



Office of the Washington State Climatologist

May 2020 Report and Outlook

May 5, 2020

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

April Event Summary

Mean April temperatures generally fell within 2 °F of the climatological normal for most of the state. Precipitation values were well below average statewide with most locations receiving between 20-60% of their normal April precipitation with only a few locations above 60%. Figure 1 shows large swaths of the state- from the Olympics to SW Washington, and North Central to South Central Washington- settling into the lowest 10% of April precipitation since records began in 1895. While Quillayute and Hoquiam received 3.56" and 2.12", respectively, these values correspond to the 5th driest April on record (Table 1).

Early in the month, an anonymously cold low-pressure system passed over the region, which marked the last of winter weather. Wenatchee and Yakima saw their lowest April 2nd temperatures at 27 °F and 20 °F, respectively. The next day, overnight lows dropped to 19 °F at Yakima, breaking yet another single day record. Snoqualmie Pass recorded its last trace of accumulated snowfall on the 4th as the low-pressure system headed south and brought record amounts of precipitation to Southern California.

In its place, a very stable ridge stationed itself directly off the coast of Washington, ushering a mostly dry period into the 22nd. While most stations recorded near-to-normal mean April temperatures, mostly clear skies during the dry

In this Issue

April Event Summary.....	1
Snowpack and Drought Monitor Update.....	3
A Review of Winter 19-20.....	4
Climate Summary	8
Climate Outlook	10

Station	April Total Precipitation (in)	Rank	Record (Amount; Year)	Records Began
Hoquiam Bowerman AP	2.12"	5	0.78"; 1956	1954
Quillayute AP	3.56"	5	1.78"; 2004	1967
Olympia AP	1.40"	7	0.37"; 1956	1942
Wenatchee	0.02"	10	0"; 1999 & 2005	1931
Richland	0.06"	6	T; 1977, 1968, 1956, 1949	1945
Walla Walla	0.65"	7	0.15"; 1956	1949
Bellingham AP	1.43"	7	0.35"; 2004	1949

Table 1: A sample of stations in WA with total April precipitation rankings in the top ten driest on record.

period allowed for overnight lows to break single day records at a variety of locations. With little cloud cover overhead, Olympia achieved consecutive single day low temperature records on the 12th at 24 °F and on the 13th at 23 °F. The Seattle WFO and the Pullman/Moscow Airport joined in with their own low temperature records on the 13th at 36 °F and 18 °F, respectively (Figure 2).

As the ridge broke down on 21st, a system arrived from the southwest, which supplied precipitation statewide, and marked the return of unsettled weather typical of Spring. Westerly flow after the 22nd favored areas west of the Cascades for precipitation. The precipitation that arrived on the 22nd broke a single day record at Bellingham totaling 0.68", and SeaTac International broke its April 25th record from 0.59" of rainfall (Figure 2). Various sites in Eastern Washington, such as Omak, Pasco, Hanford and Yakima, were largely rainshadowed by the westerly flow, and received most, if not all, of their measurable April precipitation on the 22nd. Overall, the return of unsettled weather late in the month could not surmount the extended dry period that characterized the core of the month.

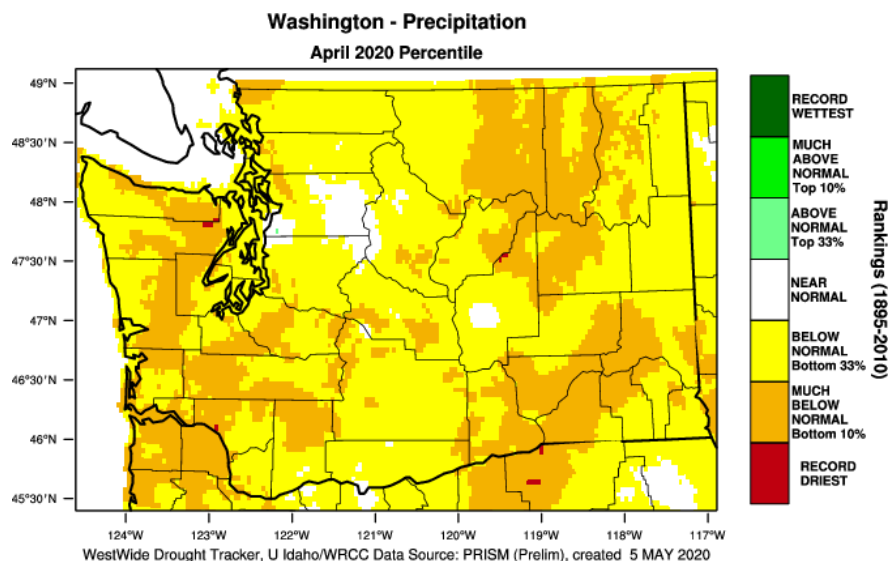


Figure 1: April 2020 precipitation total percentiles for WA state based on rankings from 1895-2010 (from [Westwide Drought Tracker](#)).

