Office of the Washington State Climatologist

February 2023 Report and Outlook

February 6, 2023

http://www.climate.washington.edu/

January Event Summary

Mean January temperatures were above normal across WA State, though the anomalies were not as warm as December was cold. January precipitation was below normal for most of the state. The northern and central portions of the state east of the Cascade Mountains were the exceptions and received above normal precipitation.

The 2023 water year, beginning in October, has seen some substantial swings in temperatures between the above normal October and January and the below normal November and December. Figure 1 shows how those anomalies win out for the first 4 months of the water year.

In this Issue

October-January temperatures are generally normal to above normal for western WA and normal to below normal for eastern WA. Water year to date precipitation totals also diverge between western and eastern WA: western WA has been drier than usual while eastern WA has been wetter than usual.

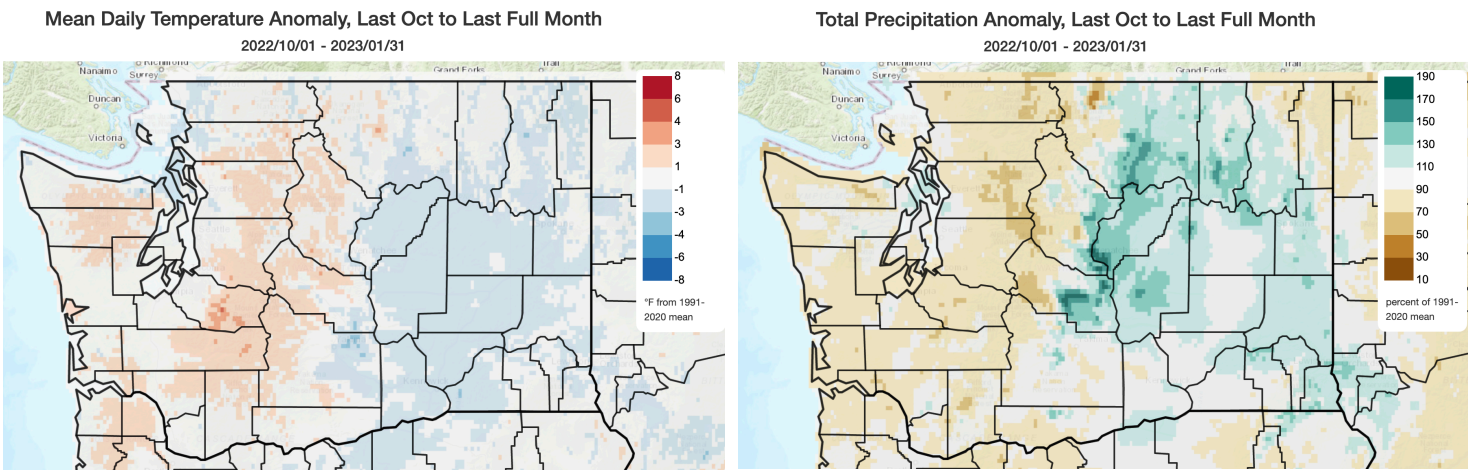


Figure 1: October 2022-January 2023 average temperature departure from the 1991-2020 normal (left) and total precipitation percent of normal (right) from Climate Toolbox.

January as a whole was relatively quiet weather-wise. For the first half of the month, the storm track continued to be directed at California. That doesn't mean the WA didn't receive precipitation; see Figure 2 for the daily temperatures and precipitation at SeaTac Airport. Temperatures were rather mild for the first half of the month, however. On the 5th, record high daily temperatures were set or tied at Bellingham (61°F - tie), SeaTac (59°F), Olympia (57°F), Quillayute (57°F), and Hoquiam (54°F - tie).

Daily precipitation records were few and far between. On the 12th, maximum daily rainfall records were set at Quillayute (2.59"), Omak (0.81"), Ephrata (0.52"), and Wenatchee Pangborn (0.38"). Omak again set a daily maximum precipitation record on the following day (1/13) of 0.43". Meanwhile, mild temperatures again set high daily records on the 13th (e.g., Walla Walla - 63°F; tie) and the 14th (e.g., SeaTac - 59°F; tie).

