Office of the Washington State Climatologist

March 2024 Report and Outlook

March 11, 2024

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

February Event Summary

Mean February temperatures were above normal across most of Washington State, with the temperature anomalies in eastern WA greater than in western WA. A few locations in western WA had near-normal or even below normal February temperatures. Regardless, the month tied 1970 as the 19th warmest on record (+2.6°F above the 1991-2020 normal). February precipitation was generally below normal across the state, with a few exceptions (more in the Climate Summary on page 7). Averaged statewide, it was 20th driest February in the 130-year record, with 63% of normal precipitation.

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The very start of February was warm from a continuation of the warm spell at the end of January. A record high daily maximum temperature was set at Quillayute (59°F), for example. As illustrated in the time series of the

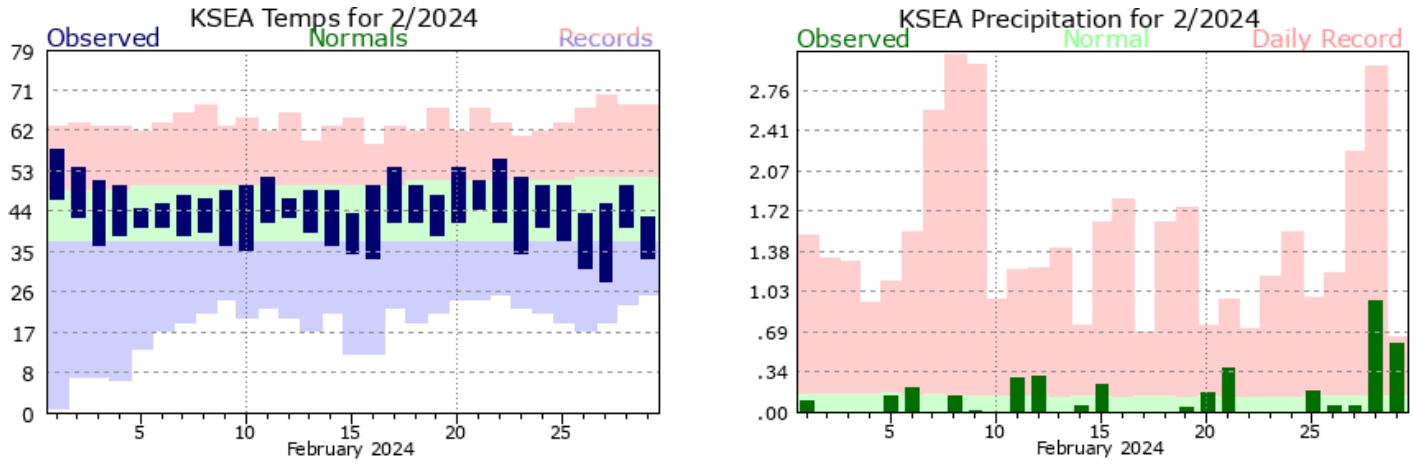


Figure 1: February 2024 daily temperatures (left) and precipitation (right) for SeaTac Airport compared to the 1991-2020 normal (green envelope) and previous records (blue and red envelopes; NWS).

daily weather at SeaTac Airport (Figure 1), temperatures returned to normal by the 3rd. February 11th was a particularly rainy day, especially in the northern Puget Sound region; Bellingham set a daily rainfall record of 0.78". Light to moderate snow fell in the central and southern Puget Sound region on the 14th to the 15th, as well as in central and eastern WA. Figure 2 shows the 24-hr snowfall totals from CoCoRaHS observers on the morning of the 15th, with the greatest totals between 5 and 7" in the south Sound and Kitsap Peninsula.

Other weather highlights include a few days with high winds. One was early on the 17th with a frontal passage that brought gusts between 30 and 55 mph in western WA. Another was the afternoon and evening of the 25th, which ushered in the cooler temperatures on the 26th. Before the switch to cooler temperatures at the end of the month, Omak measured a record daily high maximum temperature of 62°F on the 25th.

The last few days of the month were cooler than normal, with considerable snow in the mountains. There was also snow in the lower elevations of the central and northern Puget Sound as well as in the Spokane area. Rain at the end of the month caused some daily precipitation records on leap day (the 29th), mostly because the day has occurred less frequently in the historical record. Both Spokane International Airport (0.32") and Walla Walla (0.31") set daily precipitation records on the 29th.

