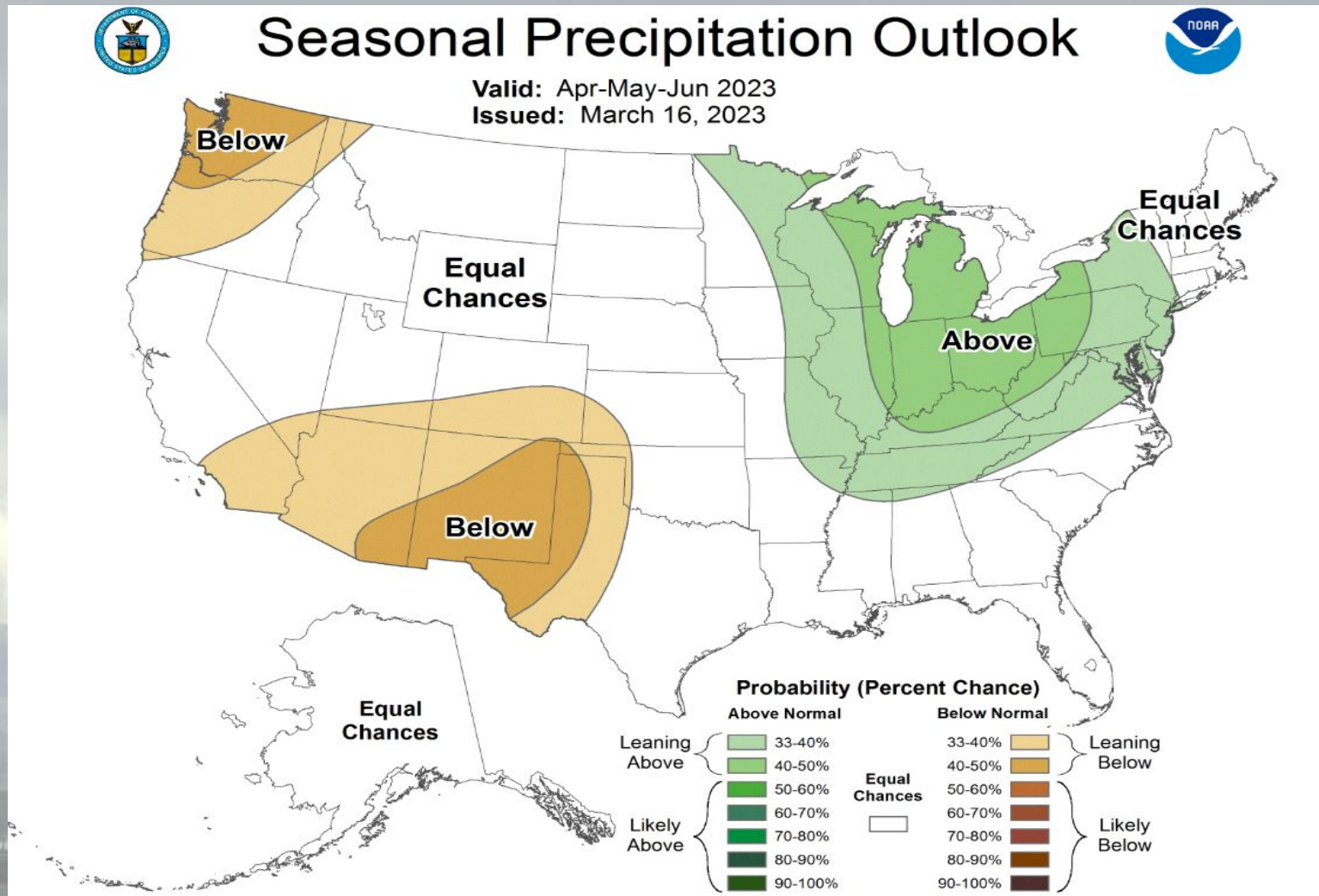
A close up of the forecast area shows that drought conditions were the worst in central OR, with a drought category of D3 (“Extreme” drought). The Lower Columbia Basin, south central WA, and parts of the Blue Mountains & Foothills (mostly in WA) had drought conditions of “none”. Elsewhere, drought conditions were mostly in the D0 to D2 (“Abnormally dry” to “Severe drought”) category.