Also notable are the gusty winds reported in western WA on the afternoon of the 21st (35-55 mph) accompanied by widespread snow in eastern WA and rain in western WA. The end of the month featured a short-lived cold snap with snow primarily in northeastern WA.

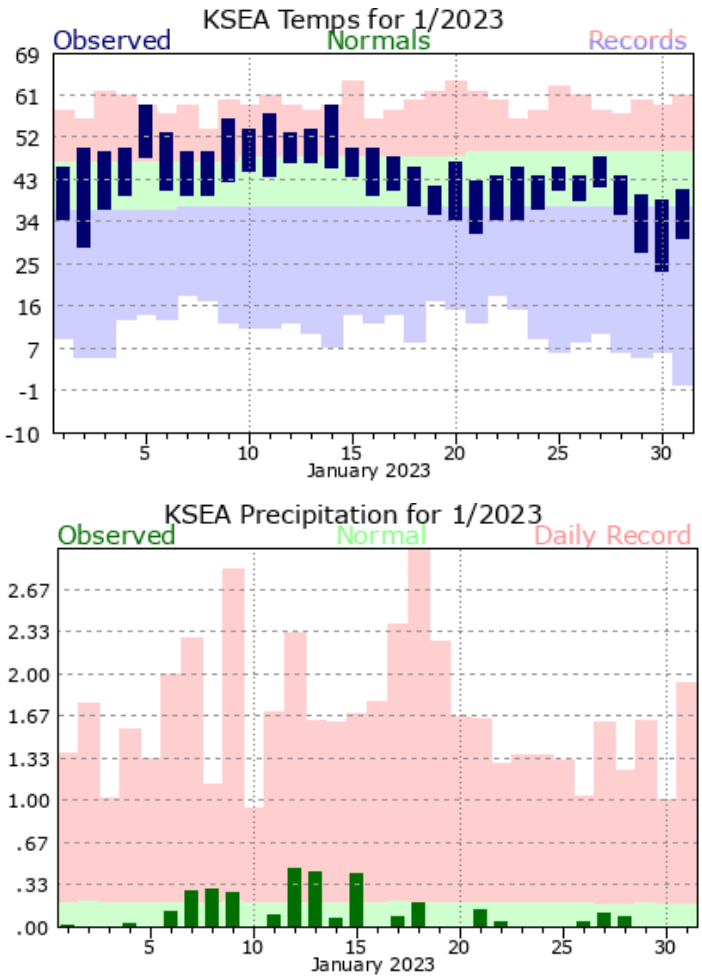


Figure 2: January 2023 daily temperatures for SeaTac Airport compared to the 1991-2020 normal (green envelope) and previous records (blue and red envelopes; NWS).

Snowpack and Drought Summary

The drier than normal January meant that snowpack did not build as much as usual for most of the state. As a result, the basin average snow water equivalent (SWE) percent of median from the Natural Resources Conservation Service (NRCS) as of February 2 (Figure 3) dropped below median for many basins. The North Puget Sound, Central Puget Sound, South Puget Sound, Central Columbia, Naches, Olympic, and Lower Pend Oreille basins have between 78 and 89% of median snowpack. The remaining WA basins are near-normal, with snowpack averaging between 90 and 105% of median.

The remaining areas of "moderate drought" that were present on the U.S. Drought Monitor map shared in the last edition of our newsletter have since been removed. The improvements were concentrated in north central Washington, where January precipitation was above normal, with precipitation surpluses extending back several months. In contrast to some improvement in streamflow that was seen in December, January average streamflow has returned to below normal in parts of the central Puget Sound region where "abnormally dry" is depicted in Figure 4.