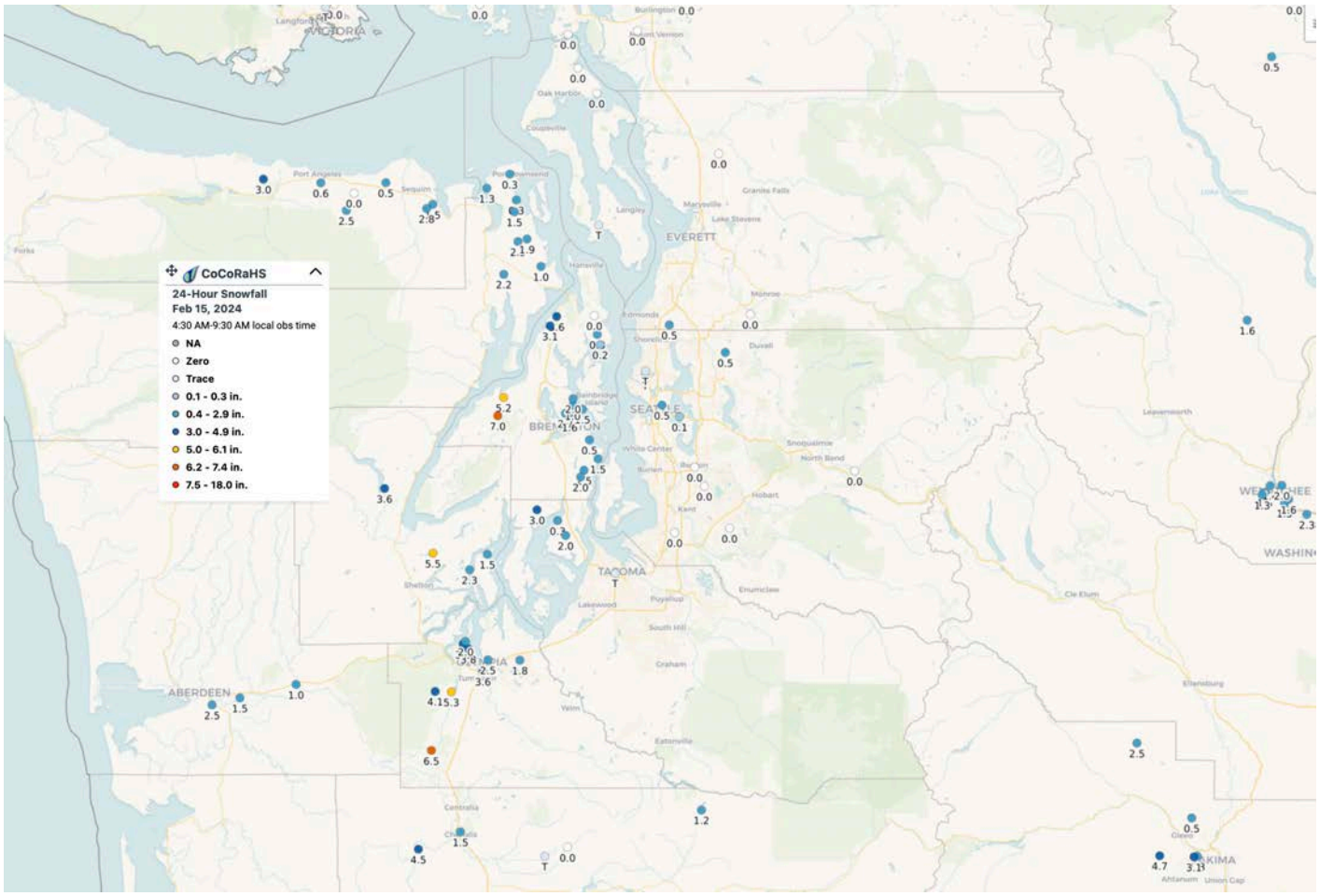


Figure 2: 24-hour snowfall observations on the morning of February 15, 2024 from the CoCoRaHS network.

Snowpack and Drought Summary

While snowpack steadily grew throughout February, the gains early in the month were minimal. The bulk of the growth occurred during the last week of February into early March. The basin average snow water equivalent (SWE) percent of median from the Natural Resources Conservation Service (NRCS) as of March 5 (Figure 3) remained below normal for all basins across Washington State. The snowpack in the Olympics remains in the worst shape, with an average of 50% of normal. The North Puget Sound, Upper Columbia, Central Puget Sound, and Lower Yakima basins average between 61 and 68% of median. Snowpack in basins in the central and southern Cascades and in eastern Washington average between 71 and 89% of median. The statewide average snowpack was 70% of median on March 5, which ranks as the 5th lowest for that date compared to all the other March 5ths since 1990.