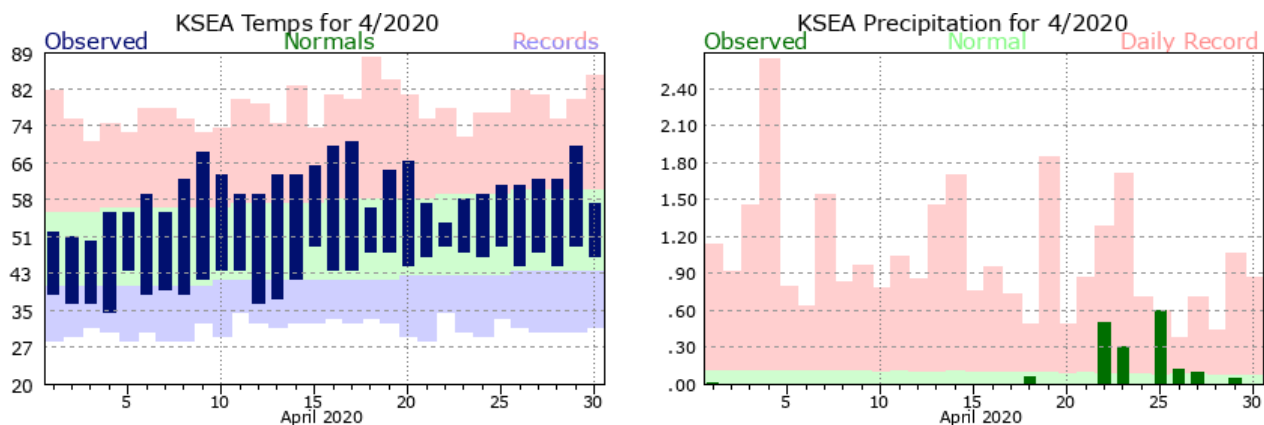


Figure 2: Daily April 2020 (a) maximum and minimum temperatures and (b) precipitation compared to normal (green envelope) and records (red and blue bars) for SeaTac Airport ([NWS](#)).

Snowpack and Drought Monitor Update

Snowpack began melting out in early April for much of the state. For some sites on the eastern slopes of the Cascades, melting occurred faster than usual, resulting in the lower percentages of normal snow water equivalent shown in Figure 3. The basin average SWE percent of normal as of May 1 ranged between 72 and 92% percent of normal for the east slopes, but those percentages are certainly brought down by some Snotel sites, such as Pope Ridge and Salmon Meadows, that are already melted out. The Olympics, western slopes of the Cascades, and Spokane and Lower Snake basin averages are near-normal, between 96 and 114% of normal.

Quickly disappearing snowpack, and continued drier than normal conditions led to further degradations shown on the U.S. Drought Monitor (Figure 4) since our last newsletter. “Abnormally dry” conditions, or D0, was also introduced to western WA. Low streamflows on the rain-fed rivers from the dry conditions was one factor taken into account for this expansion. Figure 5 shows the 28-day average streamflows ending on April 30, 2020, showing much below normal flows on the Peninsula and in southwest WA. Note the normal to above normal streamflows in Okanogan, Chelan, and Kittitas counties, where snow has been melting faster than usual.