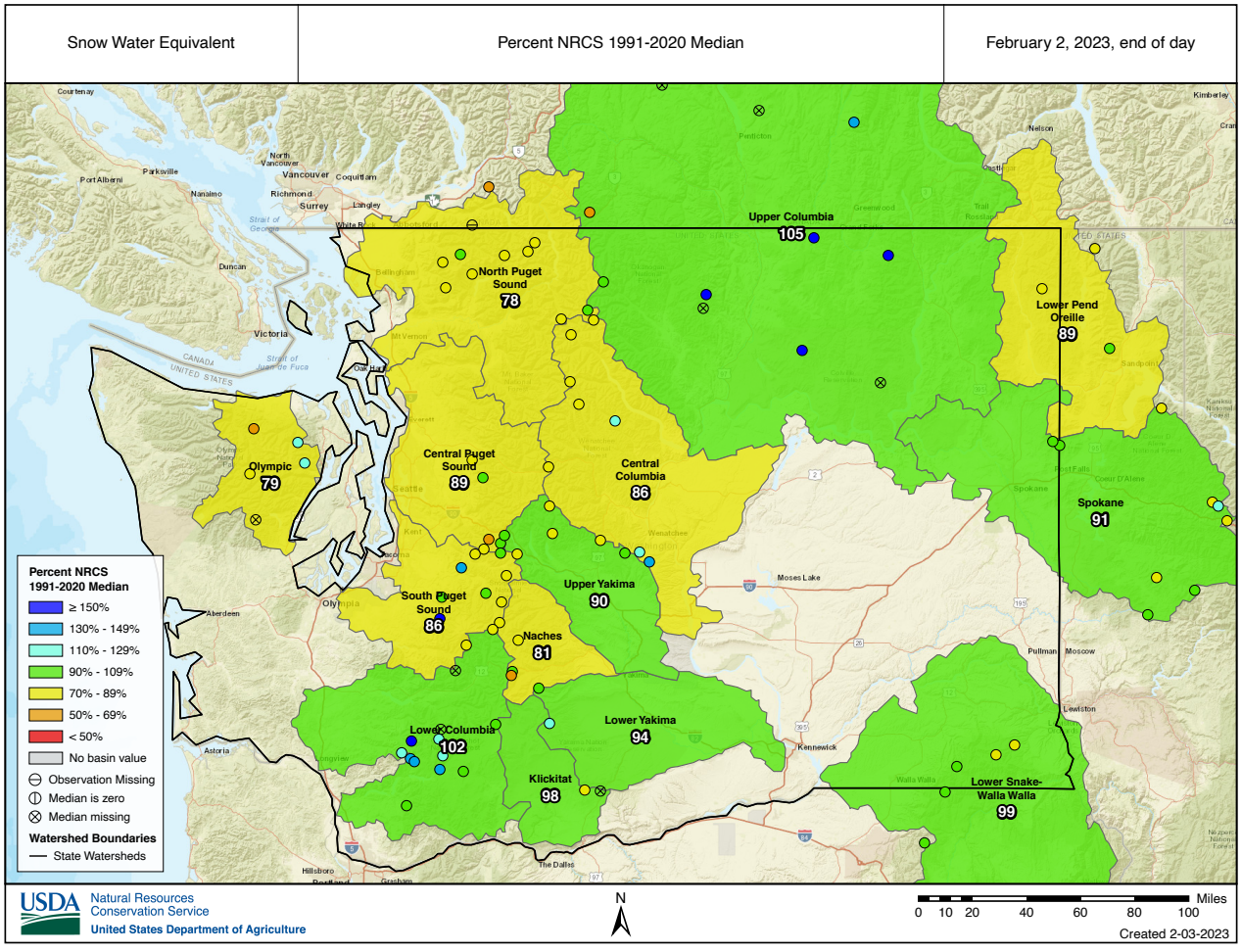


Figure 3: Snowpack (in terms of snow water equivalent) percent of normal for Washington as of February 2, 2023 (NRCS).