The current snowpack has improved compared to the last edition of our newsletter, but overall the snowpack has yet to recover from both the major

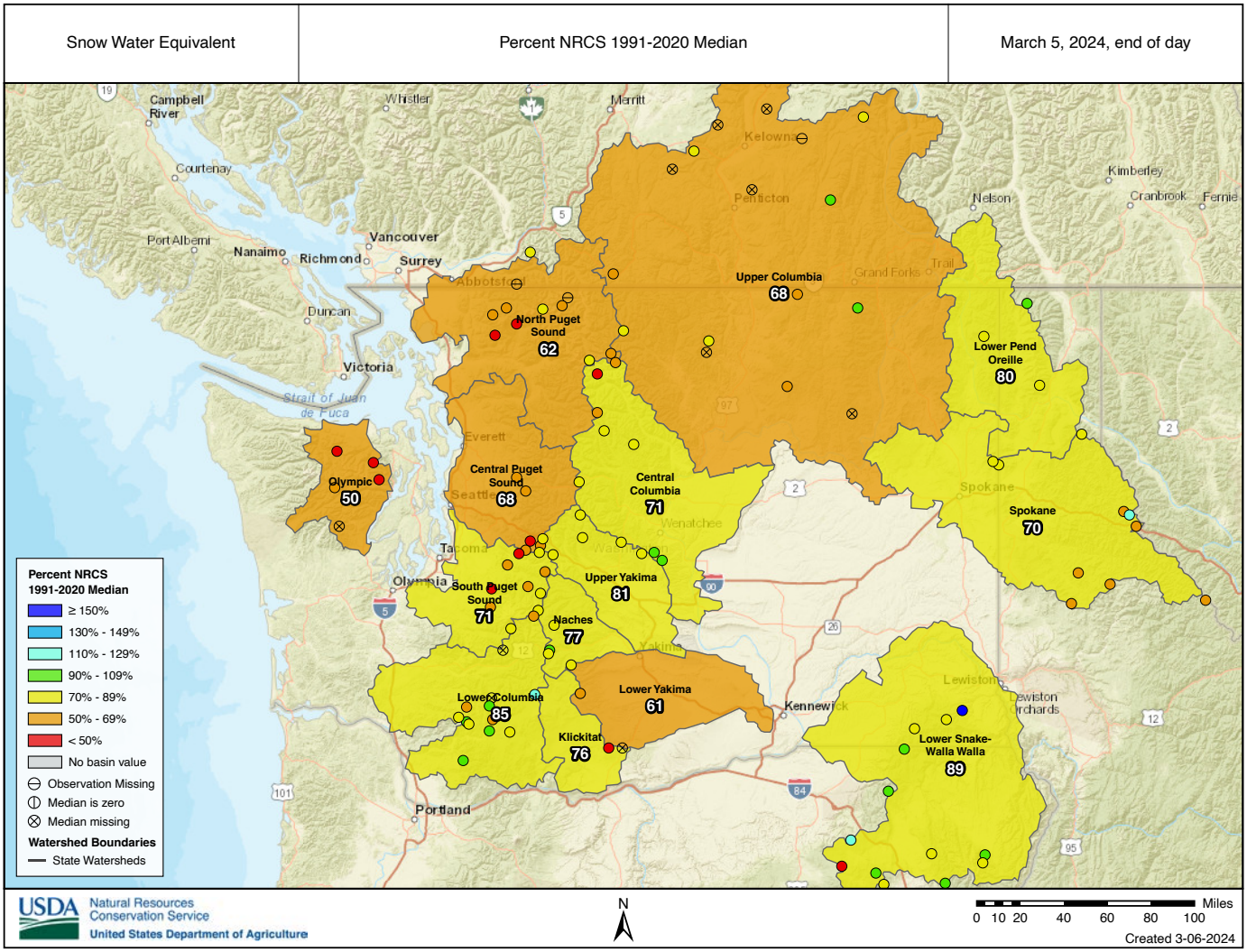


Figure 3: Snowpack (in terms of snow water equivalent) as of March 5, 2024 (NRCS).

