

# Office of the Washington State Climatologist

March 4, 2015

## February Event Summary

Mean February temperatures were much above normal statewide, marking a continuation of the warmer than normal temperatures seen all winter. Table 1 lists the average temperature for December through February at selected WA stations. Climatological winter (DJF) was extremely warm, especially through western WA where it ranks as the warmest DJF on record at SeaTac Airport, Hoquiam, Quillayute, and Bellingham. Temperatures were warmer than normal east of the Cascade Mountains as well, but didn't rank quite as high with respect to all-time records.

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Total February precipitation was a mixed bag in WA, though for much of the state it could be classified as near-normal. The month began on a very wet note, with flooding the first weekend of the month as a series of storms impacted the state. The most notable flooding

Station	DJF Average Temperature	Rank	Record/Year	Previous Record/Year	Records Since
SeaTac	46.4	1	-	45.0; 1991/92	1945
Quillayute	46.2	1	-	44.7; 1991/92	1966
Hoquiam	47.3	1	-	46.2; 1991/92	1953
Bellingham	44.0	1	-	43.7; 1991/92	1949
Pullman	36.9	2	37.3; 1957/58	-	1940
Everett	44.9	2	45.3; 1957/58	-	1914
Olympia	43.3	2	44.0; 1957/58	-	1948
Ephrata	36.6	2	37.8; 1957/58	-	1949
Wenatchee	36.2	7	37.9; 1966/67	-	1931
Spokane	34.3	8	38.2; 1933/34	~	1881

Table 1: The average December-January-February temperature, ranking (descending), the current record and year, the record broken, and the year records began for selected WA stations.

occurred on the Duckabush River near Brinnon, a town in the eastern Olympic Peninsula along the Hood Canal, where homes flooded and two mudslides occurred from heavy rain on the 6th. Temperatures remained warm during this wet spell, resulting in unseasonably muggy conditions in the lowlands and little, if any, snow in the mountains. Eastern WA temperatures were particularly warm with Walla Walla (70°F) and Yakima (60°F; tie) setting daily record high temperatures on the 6th.

There was a shift in the weather pattern on about the 12th, and the remainder of the month was essentially dry. There was a notable warm period in the middle of the month. On February 16, daily high temperature records were set at Hoquiam (62°F), Vancouver (62°F; tie), Olympia (60°F), and SeaTac Airport (59°F). Warm temperatures were recorded on the 17th as well with SeaTac (61°F), Olympia (62°F), Quillayute (65°F), Hoquiam (63°F), and Bellingham (59°F) setting daily record highs. The month ended with more normal temperatures and a little bit of snow in the mountains (less than a foot) with minimal impacts.

## Snowpack and Drought Update

The warm temperatures and thus high freezing levels have been detrimental to our snowpack statewide. Figure 1 shows the basin average snow water equivalent (SWE) percent of average as of 2 March 2015 from the National Resources Conservation Service. The snowpack is very poor throughout the Olympic and Cascade Mountains, especially the western slopes of the

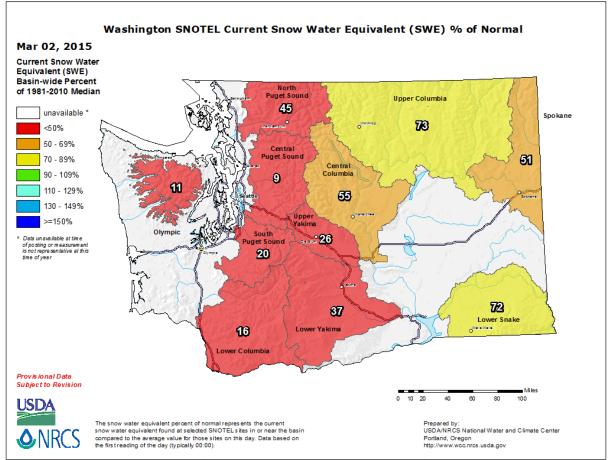


Figure 1: Snowpack (in terms of snow water equivalent) percent of normal for Washington as of 2 March 2015 (from the National Resources Conservation Service).

Cascades; the basin average SWE is between 9 and 45% of normal. The Upper Columbia and the Lower Snake has the best SWE in the state, but even those basins are reporting only 73 and 72% of normal, respectively. The Central Columbia and Spokane basins average right at about half of normal SWE with 55 and 51% of normal, respectively. The most-recent US Drought Monitor depiction (Figure 2) shows "D1" - moderate drought - through the Olympics and the southern and central Cascade Mountains where SWE is the lowest. Otherwise, there have been some slight improvements to the Drought Monitor in the Lower Columbia basin where drier than normal conditions persisted for over a year.