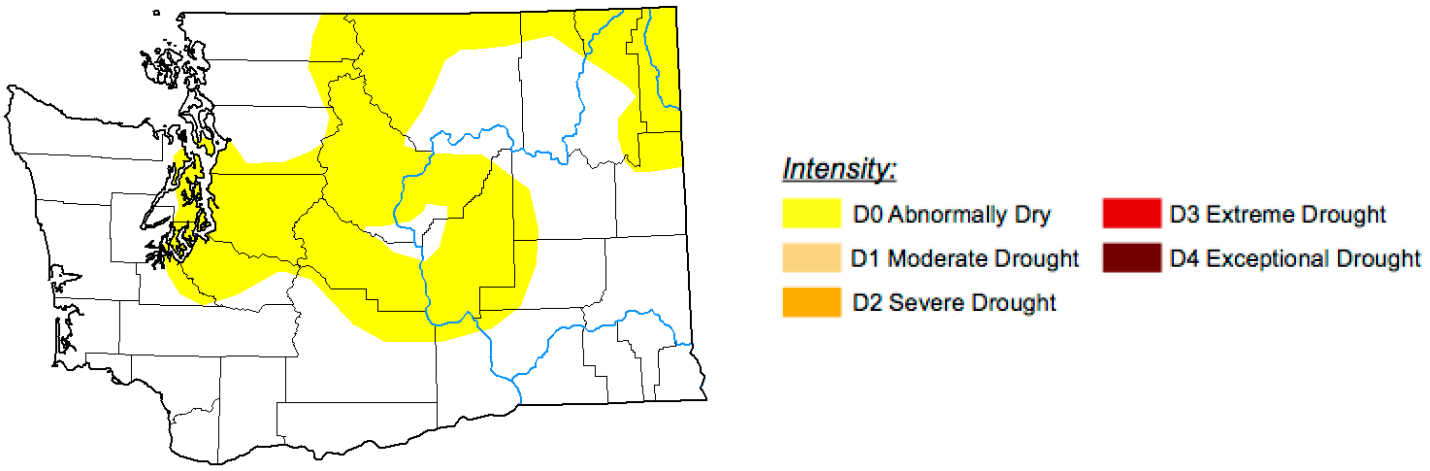


Figure 4: The February 2, 2023 edition of the U.S. Drought Monitor.

Winter Precipitation Variability in Washington State

A Message from the State Climatologist

The last few months have featured considerable fluctuations in precipitation across WA state relative to seasonal norms. While such fluctuations have certainly occurred in the past and will continue to be part of our climate, they serve as a good excuse for taking a quick look at some of the observed temporal and spatial variability in winter precipitation in WA state.

We begin with a survey of WA state mean precipitation totals for the months of December, January and February for the years of 1895-2022 from the historical record as catalogued on NOAA's Climate at a Glance website (Fig. 5). One's first impression might be that Figure 5 is a mess, and that is kind of the point. There are negligible trends in mean precipitation amounts, or in the interannual variability in these amounts. There are three extremely wet months in the first half of the record, namely December 1918, December 1934 and January 1953 but otherwise nothing much that stands out. It is difficult to tell by eye, but the correspondence between the totals for the individual months comprising each winter is also negligible. More specifically, the linear correlation coefficient between the total for December and the following January is only about 0.15, explaining merely about 2% of the variance, and even smaller values are for December versus February, and January versus February. The bottom line is that one should guard against elation, or despair, depending on how the early part of the winter plays out around here. Given these more or less null outcomes, perhaps there are more interesting results related to the spatial patterns in winter precipitation.

Here we consider precipitation amounts for the 10 climate divisions of WA state, and for brevity's sake on winter total (December through February) amounts, again based on the historical record. The results of our analysis are summarized in Figure 6. This map includes the long-term average precipitation totals. We realize that most readers