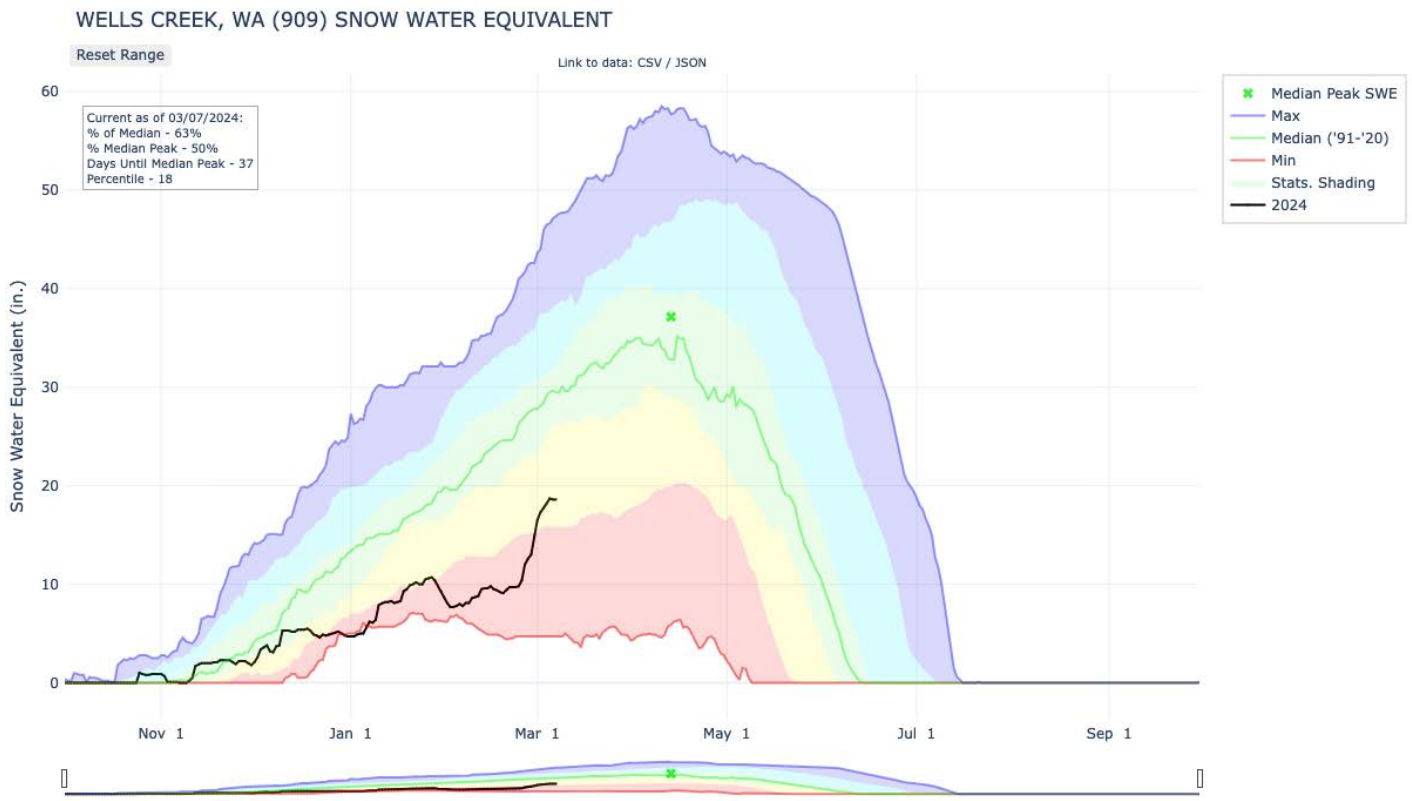


Figure 4: Snow water equivalent (snowpack, in inches) for Wells Creek from October 1, 2023 to March 5, 2024 (black line) compared to historical percentiles (shading). The 1991-2020 median is illustrated by the green line and the normal range is represented by the green shading (NRCS).

melt event at the end of January and below normal winter precipitation in the mountainous areas. Figure 4 shows an example of how detrimental the late January melt event was at Wells Creek (4,030 ft) in the northern Cascades, with nearly all of February needed to regain the snow water equivalent value before the melt.

There was modest expansion of "abnormally dry" and "moderate drought" in the Cascade Mountains and the Olympic Mountains on the U.S. Drought Monitor since the last edition of our newsletter (Figure 5). This is in response to the very low snowpack in those regions and below normal water year precipitation. The statewide drought advisory and drought emergency for parts of 12 counties issued by the WA State Department of Ecology last year is still in effect through June 30, 2024. Conditions will remain closely-monitored, especially as we approach April 1, the typical end of the snowpack season.

Report Your Drought Impacts

Are you experiencing a drought impact? Your on-the-ground observations are critical in helping us understand the broad picture of drought in the state. The National Drought Mitigation Center and partners have developed Condition Monitoring Observer Reports on Drought (CMOR-drought), a short survey that allows the public to enter their observations regarding crops, water supply, fire, etc. We would greatly appreciate your input, and these reports help experts assess drought impacts for the U.S. Drought Monitor depiction.

