Office of the Washington State Climatologist

April 6, 2016

March Event Summary

Mean March temperatures were warmer than normal and precipitation was above normal for the entire state. The amount of precipitation relative to normal was particularly high for areas of eastern WA, with parts of the lower Columbia Basin receiving over 300% of normal precipitation. Total precipitation amounts during March for six stations, mostly in eastern WA, that ranked in the top 5 wettest are indicated in Table 1. Ritzville, with a 101-year record, had its wettest March on record.

In this Issue

The month started off with an active weather pattern that brought substantial snow to the mountains. The lowlands received also plenty of rain, with Hoquiam (2.17") and Olympia (1.68") both recording daily maximum precipitation records for March 1. The wet pattern continued for most of the month, with the first half of the month being wetter than the second half, in general. SeaTac Airport, for example, recorded measurable rain (at least 0.01") for the first 14 days of the month. The most active weather for the month for western WA came as a back-to-back punch with two strong wind storms. The first occurred on the evening of the 9th into the 10th, and brought rain, wind, fallen trees, and power outages. Wind gusts were well into the 40s (mph) for western WA; a few examples of stronger gusts: Whidbey Island (64 mph), Bremerton (44 mph), Friday Harbor (50 mph), Hoquiam (61 mph), and Boeing Field (47 mph). Maximum calendar day rainfall records were set for the 9th at Hoquiam (2.53") and Wenatchee (0.51"), but heavy rain fell on the eastern slopes of the Cascades, particularly in Chelan county. The second wind storm, on the 13th,

Station	March Total Precipitation (in)	Rank	Record	Records Began
Ritzville	3.07	1	-	1916
Odessa	3.15	1	-	1903
Wenatchee Pangborn AP	2.29	2	2.34"/1983	1959
Yakima AP	1.82	4	2.63"/1957	1946
Spokane AP	3.30	4	4.56"/2012	1881
Hoquiam	13.25	5	15.13"/1997	1953

Table 1: Total March precipitation, the ranking (wettest to driest), and the period of record for selected WA sites.

brought even stronger winds across much of western WA. A tragic result was a fatality from a fallen tree in Seward Park, Seattle. More details on this storm can be found in Wolf Read's analysis of the synoptic situation and wind gusts, hosted on our webpage: http://www.climate.washington.edu/stormking/.

For eastern WA, March 21-22 was an active period in terms precipitation. Daily maximum rainfall records were set on the 22nd for Pullman (0.94") and Spokane Airport (0.70"), and tied at Walla Walla (0.40"). Light snow fell on the morning of the 28th in eastern WA, but the last few days of the month ended on a warm note with above normal temperatures statewide. For example, Olympia (75°F) and Bellingham (68°F) recorded daily record high temperatures on the 31st, offering an appreciated preview of the warmer weather ahead after a wet winter.

A Review of Winter 2015-16

A message from the State Climatologist

The winter summary reviewing the temperature and precipitation anomalies for WA will be posted on our website in the next few weeks. The summary will compare this winter to those in the recent past and examine the regional atmospheric circulation for this past winter compared to other strong El Niño years. It will be linked from our home page: www.climate.washington.edu, and notice will go out from our social media accounts.

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

Thank you, CoCoRaHS volunteers, for continuing to read your rain gauges daily throughout the soggy March! Your reports are extremely useful for us and our colleagues at the National Weather Service, TV stations, and National Center for Environmental Information, among others. Though our precipitation season is winding down, spring begins the time of more frequent precipitation for many other states. The national CoCoRaHS headquarters hosts an annual competition in March - dubbed CoCoRaHS "March Madness" - to see which state can recruit the most new volunteers. Arizona won the competition this year with 192 new observers. 1,083 new volunteers were added nationwide! We're always looking for new volunteers in WA, so please help spread the word about the program. And it's never too late to begin measurements. Sometimes folks sign up but then never get around to installing their rain gauge. With more sun around the state lately, it's a great time to finally get that rain gauge outside so that you're ready for rain when it inevitably returns.

