



Office of the Washington State Climatologist

March 2018 Report and Outlook

March 6, 2018

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

February Event Summary

Mean February temperatures were colder than normal throughout much of the state, with average temperatures between 1 and 5°F below normal. In contrast, the Lower Columbia Basin had near-normal to slightly above normal temperatures for the month. Precipitation was below normal for much of the state, though there were some regions (northern Puget Sound and Spokane area, for example) that had above normal precipitation.

Even though the amount of precipitation was less than normal, the **type** of precipitation is quite notable: snow. The second half of February was much colder than normal (see Figure 1), with several instances of lowland snow throughout the state. Spokane received a daily record amount of snowfall on the 14th with 7.3". Figure 2 shows 24-hr snow totals on the morning of the 22nd, highlighting mainly a western WA snow event. A calendar day record for snow (1") was set at SeaTac Airport the day before (2/21).

Aside from the snow, that period was accompanied by cold temperature records as well. On the 20th, record low minimum daily

In this Issue

February Event Summary.....	1
Snowpack Update.....	3
CoCoRaHS Note.....	3
Late Winter Cold.....	4
Climate Summary.....	7
Climate Outlook.....	9

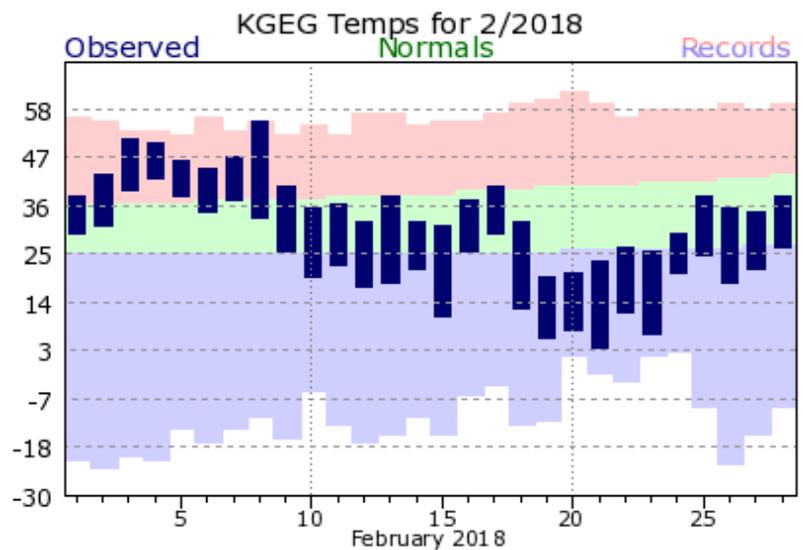


Figure 1: Daily February 2018 temperatures (dark blue bars) for Spokane Airport and historical records (red and blue bars). [NWS](#)

temperatures were set at Pullman-Moscow Airport (-6°F) and Hanford (11°F). Daily low temperature records continued at several locations around the state through the 24th. On the 23rd, for example, Olympia (16°F), Bellingham (19°F), Hoquiam (24°F), SeaTac Airport (24°F), and Quillayute (24°F) all set daily minimum low temperature records. Meanwhile, eastern WA stations were on the record books again on the 24th with Ephrata (8°F) and Wenatchee (16°F) setting low temperature records.

Wenatchee (59°F), Ephrata (63°F), and Yakima (67°F) set warm temperature records in the 3rd, and the warmer than normal temperature stuck around through the 9th.

February ended on a cold note, but began on a warm one. In contrast to the end of the month, the beginning experienced a continuation of the January warmth. Temperatures were in the 50s and 60s in early February, setting daily high temperature records. For example, a record high was measured at Vancouver (60°F) on the 2nd.