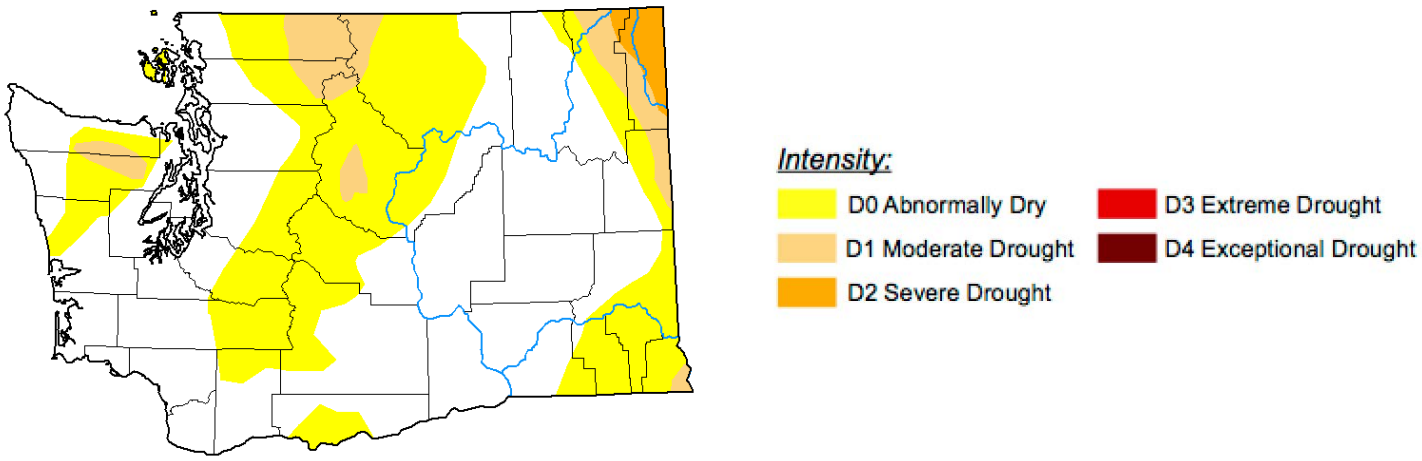


Figure 5: The March 7, 2024 edition of the U.S. Drought Monitor.

Snow and Water Interactive Maps from the Natural Resources Conservation Service

Climate Matters Series

As discussed above in this edition of our newsletter, the last week of February into March of 2024 featured some substantial snowfall in the mountains of Washington state. It has been heartening to watch the recent improvement in the snowpack – which can be thought of as out of the intensive care unit but not fully healed – and towards that end we have been making use of a relatively new application hosted by the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture. More specifically, we are referring to the Snow and Water Interactive Map (iMAP). This application has a variety of goodies, as shown in an example below.

The iMAP application makes it convenient to focus on a particular region of interest, with controls to examine different parameters related to precipitation and water supply from either station or basin perspectives. The parameters available include snow water equivalent (SWE), snow depth and density, precipitation, soil moisture and temperature, reservoir storage, and observed and forecast streamflow. What more do you want? There is also a great deal of flexibility in how these parameters are compared with climatological norms, and how they have changed with time during the periods of record. Time series generated with the application are easy to download for further analysis.

Here we use iMAP to contrast the change in SWE across WA state that has occurred during the warm and dry March of 1992 (Figure 6) versus its cool and wet counterpart during March of 2012 (Figure 7). These two periods represent bookends for what can happen to our snowpack during March. From a statewide perspective, March of 1992 was 5.4˚F warmer than normal (using the 1991-2020 baseline) and the total precipitation was 3.56" below normal, representing the 2nd driest March on record. While there is usually growth in SWE in our mountains during the month of March, except for at lower elevations, the warmth and meager precipitation of March 1992 was bad news for the snowpack. Figure 6 shows that there