USA Three Month Temperature Outlook



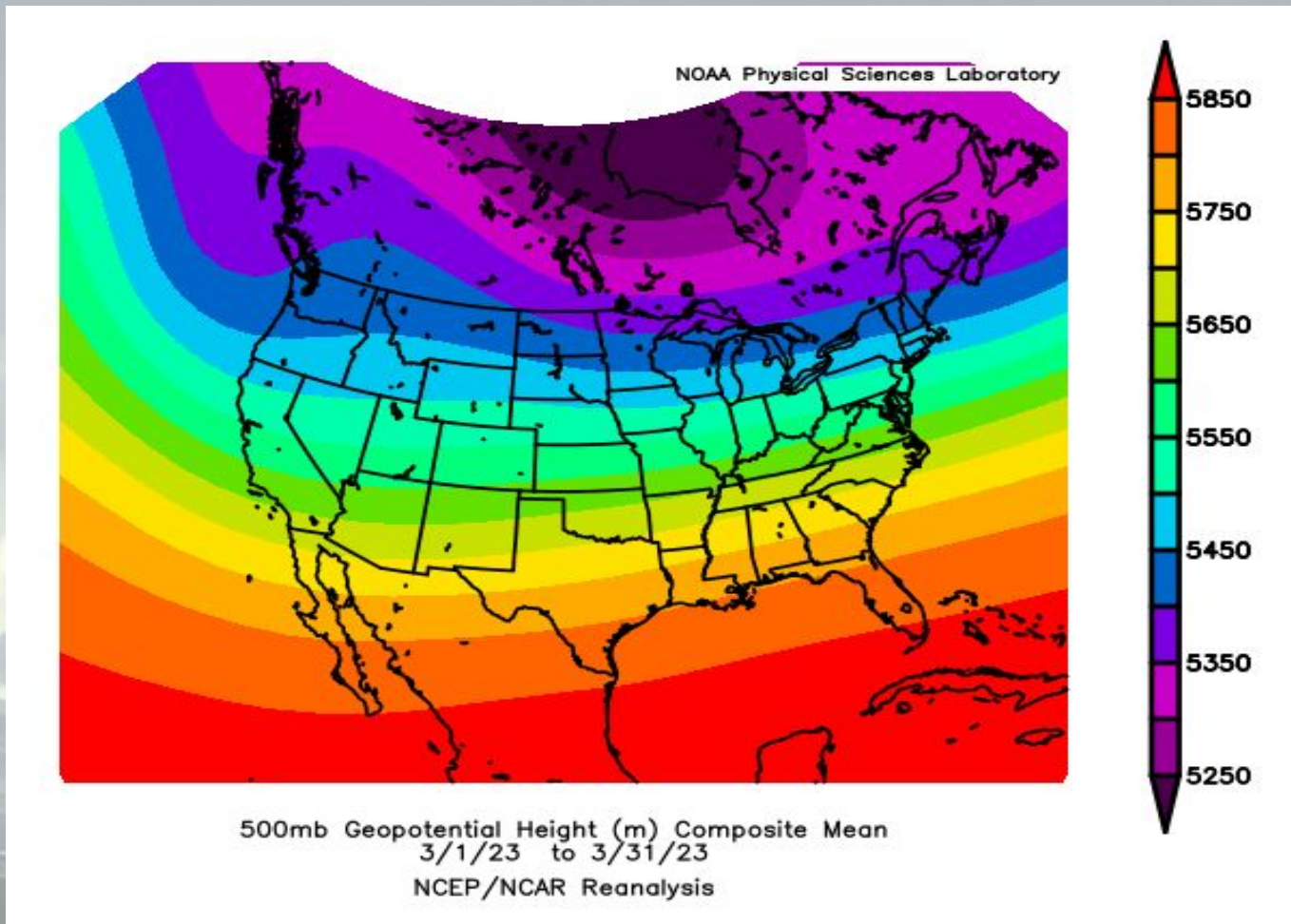
The three month outlook for the period April through June for the Pacific Northwest shows that temperature probabilities are leaning to mostly equal chances of above or below normal temperatures. Southeast OR has the best chance of having below normal temperatures.

USA Three Month Precipitation Outlook



The three month outlook for the period April through June shows that the forecast area is leaning toward having below normal precipitation. The exception is in far eastern and southeast OR, with these areas having equal chances of above or below normal precipitation for the period.