Snowpack and Drought Update

Despite the warmer than normal temperatures during March, there were several periods of mountain snow that allowed the WA State snowpack to continue to build. As of April 1, the snowpack is normal to above normal throughout the state. Figure 1 shows the snow water equivalent (SWE) percent of normal averaged for each basin in WA as of April 1 from the Natural Resources Conservation Service. The Upper Columbia, Central Columbia, Lower Yakima, North Puget Sound, and Olympic basins all have above normal SWE, with values

ranging between 112 to 128% of normal. The remaining basins (Central Puget Sound, South Puget Sound, Lower Columbia, Upper Yakima, Lower Snake, and Spokane) are near-normal, with SWE between 95 an 109% of normal. April 1 is usually the date of peak snow, and these values indicate adequate water supply for the summer. The Yakima Basin Bureau of Reclamtion, for example, has released a March forecast for full water supply for both senior and junior water rights for the spring and summer irrigation season. The forecast will be updated monthly throughout the spring.

Continued precipitation and adequate snowpack has prompted continued improvements for the U.S. Drought Monitor in WA (Figure 2). There is no longer any drought depiction in the state, and there is remaining D0 - "abnormally dry" - in southeastern WA representing long-term precipitation deficits.

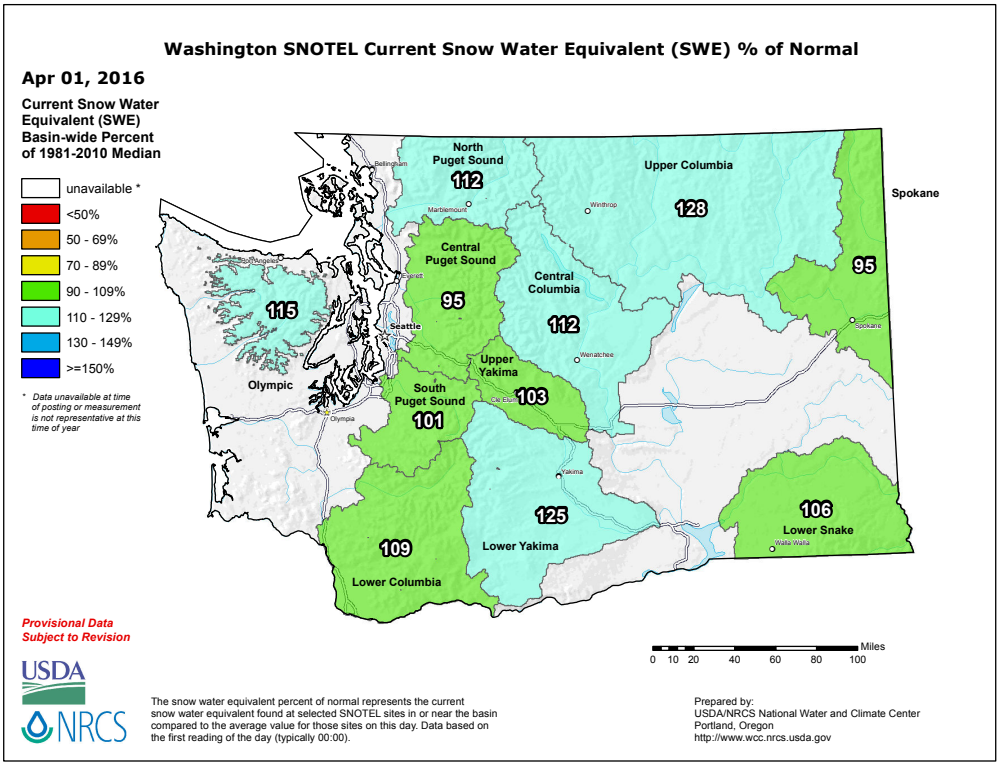


Figure 1: Snowpack (in terms of snow water equivalent) percent of normal for Washington as of April 1, 2016 (from the Natural Resources Conservation Service).