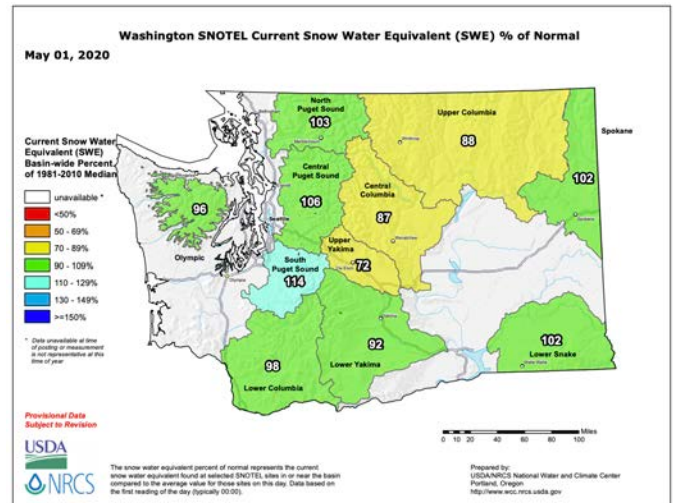


Figure 3: Snowpack (in terms of snow water equivalent) percent of normal for Washington as of 1 May 2020 (from [NRCS](#)).

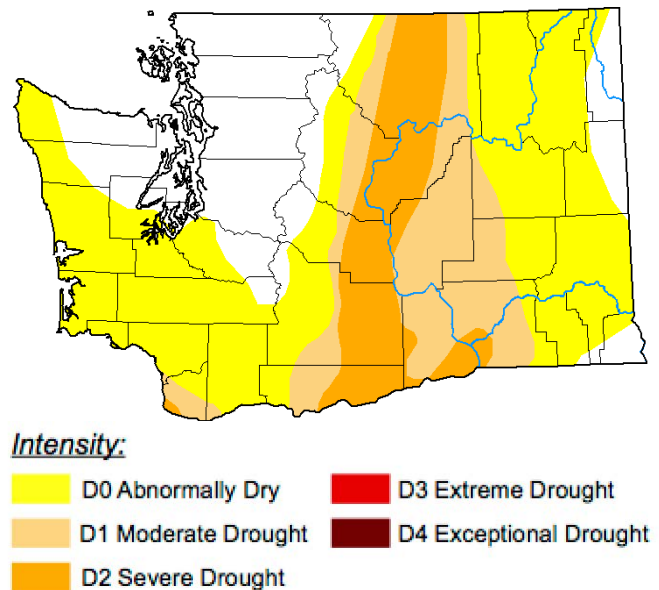
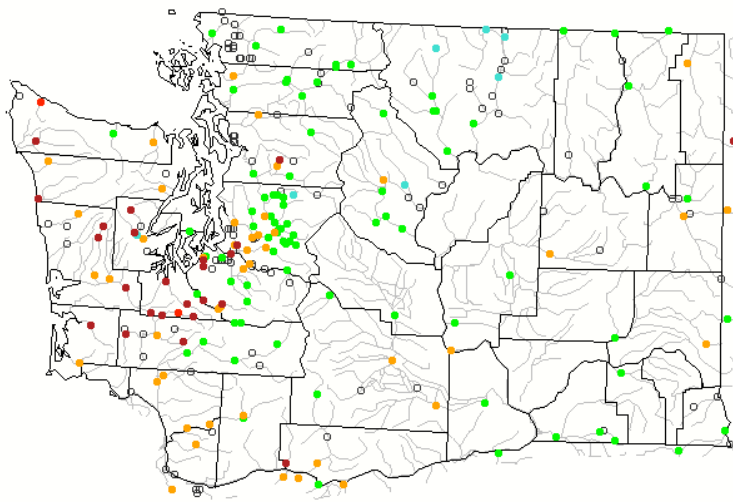


Figure 4: The 30 April 2020 edition of the [U.S. Drought Monitor](#).



Explanation - Percentile classes							
●	●	●	●	●	●	●	○
Low	<10	10-24	25-75	76-90	>90	High	Not-ranked
	Much below normal	Below normal	Normal	Above normal	Much above normal		

Figure 5: 28-day average streamflows for WA ending 30 April 2020 (from USGS).

A Review of Winter 2019-20

A message from the State Climatologist

In the fall of 2019, the El Niño-Southern Oscillation (ENSO) – one of the more reliable sources of seasonal predictability for the climate system – was expected to remain near-neutral and thus not a large consideration for our upcoming winter in Washington. Seasonal forecast models and forecasts from the Climate Prediction Center were calling for near-normal to above normal temperatures for winter with considerable uncertainty in precipitation. So how did the winter actually play out? Here we summarize the winter ENSO conditions, average temperature and precipitation anomalies for WA, and corresponding snowpack with the current implications for summer water supplies.