March 2023, Average 500 MB Pattern

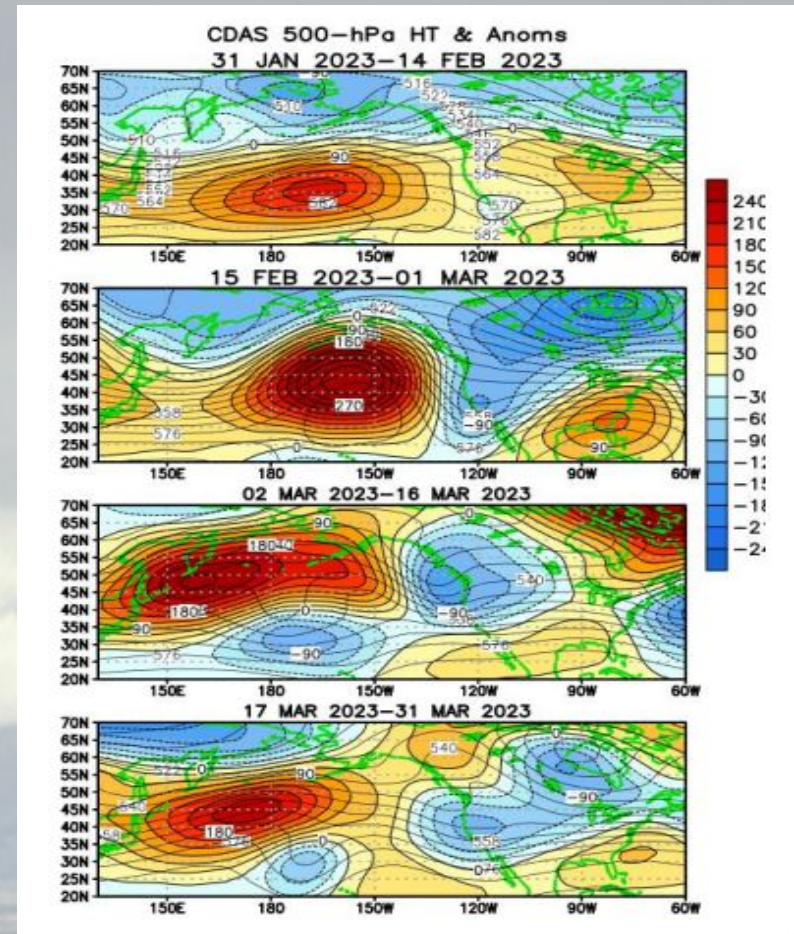


The average 500 mb pattern over the Pacific Northwest featured an upper trough pattern off the coast with a southwest flow over OR and WA. This pattern is consistent with the frequent storm systems that moved across the Pacific Northwest. While there were some short periods of time when there was an upper ridge over the region, there were frequent episodes with passing upper troughs resulting in the broad troughing seen in the average 500 mb pattern.

Two Month, average Bi-weekly 500 MB Plots for February - March 2023

These are more detailed bi-weekly average 500 mb pattern plots that was sampled from the end of January through the end of March.

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

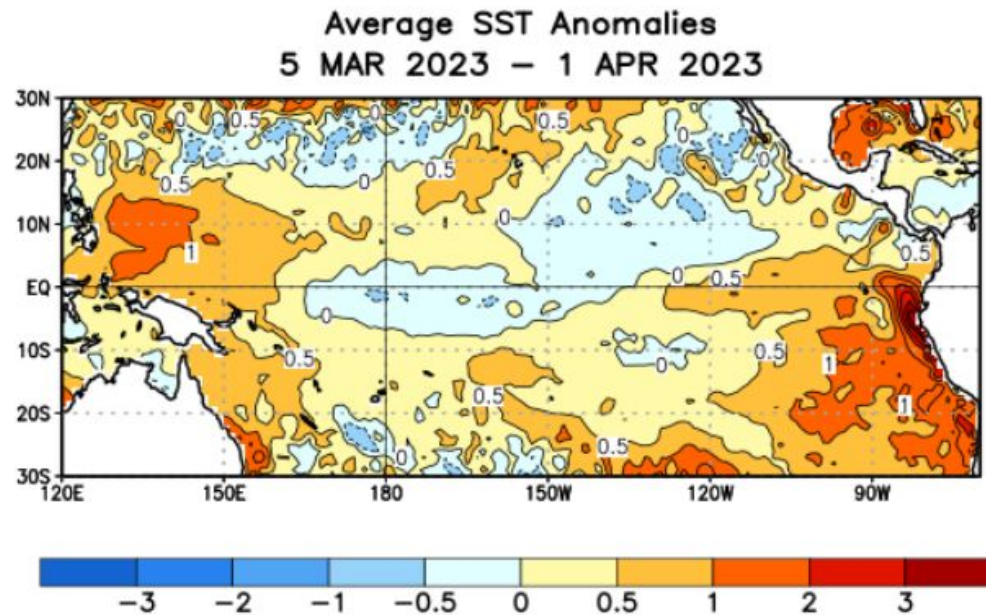


From end of January to mid February, there was an upper ridge pattern well off the coast with a nearly zonal westerly flow over the Pacific Northwest. Then from mid February through March 1st, a strong upper high pressure system developed over the eastern Pacific, resulting in an upper trough over the US west coast. Then the upper ridge off the coast retrograded westward, which allowed a weak upper trough to persist over the US west coast and the Pacific Northwest until mid March. This continued through the end of March, however, the offshore upper ridge weakened a bit that resulted in a weaker downstream trough over the Pacific Northwest for the latter half of March.