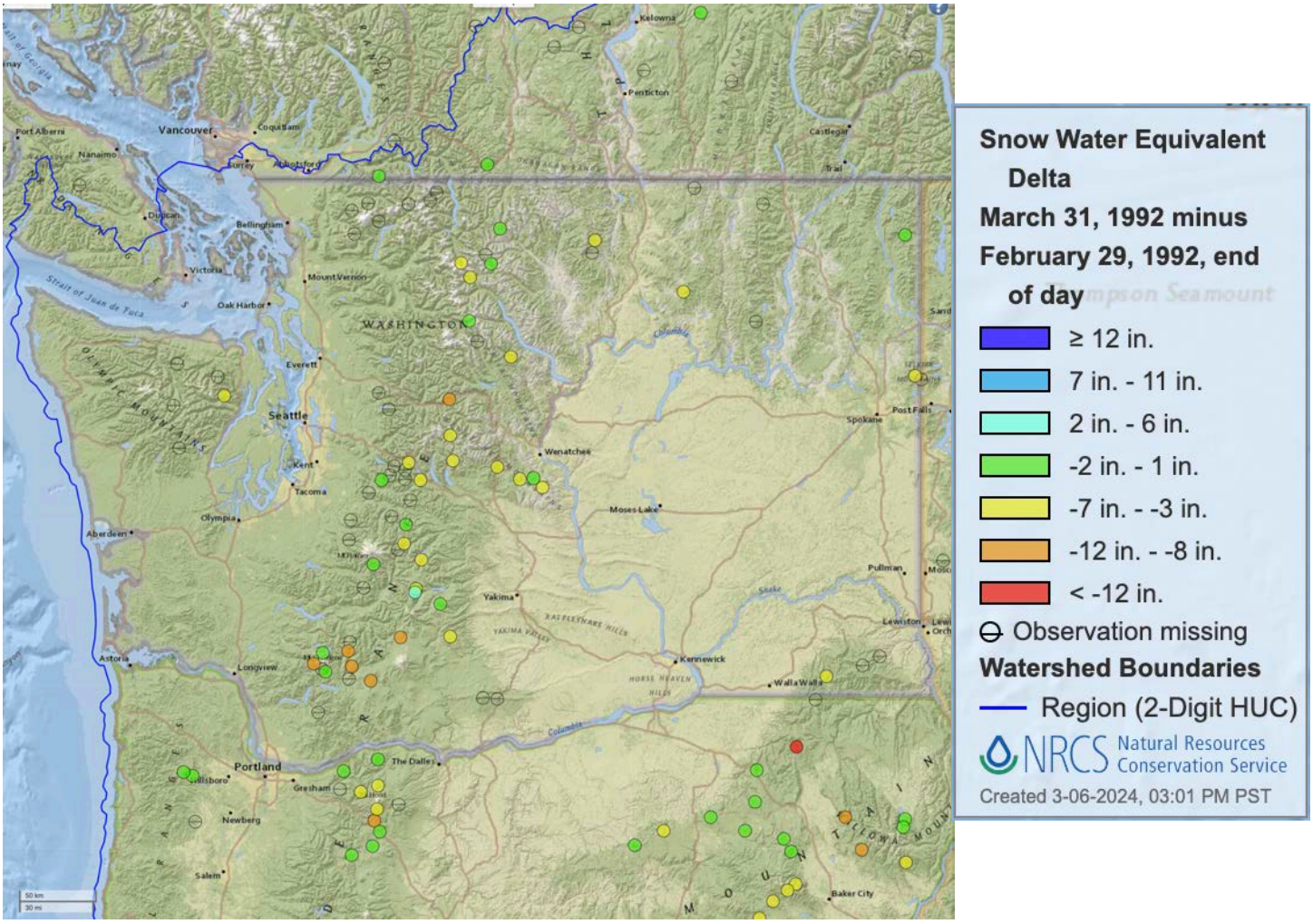


Figure 6: Change in snow water equivalent (inches) relative to climatological median values (1991-2020) during March 1992 (NRCS).

were some locations that more or less broke even, but substantial losses were widespread, with some locations in the southern Cascades of WA state experiencing declines in SWE exceeding 8". March of 2012 was a different story due to its temperature anomaly of -2.1°F and statewide average precipitation totaling 3.22" greater than normal. There have been other March months in the last couple of decades with colder temperatures, but 2012 stands out for being both cold and wet. Not surprisingly, there was major growth in the SWE in our mountains during March 2012 (Figure 7), with many stations recording increases greater than 12". Figures 6 and 7 are just screen grabs; the application itself lets one easily check out other properties at individual locations by clicking on a station.

OWSC closely monitors the evolution of the snowpack in the Pacific Northwest, especially during the present time of year. We are grateful that that is so easy to do, thanks to iMAP.