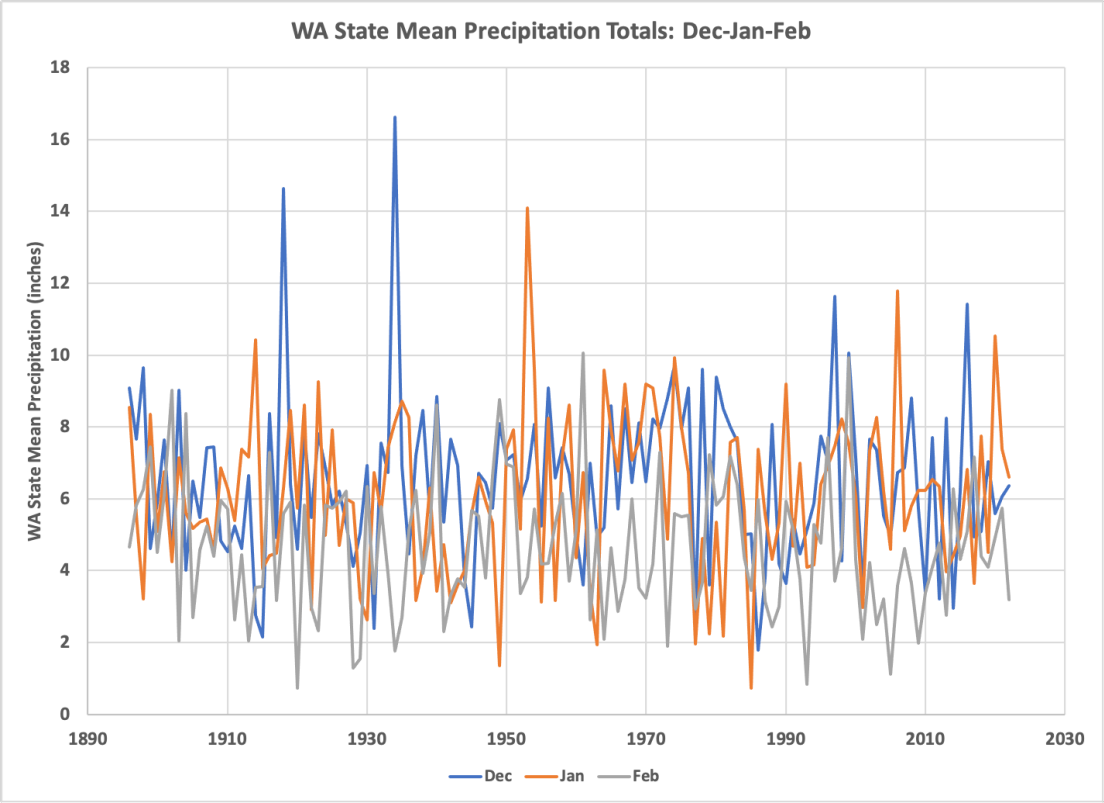


Figure 5: Total monthly precipitation averaged across Washington for December (blue), January (orange), and February (gray) from 1895 to 2022 (NCEI).

of this newsletter are familiar with the typical distribution of precipitation across WA, but babies are born every day that are not as aware of this spatial pattern, and so for completeness that information is included in Figure 6. This map also includes what are hopefully some additional perspectives of interest regarding winter precipitation: (1) the correlation between each climate division's total and the statewide average total, and (2) for each climate division the range of total winter precipitation. The climate divisions on the west side of the Cascade Mountain crest (Divisions 1-5) correspond much more closely with the statewide average, which makes sense given the greater amount of precipitation on the west side. The climate division that is most representative of the state wide average is #4, the East Olympic Cascade Foothills division, with a correlation coefficient of 0.98 between its totals and the statewide averages. The climate division that is least representative is #8, the Central Basin division, with a correlation coefficient of 0.61. That climate division also represents the part of the state that is driest on average, and subject to greatest variability in winter precipitation relative to its mean totals. Winter total amounts in Division #8 have ranged from a meager 1.05" in the notably dry winter of 1976-77 for the US West as a whole, to an enviable 7.53" in the winter of 1939-40.

We also computed the correlations between each of the 10 climate divisions with the others as another way to describe the co-variability in winter precipitation patterns. We spare you all the details here and instead mention a few tidbits. One interesting result was that the correspondence between most of the west side climate divisions and Division #9, the Northeastern division that includes the Spokane area, are greater than with east side divisions #7 an #8 that are closer in distance. We suspect that this result reflects the importance of the zonal component of the flow, with more westerly flow leading to not just greater amounts on the west side of the Cascade crest but also in the northeastern portion of WA state due to upslope