Sea Surface Temperature (SST) Anomalies for March 2023

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

In the last four weeks, equatorial SSTs were above average in the eastern and far western Pacific Ocean and near-to-slightly below average near the International Date Line.



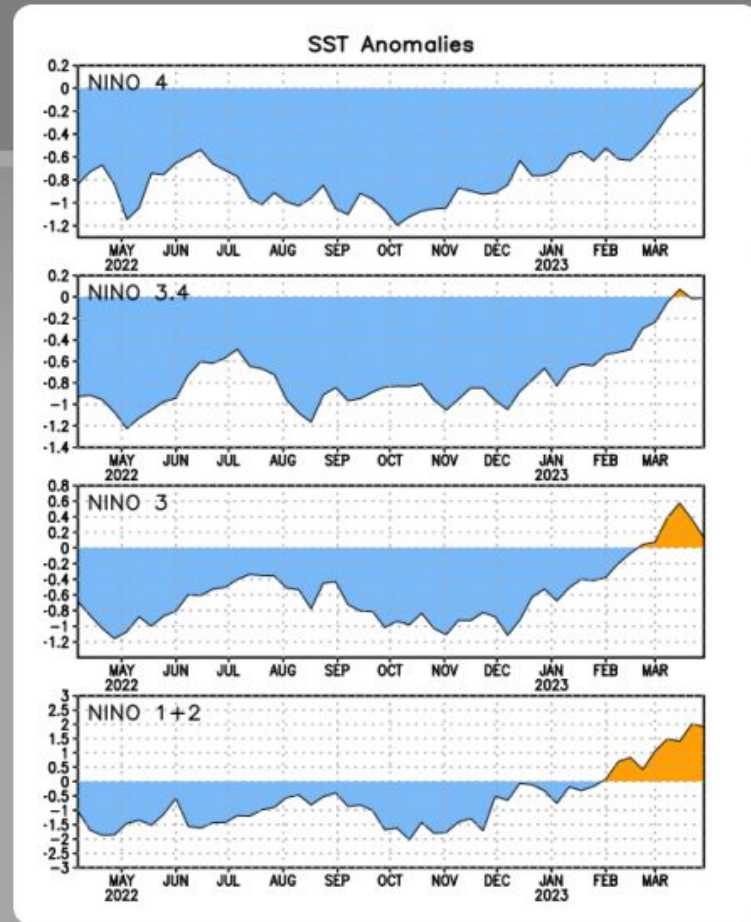
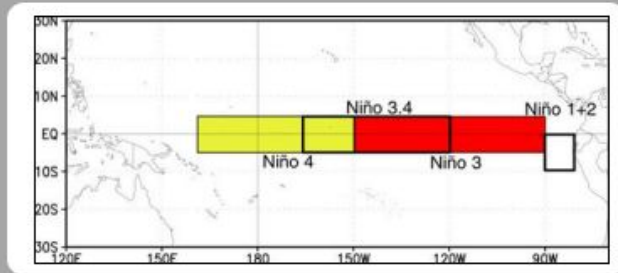
During the last 4 weeks up to March 1st, Sea Surface Temperatures (SSTs) warmed to slightly cooler than average across the central tropical Pacific, but they warmed to slightly above normal over the far eastern and far western tropical Pacific. This is an indication that ENSO La Nina conditions are still weakening, and becoming closer to ENSO neutral.

ENSO NINO Regions SST Anomalies for Each Nino Region in March 2023

Niño Region SST Departures (°C) Recent Evolution

The latest weekly SST departures are:

Niño 4	0.1°C
Niño 3.4	0.0°C
Niño 3	0.1°C
Niño 1+2	1.9°C



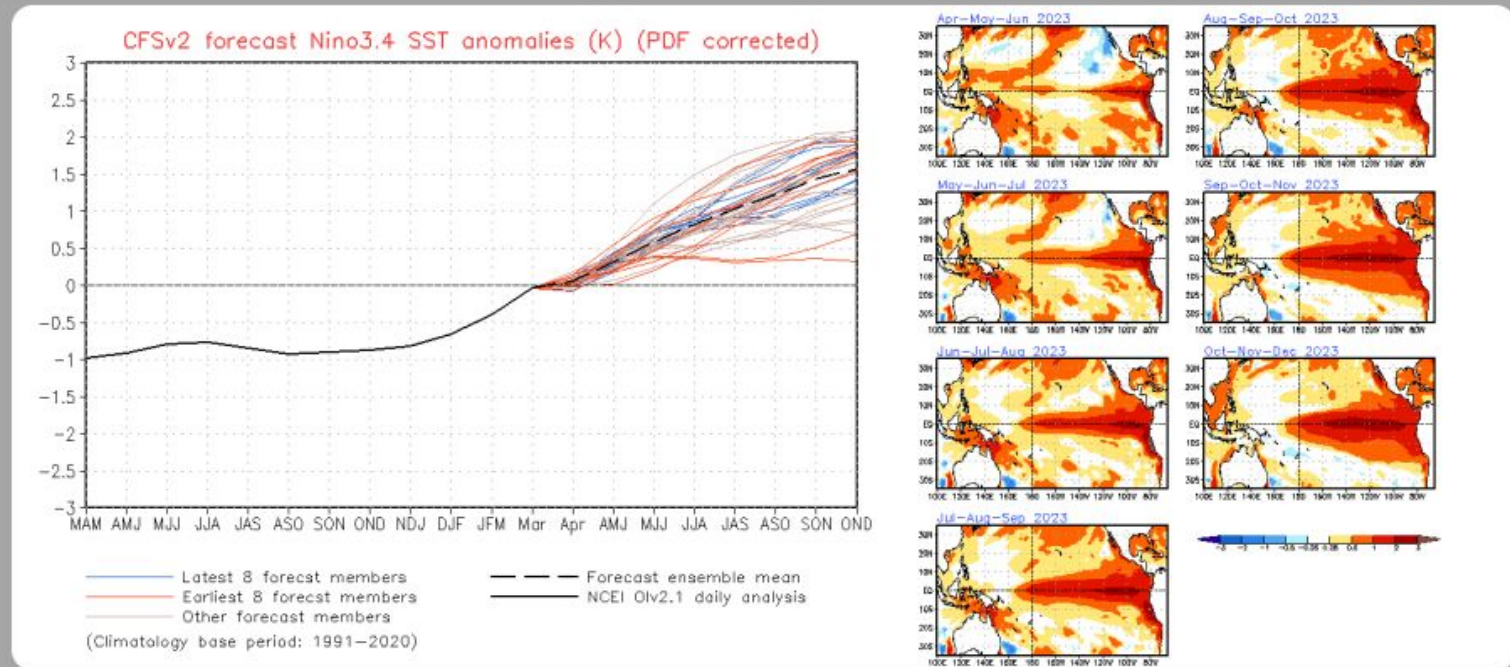
All Niño Regions had significant warming, especially Niño Regions 1+2, 3, and 3.4 to above normal SSTs. Niño Region 3.4 (which has the greatest effects on the Pacific Northwest) only warmed to slightly above normal by the middle of the month, then cooled slightly at the end of the month. Niño region 4 also warmed up, but only to the zero line. These warm ups are consistent with continued weakening La Nina conditions.

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

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

Issued: 30 March 2023

The CFS.v2 ensemble mean (black dashed line) favors a transition from ENSO-neutral to El Niño during the early summer 2023.



The SST CFS.v2 forecast ensemble mean shows a favorable transition from La Nina conditions to ENSO neutral then to El Nino conditions by late spring to early summer of 2023. The black dashed line (forecast ensemble mean) is forecast to warm up to well above zero by the fall of 2023. The small images to the right also show continued warming through the summer of 2023.

Current ENSO (El Nino Southern Oscillation) Alert System Status

Summary

ENSO Alert System Status: **Final La Niña Advisory**

ENSO-neutral conditions are observed.*

Equatorial sea surface temperatures (SSTs) are near average across most of the Pacific Ocean.

The tropical Pacific atmosphere is still consistent with a weak La Niña signal.

ENSO-neutral conditions are expected to continue through the Northern Hemisphere spring and early summer 2023.*

The current ENSO Alert System Status is “**Final La-Nina Advisory**”. Equatorial sea surface temperatures are near average across most of the Pacific Ocean. However, the tropical Pacific atmosphere is still consistent with a weak La Nina signal. ENSO-neutral conditions are expected to develop through the Northern Hemisphere spring into early summer 2023. ENSO El Nino conditions are then possible by the fall of 2023.



Thank You!