As expected, ENSO remained in a near-neutral state throughout the winter. Figure 6 shows a monthly mean of the sea-surface temperature (SST) anomalies for the Niño3.4 region of the equatorial Pacific Ocean (known as the Oceanic Niño Index) from 2013 through early 2020. As shown, SSTs were on the warm side this

past winter, but not enough to cross the threshold to signify El Niño. Therefore, the state of the tropical Pacific Ocean likely had very little impact on our weather.

Figure 7 shows the departure from average temperature and percent of normal precipitation across the state from October 2019 through March 2020. Averaged statewide, both temperatures and precipitation were near-normal, with temperatures only +0.3° F different from the 1981-2010 normal and precipitation at 94% of normal. For temperatures, the statewide average is a fair representation of the average winter temperatures for most of the state. The statewide average precipitation, on the other hand, masks the variability seen within WA state. As shown in Figure 7b, conditions east of the Cascade Mountains were significantly drier than normal during winter, with most regions receiving between 55 and 85% of normal. Specific average precipitation amounts for October through March for the counties of Benton, Okanogan, and Yakima counties totaled 59, 78 and 81% of normal,

respectively. Notably, the low precipitation in Benton county ranked as the 9th driest Oct-Mar on record (since 1895).

The average October through March temperatures and precipitation masks some substantial monthly variability as well. Water year 2020 began with an extremely cold October – the 2nd coldest averaged statewide since records began in 1895 – with a large number of individual stations in eastern WA reporting record low October temperatures and early season snow. November followed with unusual conditions of another type, ranking as the 5th driest November on record averaged statewide. November temperatures were near-normal, but the lack of precipitation resulted in very little accumulation of snowpack. December was also drier than normal for much of the state with the exception being parts of the Puget Sound region where heavy rains near the end of the month brought monthly precipitation totals back up to near normal. Still, November and December precipitation combined (shown in Figure 8) was between 25 and 70% of normal for much of the state, and by January 1, statewide snowpack was only 49% of normal.

Snowpack made an impressive comeback in January, however, as the month ranked as the 4th wettest January on record with between 130 and 300% of normal precipitation for most of the state (Figure 9). Overall, there was almost a 15” gain in snow water equivalent averaged statewide with statewide snowpack at 97% of normal by February 1. A unique feature of this past winter that is evident in Figure 9 is the slightly below normal precipitation in the Lower Columbia Basin for January. This rainshadow was even more widespread in February and was due to westerly and northwesterly flow anomalies that left the

eastern side of the Cascades with precipitation deficits, while most areas of western WA and southeastern WA received above normal precipitation. March was dry statewide. On the other hand, below normal temperatures helped preserve the snowpack. By April 1, statewide average snowpack was at a comfortable 109% of normal; Figure 10 shows the snowpack averages by basin.

Despite the healthy snowpack, at the time of this writing (late-April), April has been considerably drier than normal. The streamflow forecasts from the National Weather Service Northwest River Forecast Center reflect this recent dryness and the conditions expected in the next 10 days. In these forecasts, the Center reduced some of the April through September streamflow values compared to projections from early April. Figure 11 shows the Apr-Sept streamflow natural forecast as of April 26, 2020, indicating lower than normal flows in SW WA and on the Olympic Peninsula that range from 63 to 87% of normal. Southeastern WA also has an area of below normal flows, with the South Fork of the Palouse in Pullman at only 47% of normal Apr-Sept streamflow expected. Other parts of the state are looking better, and it should be noted that the early April Yakima Bureau of Reclamation forecast was for junior water users to received 96% of their normal water allotment. Spring conditions will impact this, however, and updates to these forecasts in the May and June will provide more definitive information on water availability and summer streamflows.

In summary, our wet season had near-normal temperatures with quite variable precipitation amounts depending on location. So, the early fall

seasonal forecasts can be considered accurate, though they did not (and certainly could not) imply the monthly variations in both temperature and precipitation. The Climate Prediction Center has a higher likelihood of warmer and drier than

normal conditions for both spring and summer so while there aren't many water supply issues in WA at present, conditions need to continue to be monitored as we enter our drier part of the year.