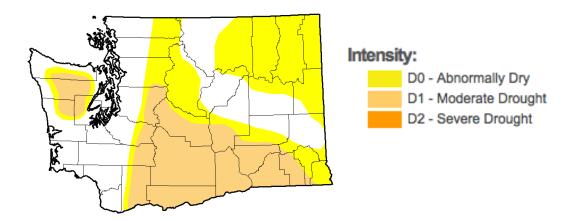


Figure 2: The 24 February 2015 edition of the US Drought Monitor (http://droughtmonitor.unl.edu/).

# March Snowfall in the Lowlands of Washington State

## A message from the State Climatologist

The subject of this piece may be cruelly ironic, given the lack of much cold weather and snow during this winter. On the other hand, perhaps some of this material will represent a comfort somewhat akin to that sought by fans of the Chicago Cubs. There is always next year!

Our objective is to provide a sense of how often and how much it can snow in the lowlands of Washington state during the month of March, again for those that dare to dream. Folks with even just a nodding acquaintance with the weather of the Pacific Northwest know that major snowfalls can occur at higher elevations well into spring. We expect that there may not be so much of a familiarity with the records at major population centers around the state, and we would like to do something about that.

Table 2 shows March snowfall information for a sample of WA locations. The data are based on the period of record of snowfall observations at each station – typically since the 1950s – but it's important to note that many stations have periods of missing snowfall data. There may be some surprises. For example, the greatest March monthly total is at Bellingham (34.5"), not at Spokane, which has had its fair share of snowy months earlier in the winter season. Pullman also bests Spokane with both a larger 1-day snow total (12.5") and a higher monthly

total (18.6") for March. Hoquiam is the least snowy station of the bunch, with its greatest March total at 4".

Station	Avg # of Measurable (>1") Snowfalls	Greatest 1-day Total	Average Monthly Total	Greatest Monthly Total	
SeaTac	0.4	6.0	1.2	18.2	
Olympia	0.5	8.7	1.6	20.6	
Hoquiam	0.1	4.0	0.2	4.0	
Bellingham	0.5	7.8	1.7	34.5	
Yakima	0.4	6.8	1.2	10.8	
Coulee Dam	0.3	7.2	0.1	9.8	
Pullman	1.3	12.5	3.1	18.6	
Spokane	1.3	6.0	3.7	16.4	

Table 2: March snowfall statistics (in inches) for selected locations in WA State. The average number of measurable March snow events (greater than 1"), the greatest 1-day March snowfall total, the March snowfall climatology, and the greatest monthly March snowfall total is listed for each.

The likelihood of snow in March is higher in far eastern WA (i.e., Pullman, Spokane), as might be expected (Table 2). Another sanity check comes from examining the lowest minimum and lowest maximum temperature recorded as each site in March (Table 3). It can get

Station	Lowest Min. Temperature	Lowest Max. Temperature
SeaTac	11	29
Olympia	9	31
Hoquiam	22	36
Bellingham	10	26
Yakima	-1	23
Coulee Dam	0	16
Pullman	-4	17
Spokane	-10	13

Table 3: March maximum and minimum temperature statistics (Fahrenheit) for the same locations listed in Table 2. The lowest daily March minimum temperature and the lowest daily maximum temperature are listed for each.

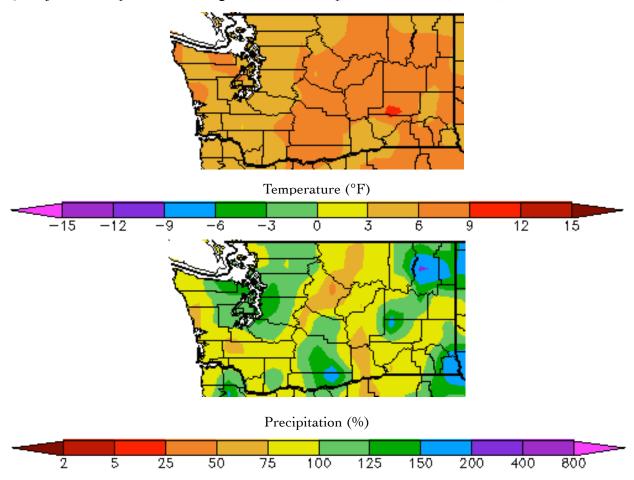
much colder on the east side during March. The lowest minimum and maximum temperatures for those stations are 15-20°F colder than stations west of the Cascade Mountains.

It bears mentioning that all the stats shown are for the entire historical record and so while these data can show what is possible, it is anticipated that cold-air outbreaks will gradually become less severe and frequent with time (to what extent and how fast is a prime directive of the climate community). Of course, these sorts of long-term trends will be modulated by interannual and multi-year fluctuations in wintry weather. You would be well advised to hang onto your skies and snowboards.