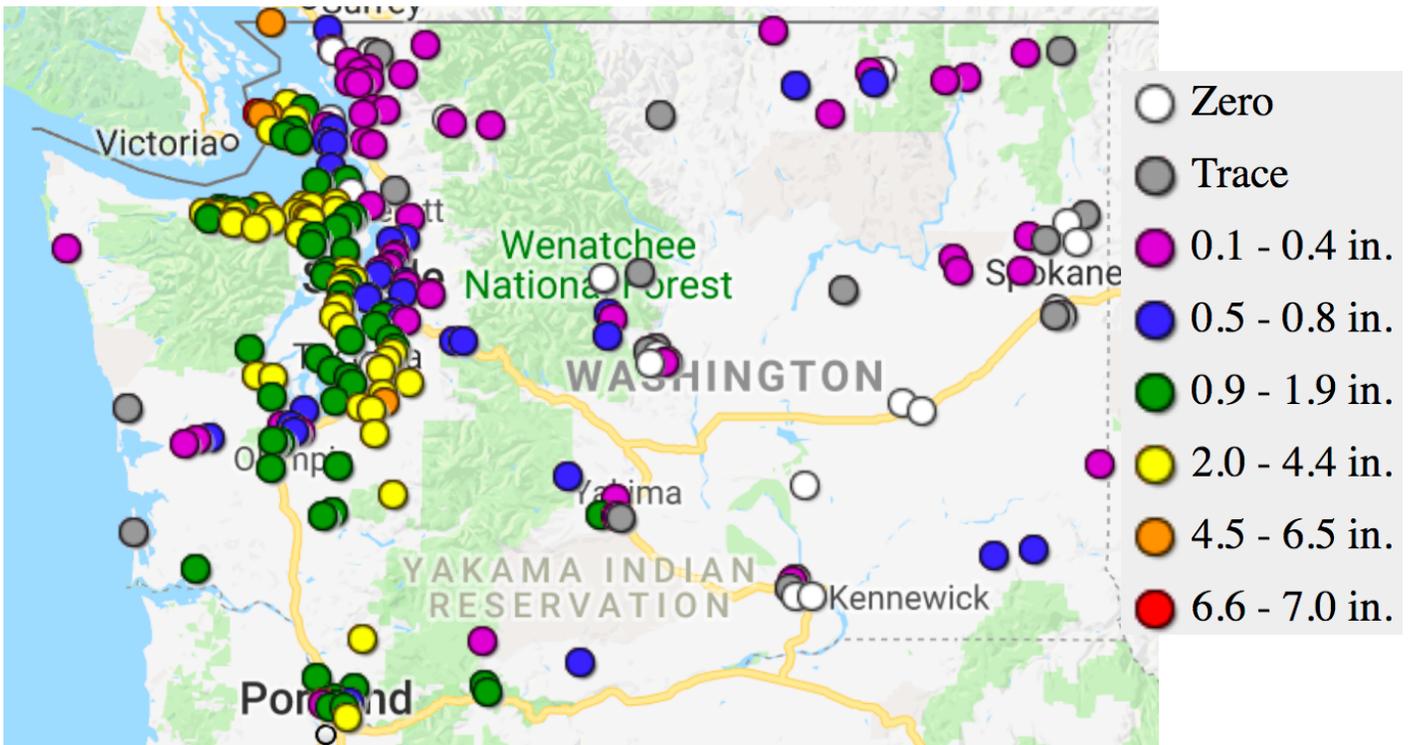


Figure 2: 24-hr snowfall observations ending between 7 and 9 am on February 22, 2018 from [CoCoRaHS](#) observers.

Snowpack Update

Despite below normal precipitation throughout most of the state in February, the statewide snowpack is doing quite well. The cooler than normal temperatures helped, as well as normal to above-normal precipitation (snow) in the central and northern Cascades. The basin average snow water equivalent (SWE) percent of normal from NRCS is shown in Figure 3 for WA. As of March 1st, basin-average SWE is normal to above normal throughout the entire state. The Olympic, North Puget Sound, Upper Columbia, Spokane, and Lower Snake basins are doing the best, relative to normal, but the central and southern Cascades have healthy snowpack as well.

Even with promising snow conditions, the U.S. Drought Monitor has “Do”, or abnormally dry conditions, in the Lower Columbia basin (Figure 4). These regions have had below normal precipitation beyond just the last month, with drier than normal conditions present on the 60 and 90-day time scales as well. The “Do” category is used for areas showing dryness but that are not in drought. We will continue to monitor this region.



photo by Henry Reges, CoCoRaHS

Community, Collaborative Rain, Hail, and Snow (CoCoRaHS) Network

Thank you, CoCoRaHS observers, for your continued dedication to reporting precipitation in your backyards! As evidenced by the snowfall total map shown on the previous page, we rely heavily on your precipitation observations, particularly with regards to snow. Unfortunately snow isn't measured at many of the other weather stations that we rely on, so your reports really help fill in the picture of each snow event in the state.

If you think your friends and relatives may be interested in reporting for CoCoRaHS, then please help spread the word! New observers can sign up at www.cocorahs.org.