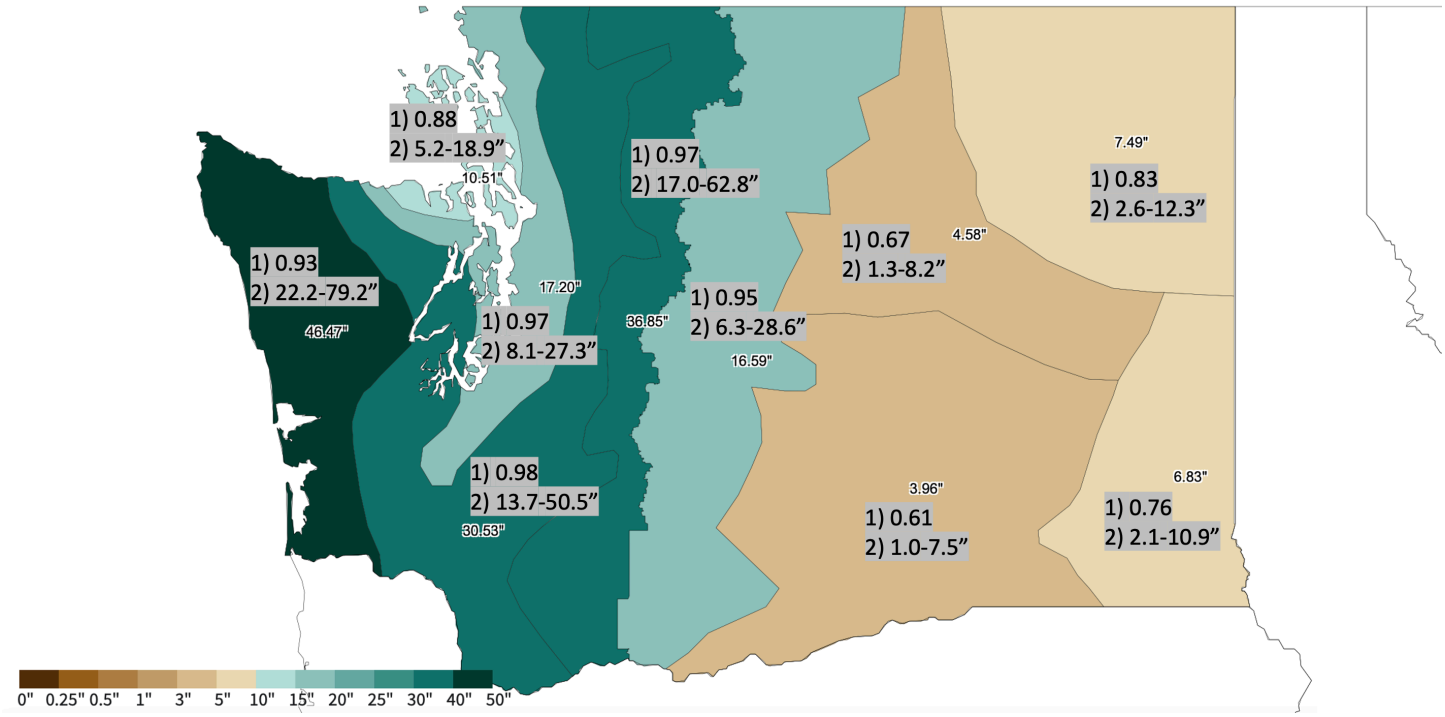


Figure 6: A map of longterm (1901-2000) December-February (DJF) average precipitation for each climate division with 1) the correlation between the DJF divisional precipitation and statewide precipitation and 2) the range of total DJF precipitation within each climate division from 1896 to 2022 (base map from NCEI).