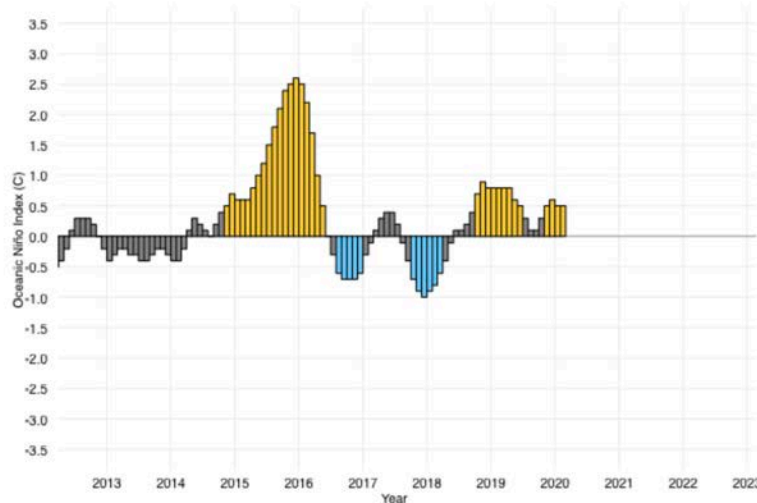


Figure 6: The monthly Oceanic Niño Index based on the sea-surface temperatures in the Niño3.4 region of the equatorial Pacific Ocean from 2013 through 2020 (from [NOAA](#)).

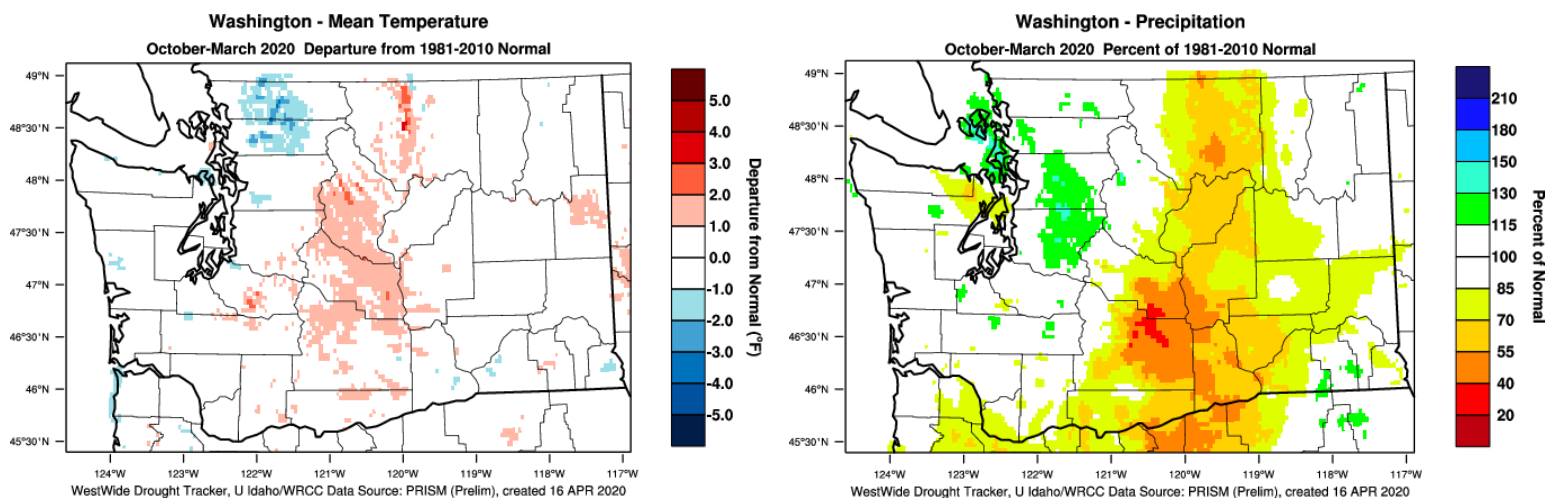


Figure 7: October 2019 through March 2020 (a) average temperature departure from the 1981-2010 normal and (b) precipitation percent of normal for WA state (from [Westwide Drought Tracker](#)).

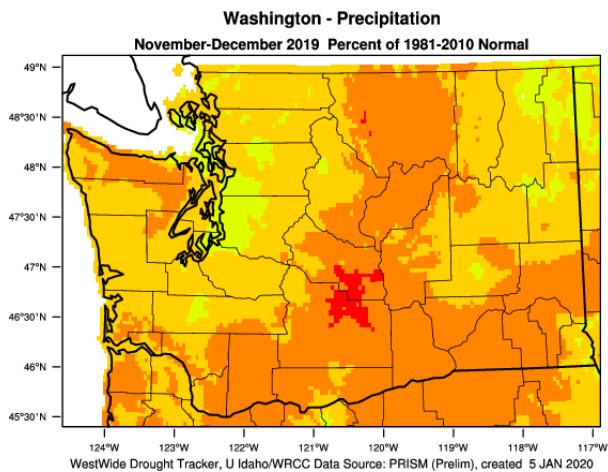


Figure 8: November-December 2019 precipitation percent of normal for WA state (from [Westwide Drought Tracker](#)).