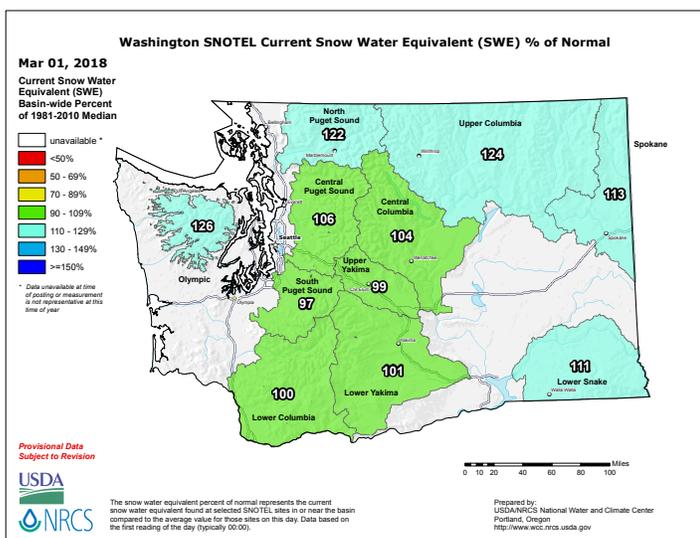


Figure 3: Snowpack (in terms of snow water equivalent) percent of normal for WA as of 1 March 2018 (NRCS).

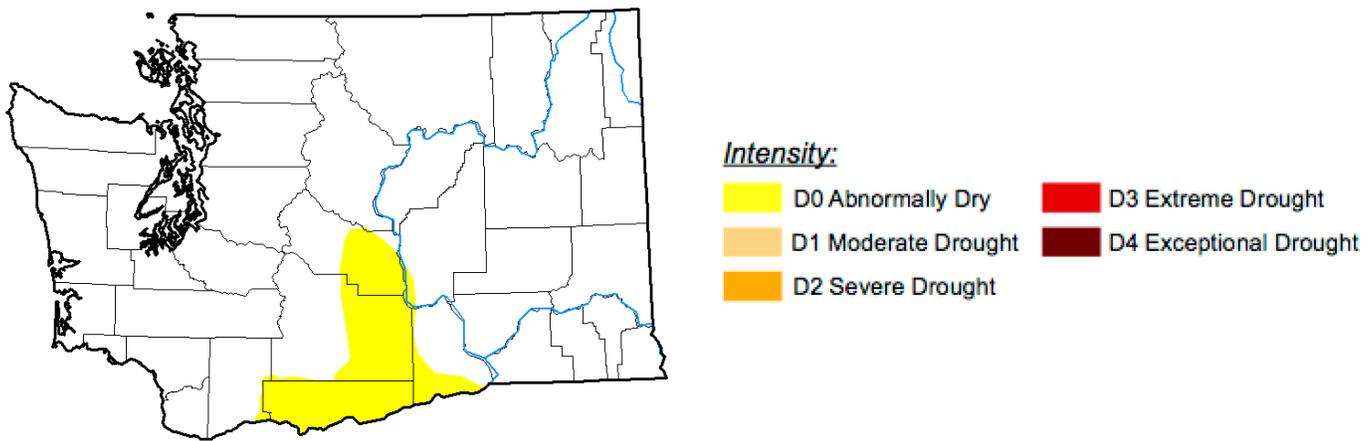


Figure 4: The 1 March edition of the [US Drought Monitor](#).

Late Cold during Winters in Washington State

A message from the State Climatologist

As reported above, the last 2 weeks of February were quite chilly, with numerous locations setting all-time lows for the date on the 23rd. Many places have had their coldest temperatures of this winter in late February, even though the nights are noticeably shorter than in December and January. We were curious about how often this sort of thing happens based on the historical record, with an arbitrary start of the winter of 1949-1950. Our procedure was to simply catalog the instances when February (or in a couple of cases, March) included the coldest minimum temperature of the winter. This was done for 4 stations on the west side of the state (Forks, Vancouver, Olympia, and Bellingham) and 4 stations on the east side (Tri-Cities, Winthrop, Pullman, and Spokane Airport).

Out of the 69 years considered, the number of winters with February or March having the lowest or tied for the lowest daily minimum temperature ranged from 14 at Forks and Vancouver to 6 at Winthrop and Pullman (Table 1). Olympia and Bellingham have had one winter during which the lowest minimum temperature was recorded in

March; Vancouver has had two winters with the lowest temperatures that late in the season.