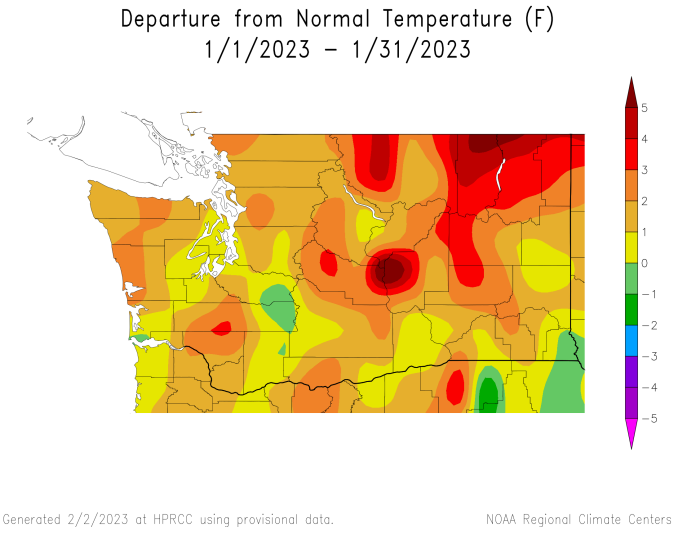
flow on the western margin of the Rocky Mountains. But this factor is not simple, in that there is a strong correlation (0.94) between the winter totals for Division #5, the Cascade Mountains West, and Division #6, East Slope Cascades, despite their overall differences in sense of slope. Presumably the linkage here reflects spillover effects, i.e., wet periods for the west slopes also include enhanced precipitation for higher elevations east of the crest, even if amounts farther east in the foothills are minimal. Finally, the very lowest correlation coefficient of 0.33 is between Division #2, NE Olympic San Juan, and Division #8, Central Basin.

One upshot of our analysis may already be obvious but we are going to make it here anyway and that is the diversity of our climate and its variability. It is why WA has a relatively large number of climate divisions relative to its size, and also why we need to consider the spatial variability in our precipitation in assessing the presence of drought and water availability, which can vary so substantially across the state.

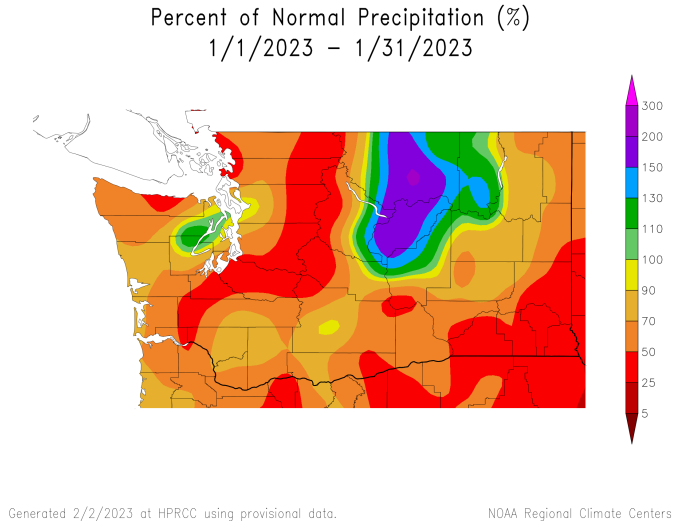
Climate Summary

In contrast to the below normal mean temperatures across Washington in November and December, January average temperatures were above normal across much of the state. Temperatures were warmest relative to normal in north central and northeastern WA, ranging between 3 and 5˚F above normal. Average January temperatures between 1 and 2˚F were more common; Quillayute and Spokane, for example, were 1.8 and 1.6˚F above normal for the month, respectively (Table 1). Some parts of the central and southern Puget Sound region, southwestern, and southeastern WA had near-normal January temperatures. SeaTac Airport and Pullman are two such examples.

Total January precipitation was below normal for most of the state. Precipitation was under 50% of normal in the southern Puget Sound region, northwestern WA, the north and central Cascades, and southeastern WA. More specifically, Pasco, Olympia, and Pullman received 43, 47, and 48% of normal precipitation, respectively (Table 1). On the other hand, parts of north central WA received well above normal precipitation, ranging between 110 and 200% of normal. Omak precipitation took the top prize, totaling 208% of normal (Table 1). Aside from above normal precipitation on the eastern Olympic Peninsula, the rest of the state received between 70 and 100% of normal precipitation.



January temperature (˚F) departure from normal relative to the 1991-2020 normal (HPRCC).



January total precipitation percent of 1991-2020 normal (HPRCC).