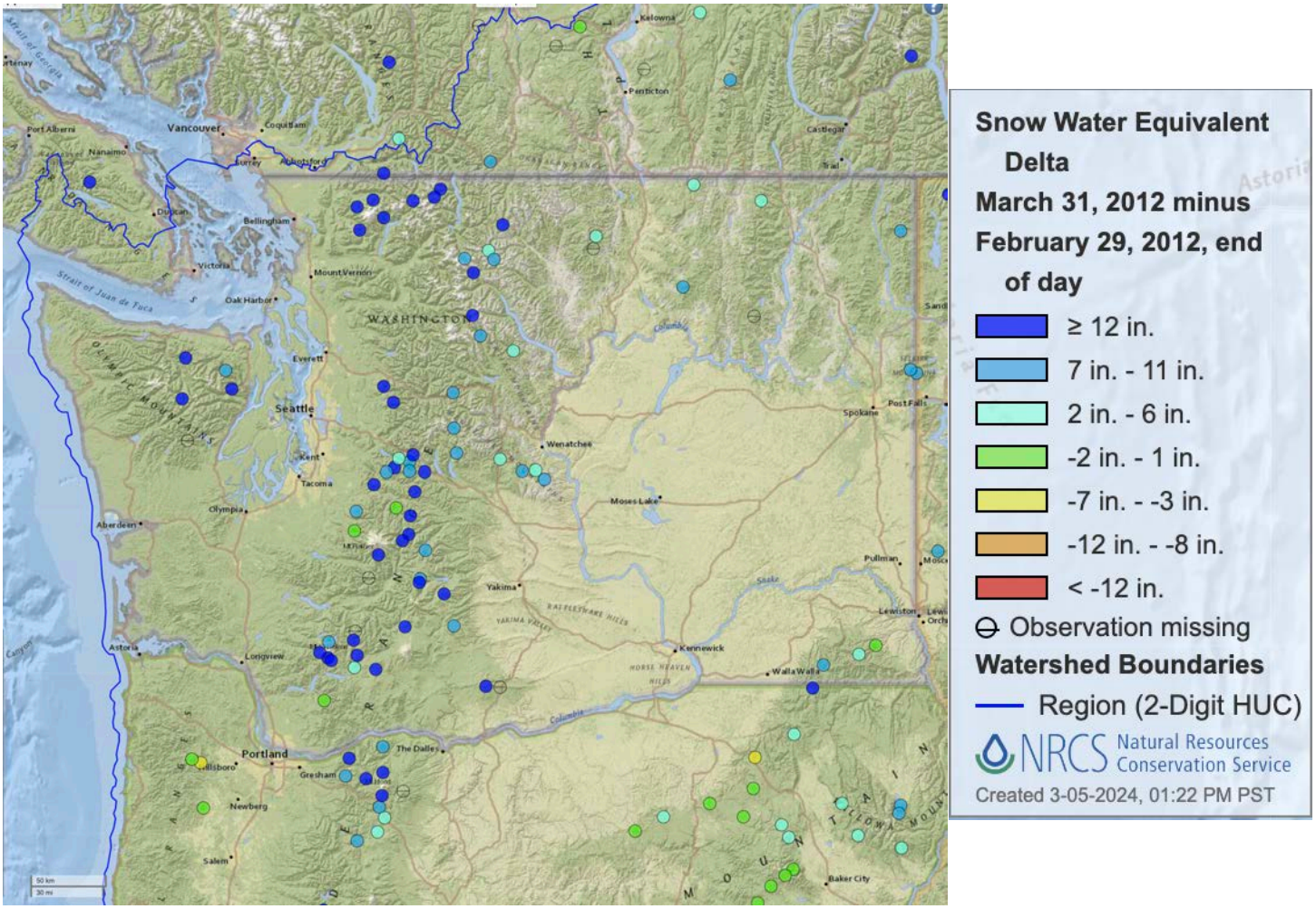
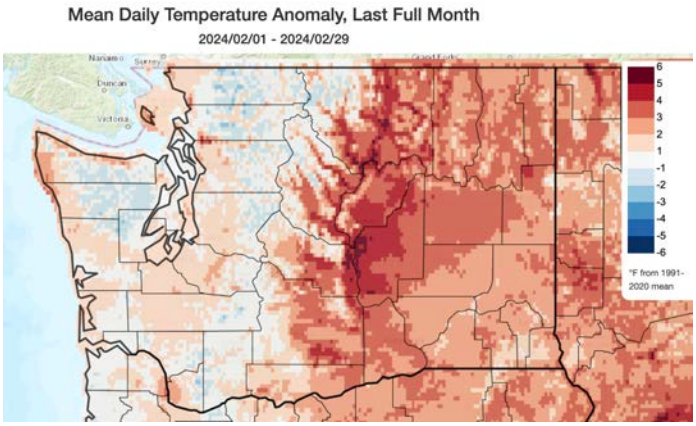


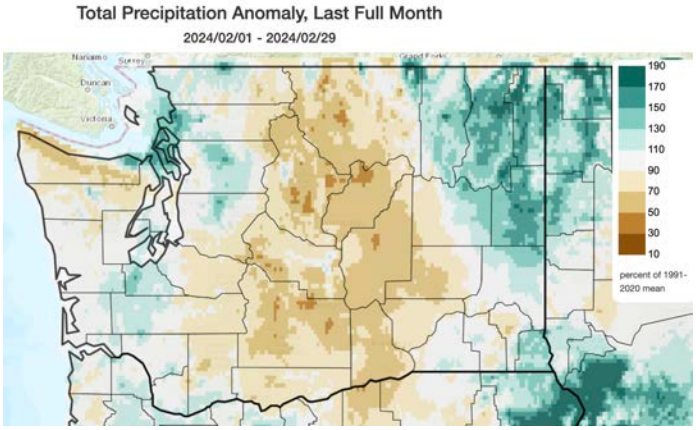
Figure 7: As in Figure 6, except for March 2012.

Climate Summary

February average temperatures were warmer than normal for a majority of the state. Similar to January, the temperature anomalies were larger in eastern WA compared to western WA, except the sense of those anomalies is opposite that of the cold anomalies of January. Omak and Ephrata were quite warm relative to their normal, with average temperatures 6.6 and 4.5°F above normal, respectively. Locations further east were not quite as anomalous: Spokane was 3.2°F above normal, while Pullman was 1.5°F above normal (Table 1). February average temperatures in western WA, including the Cascade Mountains, were within 2°F of normal; some locations had temperatures above normal and others were below normal. The areas with below normal temperatures were generally confined to the mountains. Every lower elevation location listed in Table 1 had near-normal to above normal February temperatures.



February temperature (°F) departure from normal relative to the 1991-2020 normal (Climate Toolbox).



February total precipitation percent of the 1991-2020 normal (Climate Toolbox).