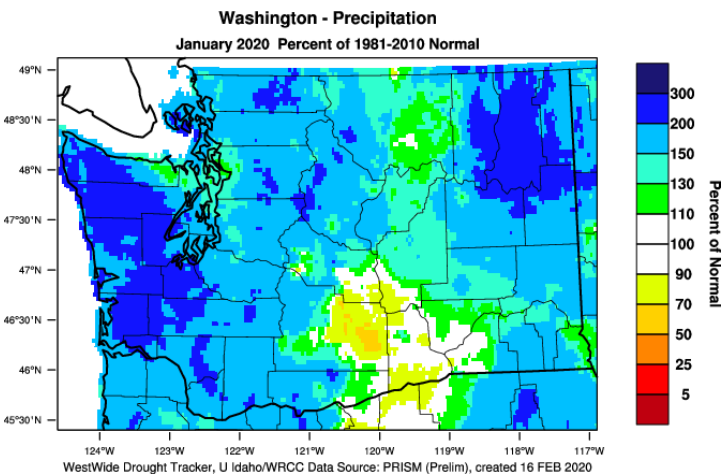


Figure 9: January 2020 precipitation percent of normal for WA state (from [Westwide Drought Tracker](#)).

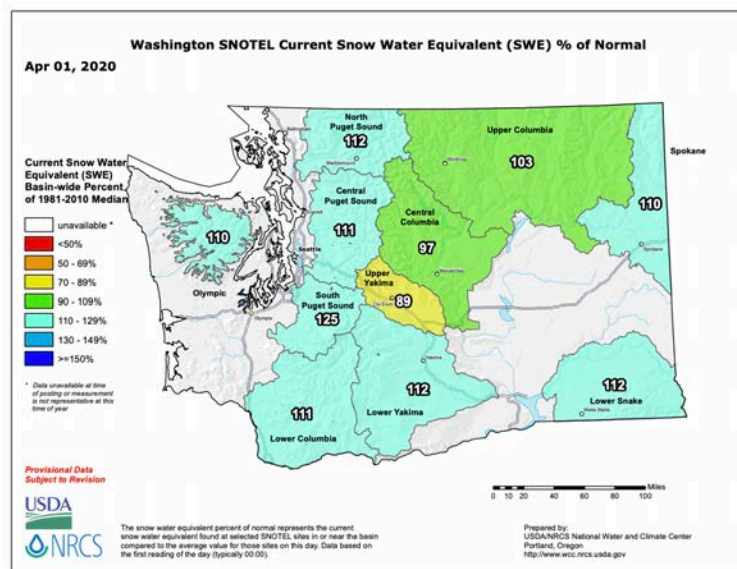


Figure 10: Basin-average snow water equivalent (SWE) on April 1, 2020 for WA (from [NRCS](#)).