Station	Mean Temperature (°F)			Precipitation (inches)			Snowfall (inches)		
	Avg	Norm	Departure from Normal	Total	Norm	Percent of Normal	Total	Norm	Percent of Normal
Western Washington									
Olympia	40.4	39.6	0.8	3.70	7.80	47	M	M	-
Seattle WFO	43.5	42.3	1.2	4.11	5.14	80	T	0.9	0
SeaTac AP	43.5	42.8	0.7	3.09	5.78	53	0.1	1.8	6
Quillayute	43.5	41.7	1.8	10.47	15.59	67	M	M	-
Hoquiam	45.4*	42.8	2.6	8.01	10.91	73	M	M	-
Bellingham AP	42.4	40.2	2.2	1.46	4.49	33	M	M	-
Vancouver AP	42.0	40.7	1.3	3.31	5.34	62	M	M	-
Eastern Washington									
Spokane AP	31.2	29.6	1.6	1.52	1.97	77	6.1	12.3	50
Wenatchee	29.4	28.9	0.5	1.38	1.02	135	M	M	-
Omak	29.4	28.0	1.4	2.76	1.33	208	M	M	-
Pullman AP	32.3	32.7	-0.4	1.03	2.15	48	M	M	-
Ephrata	32.0	29.6	2.4	1.18	0.91	130	M	M	-
Pasco AP	34.8	34.6	0.2	0.44	1.03	43	M	M	-
Hanford	33.8	33.3	0.5	0.57	1.01	56	0.2	5.0	4

Table 1: January 2023 climate summaries for locations around Washington with a climate normal baseline of 1991-2020. *Hoquiam has 3 days of missing January data.

Climate Outlook

La Niña conditions are still present in the Pacific Ocean and a "La Niña Advisory" remains in effect, according to the Climate Prediction Center (CPC). The below normal sea-surface temperature anomalies in the tropical Pacific Ocean have decreased in magnitude over the last four weeks. ENSO models indicate a shift to neutral conditions this spring, with the chances of neutral conditions at 73% for the February-April period and 82% for March-May.

The CPC outlook for February (Figure 7) is calling for higher chances of below normal temperatures statewide. The chances of below normal temperatures are between 40 and 50% on the three-tiered scale. For February precipitation, the eastern two-thirds of the state has higher chances of above normal precipitation. The Olympic Peninsula, southwestern WA, and portions of the Puget Sound region have equal chances of below, equal to, or above normal February precipitation.

The three-month outlook for February-March-April (FMA; Figure 8) is similar to the February outlook. There are higher chances of below normal FMA temperatures statewide, with the odds between 50 and 60% on the three-tiered scale. There are increased chances of above normal FMA precipitation in eastern WA, but equal chances of below, equal to, or above normal precipitation in western WA.

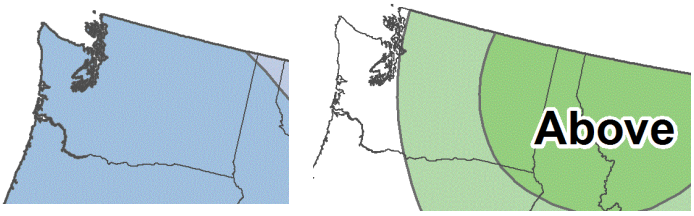


Figure 7: February outlook for temperature (left) and precipitation (right).

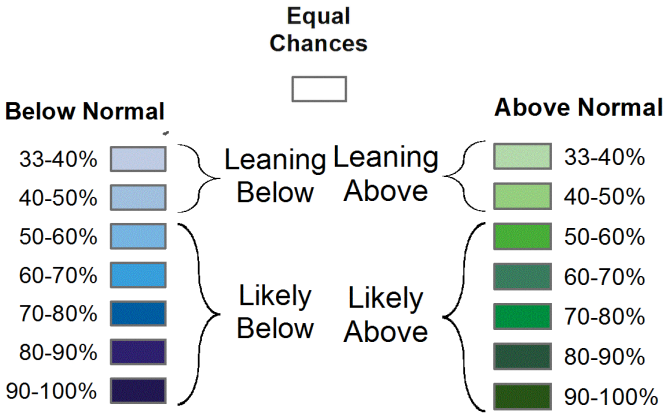


Figure 8: February-March-April outlook for temperature (left) and precipitation (right) (Climate Prediction Center).