## **Climate Summary**

Similar to preceding months, mean temperatures were warmer than normal throughout the entire state. The magnitudes of the anomalies are quite remarkable, with the map from the High Plains Regional Climate Center showing parts of eastern WA between 6 and 9°F above normal. Wenatchee, for example, had a mean February temperature 8.5°F above normal (Table 4). The west side of the Cascade Mountains was warm as well, with mean temperatures generally between 4 and 7°F above normal (e.g., Quillayute, Hoquiam, and Bellingham were 6.4, 6.3, and 6.2°F above normal, respectively).

Total February precipitation amounts relative to climatological means were variable across the state with the eastern Olympic Peninsula, the Puget Sound, northeastern WA, and the south-eastern slopes of the Cascades all with normal to above normal precipitation (see map). SeaT-ac Airport, for example, received 151% of normal precipitation and Olympia received normal February precipitation. The remainder of the state had below normal precipitation, with both Quillayute and Ephrata receiving 80% of their respective normals (Table 4).



February temperature (°F) departure from normal (top) and February precipitation % of normal (bottom).

(High Plains Regional Climate Center (http://www.hprcc.unl.edu); relative to the 1981-2010 normal).

	Mean Temperature (°F)		Precip	oitation (	inches)	Snowfall (inches)			
	Avg	Norm	Departure from Normal	Total	Norm	% of Norm	Total	Norm	% of Norm
Western Washington									
Olympia	46.0	41.0	5.0	5.28	5.27	100	0	4.7	0
Seattle WFO	48.3	43.4	4.9	4.40	3.31	133	0	0.6	0
SeaTac AP	48.8	43.4	5.4	5.27	3.50	151	0	1.7	0
Quillayute	48.5	42.1	6.4	8.30	10.35	80	0	2.6	0
Hoquiam	50.0	43.7	6.3	***	7.21	M	0	0.8	0
Bellingham AP	47.0	40.8	6.2	2.48	3.02	82	0	2.4	0
Vancouver AP	47.8	43.5	4.3	4.07	4.03	101	0	M	-
Eastern Washington									
Spokane AP	39.2	33.0	6.2	1.04	1.33	78	1.1	6.8	
Wenatchee	43.3	34.8	8.5	0.90	0.81	111	M	4.4	-
Omak	40.2	31.8	8.4	1.00	1.30	77	M	M	-
Pullman AP	41.2	34.9	6.3	2.14	1.52	141	M	M	-
Ephrata	42.4	34.1	8.3	0.59	0.74	80	M	3.1	-
Pasco AP	43.0	38.9	4.1	0.54	0.86	63	0	M	-
Hanford	45.3	38.2	7.1	0.42	0.70	60	Т	2.3	0

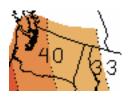
Table 4: February 2015 climate summaries for locations around Washington with a climate normal baseline of 1981-2010. Note that the Vancouver Pearson Airport and Seattle WFO 1981-2010 normals involved using surrounding stations in NCDC's new normal release, as records for these station began in 1998 and 1986, respectively. M denotes missing data. \*\*\*The Hoquiam rain gauge malfunctioned during a portion of the month so the monthly total reported is too low.

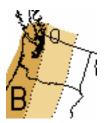
#### Climate Outlook

Neutral ENSO conditions still exist in the equatorial Pacific Ocean, according to the Climate Prediction Center (CPC): <a href="http://www.cpc.ncep.noaa.gov">http://www.cpc.ncep.noaa.gov</a>. The sea-surface temperatures (SSTs) averaged over the last 4 weeks as well as the last week are warmer than normal throughout the western equatorial Pacific Ocean and near-normal in the eastern Pacific. Models are still predicting about a 55% chance of a weak El Niño developing in the next two months, but then the probability of neutral conditions is about equal to those of an El Niño in the months that follow. The "El Niño Watch" that was initially released by the CPC in early March 2014 is still in effect.

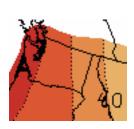
The Climate Prediction Center seasonal outlook for March is calling for a continuation of the warmer than normal temperatures statewide, with higher chances of warmer than normal temperatures in the western half of the state. The March precipitation outlook has greater chances of below normal precipitation for two-thirds of the state. The eastern one-third has equal chances of below, equal to, or above normal precipitation.

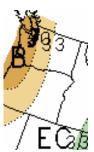
The spring (March-April-May; MAM) CPC outlook is very similar to the March outlook. There are higher chances of above normal temperatures statewide for the spring temperature outlook, showing higher chances of above normal temperatures in western WA. Precipitation is expected to be below normal for the western half of the state. Eastern WA has equal chances of below, equal to, or above normal precipitation.





March outlook for temperature (left) and precipitation (right) from the CPC.





March-April-May outlook for temperature (left) and precipitation (right) from the CPC.