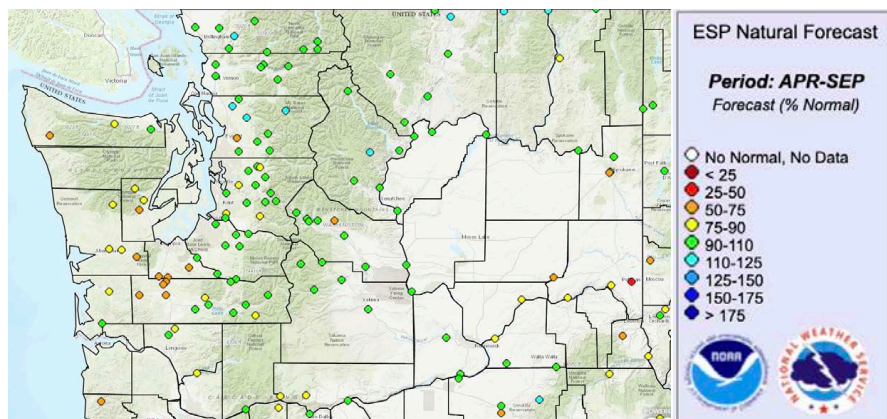
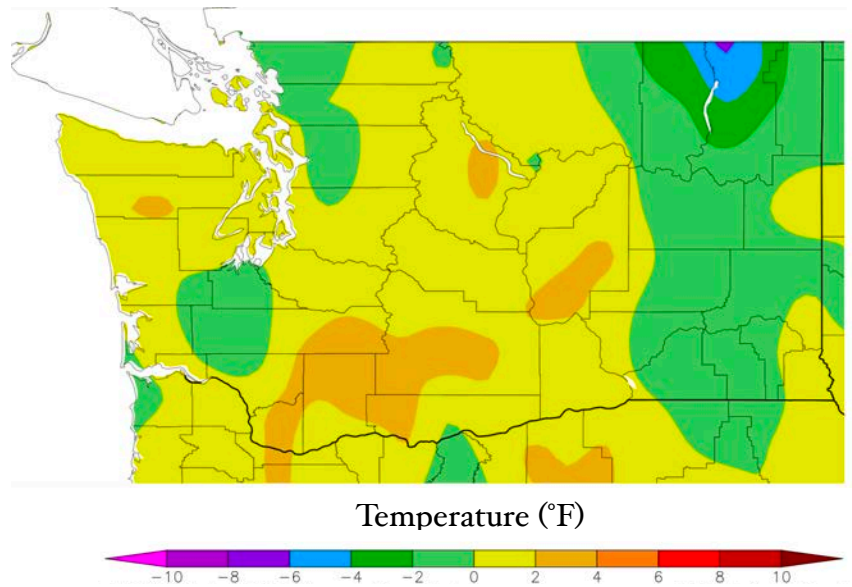


Figure 11: April through September 2020 natural water supply forecast in percentage of normal for WA as of April 26, 2020 from the NWS Northwest River Forecast Center. [Forecasts](#) are updated daily.
Volume IX Issue 5

Climate Summary

Mean April temperatures were near normal across most of Washington, outside of a single station in the NE corner, according to the analysis from the High Plains Regional Climate Center. The Eastern third of the state featured temperatures slightly below normal, though observation sites in Spokane and Pullman recorded temperatures 0.6 and 0.4 °F above normal (Table 2). Similar to average temperatures in March, the greatest cold anomaly in the NE is based off a single station, which should be noted with some skepticism. Temperatures were above normal for south central Washington with Vancouver seeing average temperatures 1.3 °F above normal.



Mean April precipitation totals were significantly below normal across the entire state. Central and northern Puget Sound recorded the smallest deviation of normal with precipitation totals in the lower 60's percentile range at the Seattle WFO and SeaTac International. Most other stations west of the Cascades fell into the range 40-60% of normal precipitation. The greatest departure from normal occurred in the eastern half of the Cascades to the Columbia Basin. Sites in this area such as Wenatchee and Hanford observed only 11% and 5% of normal April precipitation respectively; the latter recorded the entirety of its 0.03" total on April 22nd, though a trace of precipitation was recorded on eight other occasions. Omak followed up the 0.04" of precipitation received in March with 0.11" in April- representing 11% of normal.

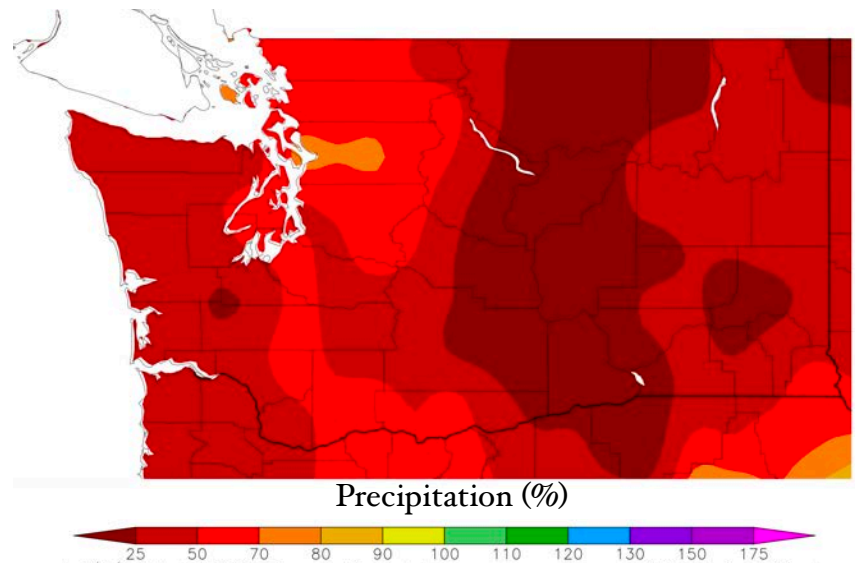


Figure 12: April temperature (°F) departure from normal (top) and precipitation percent of normal (bottom). ([High Plains Regional Climate Center](#);