It turns out that February 2018 was a rather unusual from the perspective that each of the 8 stations considered had their coldest temperatures of the season during that month. Here it is assumed that March of 2018 will lack any extreme cold snaps (at least there is no indication of the sort in the numerical weather prediction forecasts at the time of this writing). There is only one other example in the record going back to 1950 for which essentially the entire state experienced its coldest temperatures in February, and that is the year of 1989. By many measures, February 1989 was extraordinary. An extreme Arctic air outbreak occurred early in the month with widespread records set for the month, followed by another period of unusually cold weather near the end of the month extending into March, accompanied by substantial lowland snow.

The large-scale atmospheric circulation anomalies for February 1989 and 2018 resemble one another,

as illustrated by the 500 hPa geopotential height anomaly distributions of Figures 5a and 5b. It bears emphasizing that the February of 1989 was much colder than that of 2018 in terms of both the monthly mean and lowest daily minimum temperatures. The easterly component to the anomalous flow shown in Figure 1a implies that much more of a continental source for the air mass during 1989.

Both 1989 and 2018 can be categorized as La Niña winters. It is generally appreciated that ENSO has its most robust impacts on the Pac NW during the late winter and the statistic considered here is no exception. Table 1 shows how many of the winters with the coldest temperatures in February or March coincide with La Niña (and El Niño). A disproportionate number of the winters with late cold have occurred with La Niña, and very few have occurred with El Niño. The moral of the story: while it might have seem farfetched given how warm it was in January of 2018, don't give up on getting a real taste of winter during La Niña.

	Forks	Vancouver	Olympia	Bellingham	Tri-Cities	Winthrop	Spokane	Pullman
# of Feb Mins	14	14	12	7	10	6	10	6
La Niña	9	9	9	4	8	5	6	5
El Niño	2	1	0	1	1	0	0	0

Table 1: Number of winters in which the coldest daily minimum temperature was in February or March. Of those winters, the number that could be classified as a La Niña or El Niño winter is also indicated.