February precipitation totals varied relative to normal throughout the state. A large area in central WA, encompassing the east slopes of the Cascades, received only between 50 and 90% of normal February precipitation. Omak and Ephrata were prime examples again, receiving only 60 and 48% of their normal precipitation amounts, respectively. The northern coast of the Olympic Peninsula also received below normal precipitation. Elsewhere in the state, precipitation was near-normal or above normal. SeaTac AP, for example, was almost exactly normal with 102% of average total precipitation, while Spokane AP received more than usual with 141% of normal (Table 1).

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	42.7	40.7	2.0	6.10	5.09	120	M	M	-
Seattle WFO	45.0	43.4	1.6	3.47	3.54	98	T	1.0	0
SeaTac AP	44.3	44.0	0.3	3.84	3.76	102	T	2.2	0
Quillayute	45.7	42.1	3.6	9.75	9.73	100	M	M	-
Hoquiam	44.4	43.6	0.8	7.74	6.65	116	M	M	-
Bellingham AP	42.1	41.7	0.4	3.03	2.85	106	M	M	-
Vancouver AP	45.1	43.1	2.0	4.17	3.77	111	M	M	-
Eastern Washington									
Spokane AP	36.1	32.9	3.2	2.03	1.44	141	4.9	7.8	63
Wenatchee	38.5	34.5	4.0	0.64	0.76	84	M	M	-
Omak	39.1	32.5	6.6	0.55	0.91	60	M	M	-
Pullman AP	36.9	35.4	1.5	1.53	1.59	96	M	M	-
Ephrata	39.4	34.9	4.5	0.31	0.64	48	M	M	-
Pasco AP	42.2	38.4	3.8	0.47	0.63	75	M	M	-
Hanford	40.9	38.2	2.7	0.69	0.66	105	3.4	2.8	121

Table 1: February 2024 climate summaries for locations around Washington with a climate normal baseline of 1991-2020.

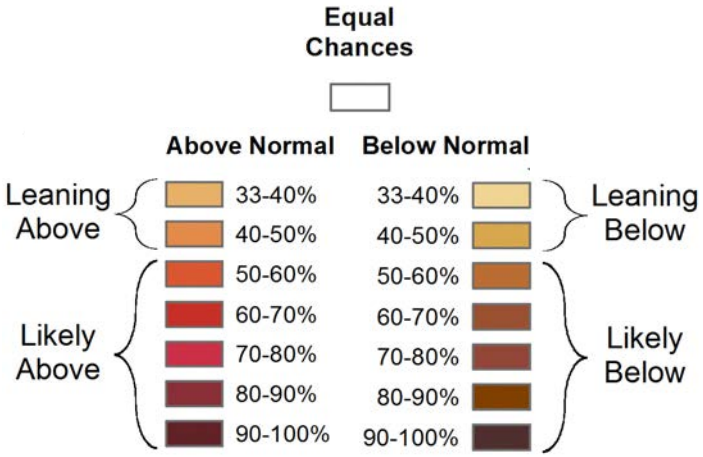
Climate Outlook

According to the Climate Prediction Center (CPC), El Niño conditions remains in the equatorial Pacific Ocean and an "El Niño Advisory" is still in effect. The sea-surface temperature (SST) anomalies have weakened across the equatorial Pacific Ocean over the last month. There has also been lessening in the atmospheric component of El Niño. ENSO models indicate that El Niño will transition to neutral conditions during the period of April-June. They are also indicating that more likely than not, La Niña will develop during the period of July-September, and because of that, the CPC has issued a "La Niña Watch".

The CPC March temperature outlook (Figure 8) has equal chances of below, equal to, or above normal temperatures statewide. The March precipitation outlook is similar, and showing equal chances of either below, near-normal, or above normal precipitation. That may appear to be an admission of defeat, but sometimes there is simply little to go on.

The March-April-May (MAM) temperature outlook (Figure 9) has high odds (between 50 and 60% on the three tiered scale) of above normal temperatures for nearly the entire state. Southeastern Washington has slightly lower odds of above normal temperatures, between 40 and 50% on the three-tiered scale. MAM precipitation is more likely to be below normal statewide, with the highest odds of below normal precipitation across eastern Washington.

Figure 8: March outlook for temperature (left) and precipitation (right).



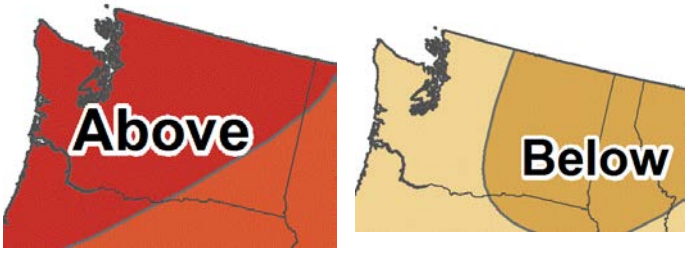


Figure 9: March-April-May outlook for temperature (left) and precipitation (right) (Climate Prediction Center).