	Mean Temperature (°F)			Precipitation (inches)		
	Avg	Norm	Departure from Normal	Total	Norm	% of Norm
Western Washington						
Olympia	48.4	48.3	0.1	1.40	3.54	40
Seattle WFO	51.8	50.5	1.3	1.73	2.77	62
SeaTac AP	52.3	50.3	2.0	1.70	2.71	63
Quillayute	47.4	46.7	0.7	3.56	7.85	45
Hoquiam	49.3	48.7	0.6	2.12	5.10	42
Bellingham AP	49.6	48.4	1.2	1.43	2.69	53
Vancouver AP	53.4	52.1	1.3	0.91	3.01	30
Eastern Washington						
Spokane AP	47.6	47.0	0.6	0.29	1.28	23
Wenatchee	52.4	51.6	0.8	0.08	0.46	17
Omak	50.5	50.0	0.5	0.11	1.04	11
Pullman AP	46.5	46.1	0.4	0.58	1.56	37
Ephrata	51.5	50.4	1.1	0.09	0.48	19
Pasco AP	53.8	52.9	0.9	0.19	0.65	29
Hanford	54.0	53.0	1.0	0.03	0.55	5

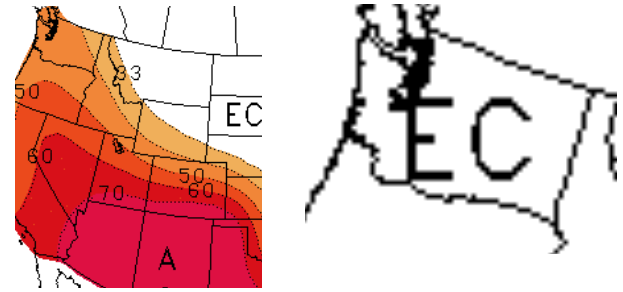
Table 2: April 2020 climate summaries for locations around Washington with a climate normal baseline of 1981-2010. Note that the Vancouver Pearson Airport and Seattle WFO 1981-2010 normals involved using surrounding stations in estimating the normal, as records for these station began in 1998 and 1986, respectively.

Climate Outlook

According to the Climate Prediction Center (CPC), neutral ENSO conditions are currently presiding in the equatorial Pacific, and are expected to remain through the summer. Sea surface temperatures (SST) are above normal across most of the basin, but have decreased over the last month especially off the coast of South America. While April SST values were on the edge of a weak El Niño, the tropical atmospheric circulation was in alignment with neutral conditions. ENSO forecast models place a 64% likelihood of neutral ENSO conditions through July. Models prefer to keep ENSO conditions through the fall, but the odds of La Niña is slowly rising relative to the odds of El Niño.

The CPC May outlook has increased chances of above normal temperatures across the entire state. Slightly lower chances of above normal temperatures exist for a pocket in the northeast corner. The May precipitation outlook is split with equal chances of above, below or equal precipitation for the entire state.

The CPC May-June-July outlook has increased chances of above normal temperatures for the entire state. Chances of above normal temperatures are highest in the central and southern portions of the state. The precipitation outlook has increased chances of below normal precipitation for the entire state.



May outlook for temperature (left) and precipitation (right)

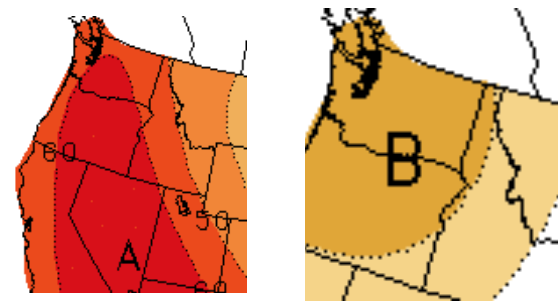


Figure 13: May-June-July outlook for temperature (left) and precipitation (right)

([Climate Prediction Center](#))