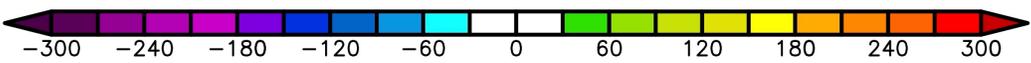
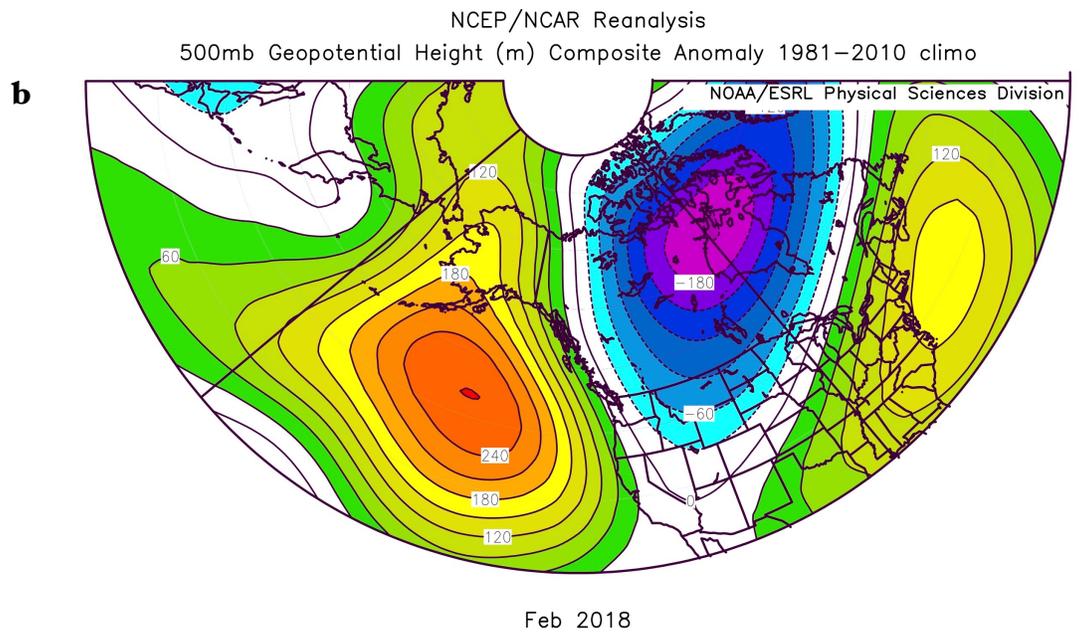
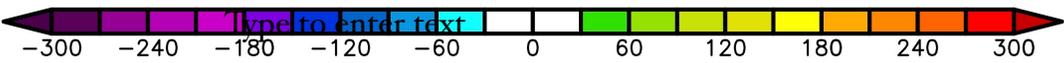
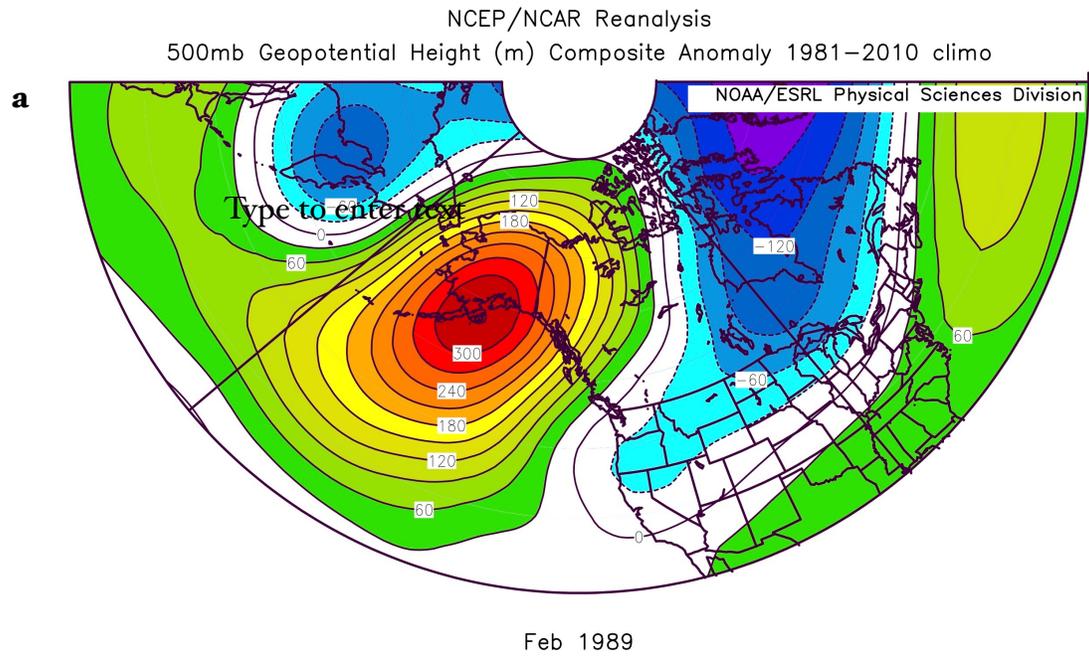
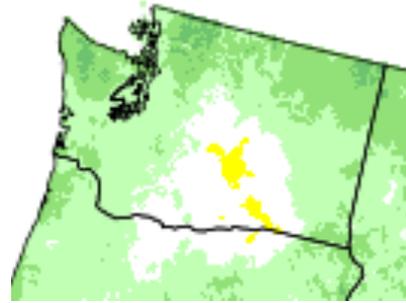


Figure 5: February (a) 1989 and (b) 2018 500-hPa geopotential height anomalies from the NCEP/NCAR Reanalysis.

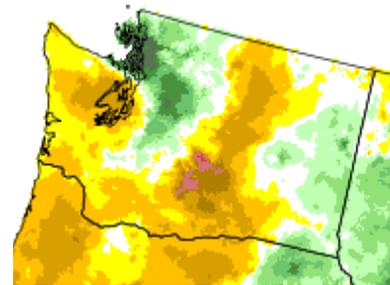
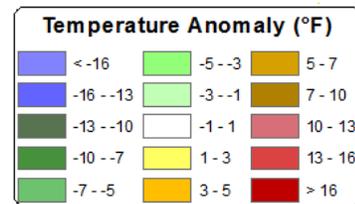
Climate Summary

Mean February temperatures were below normal throughout most of the state, with most of the state between 1 and 3°F below normal. Olympia, SeaTac Airport, and Hoquiam were 2, 2.3, and 2.7°F below normal for the month, respectively (Table 2). The map on the right-hand side is preliminary data from the PRISM Climate Group and shows that the Olympic Peninsula and some regions in northern WA had even larger cold anomalies. The Lower Columbia basin, on the other hand, had near-normal to slightly above normal February temperatures.

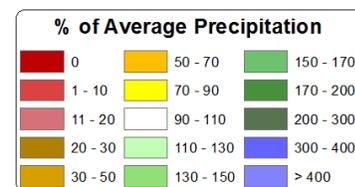
Total February precipitation was below normal for most of the state, though some locations had above normal precipitation. The Olympic Peninsula, southwestern WA, the Lower Columbia Basin and north central WA received less precipitation than normal, with percentages between 20 and 90% of normal throughout those areas. For example, Vancouver, Hoquiam, and Ephrata had 44, 82, and 59% of normal precipitation, respectively (Table 2). On the other hand, the Spokane area and the central and northern Puget Sound had near-normal to above normal precipitation. Bellingham and Pullman were two such locations, with 139 and 146% of normal, respectively.



Temperature (°F)



Precipitation (%)



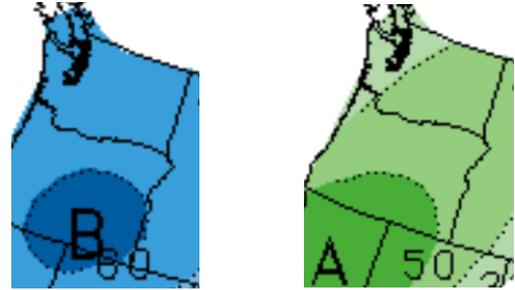
February temperature (°F) departure from normal (top) and precipitation percent of normal (bottom). (PRISM; relative to the 1981-2010 normal).

	Mean Temperature (°F)			Precipitation (inches)			Snowfall (inches)		
	Avg	Norm	Departure from Normal	Total	Norm	% of Norm	Total	Norm	% of Norm
Western Washington									
Olympia	39.0	41.0	-2.0	3.63	5.27	69	M	4.7	-
Seattle WFO	41.4	43.4	-2.0	3.44	3.31	104	0.8	0.6	133
Sea Tac AP	41.4	43.4	-2.3	2.16	3.50	62	1.0	1.7	59
Quillayute	39.5	42.1	-2.6	9.28	10.35	90	M	2.6	-
Hoquiam	41.0	43.7	-2.7	5.92	7.21	82	M	0.8	-
Bellingham AP	39.1	40.8	-1.7	4.21	3.02	139	M	2.4	-
Vancouver AP	41.7	43.5	-1.8	1.77	4.03	44	M	M	-
Eastern Washington									
Spokane AP	30.2	33.0	-2.8	1.60	1.33	120	12.0	6.8	176
Wenatchee	35.1	34.8	0.3	0.50	0.81	62	M	4.4	-
Omak	30.1	31.8	-1.7	0.49	1.41	35	M	M	-
Pullman AP	31.5	34.9	-3.4	2.22	1.52	146	M	M	-
Ephrata	34.9	34.1	0.8	0.44	0.74	59	M	3.1	-
Pasco AP	39.3	38.9	0.4	0.40	0.86	47	T	M	-
Hanford	38.6	38.2	0.4	0.22	0.70	31	0.6	2.3	26

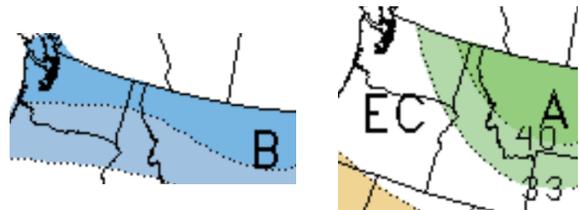
Table 2: February 2018 climate summaries for locations around Washington with a climate normal baseline of 1981-2010. Note that the Vancouver Pearson Airport and Seattle WFO 1981-2010 normals involved using surrounding stations in estimating the normal, as records for these station began in 1998 and 1986, respectively.

Climate Outlook

La Niña conditions persisted into February 2018 as evidenced by below-average sea-surface temperatures across the central and eastern Pacific Ocean. Most models used by the CPC predict that the current La Niña conditions will decay and become ENSO neutral during the Northern Hemisphere's spring (March-May). Until then, La Niña is expected to continue to affect the United States with outlooks generally favoring above-average temperatures and below median precipitation across the south as well as below-average temperatures and above median precipitation across the northern states.



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



March-April-May outlook for temperature (left) and precipitation (right)

The March climate outlook for Washington generally follows what we would expect from La Niña conditions in the equatorial Pacific Ocean. The CPC calls for a higher chance of below-average temperatures across the state. For precipitation, the CPC expects above-median amounts throughout the state with higher chances in central and southeastern Washington.

The spring (March-April-May) CPC outlook calls for higher chances of below-average temperatures across Washington state with higher probabilities in northern Washington. The outlook also includes increased chances for above-median precipitation in eastern Washington. The remainder of the state has equal chances of above, equal to, or below median precipitation for spring.

(Climate Prediction Center)