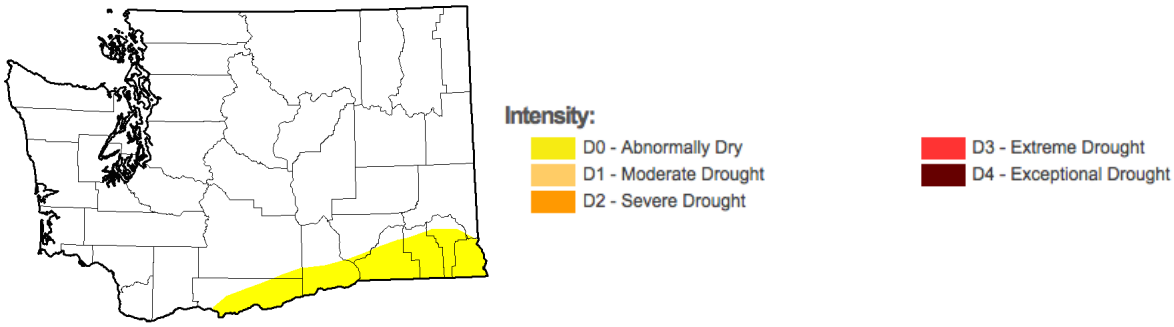
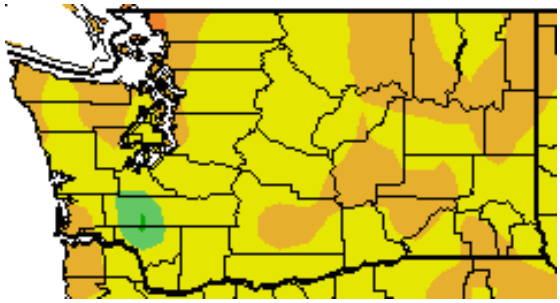


Figure 2: The March 29, 2016 edition of the US Drought Monitor (http://droughtmonitor.unl.edu/).

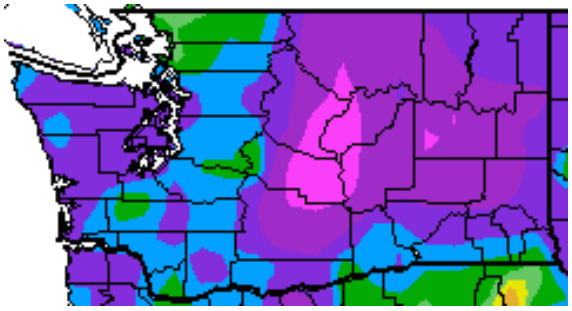
Climate Summary

Mean March temperatures were warmer than normal for a majority of the state. Most of the state was within 2°F of normal, according to the map from the High Plains Regional Climate Center. For example, Vancouver, Olympia, and Wenatchee were 1.0, 1.7, and 1.8°F above normal, respectively, for the month (Table 2). The central and northern Puget Sound, the northern Olympic Peninsula, and portions of northeastern WA had greater anomalies ranging from 2 to 4°F above normal. Bellingham was a warm spot, with average March temperatures 4.6°F above normal. East of the Cascades Mountains, Omak was the warm anomaly, with temperatures 3.3°F above normal. Note that the anomalously warm bull's eye shown in previous newsletters - resulting from bad data on the Peninsula - is now gone from the map, and the historical data from the site has been flagged.

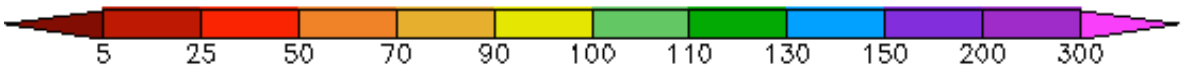
Total March precipitation was above normal for the entire state, with most of eastern WA receiving between 150 and 350% of normal. Wenatchee was a wet spot, receiving 358% of normal with a total of 2.29" for the month (Table 2). Spokane's 3.30" of March precipitation was 205% of normal, and was a result of frequent precipitation as opposed to a particularly heavy event. Western WA was wetter than usual as well, with most locations receiving between 130 and 200% of normal. Bellingham was less extreme in its monthly precipitation totals, receiving "only" 119% of normal (Table 2).



Temperature (°F)



Precipitation (%)



March temperature (°F) departure from normal (top) and precipitation % of normal (bottom). (High Plains Regional Climate Center; 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	46.2	44.5	1.7	8.51	5.29	161	0	0.7	0
Seattle WFO	49.4	46.6	2.8	5.22	3.51	149	0	0	0
SeaTac AP	49.4	46.5	2.9	5.52	3.72	148	0	0.8	0
Quillayute	47.7	44.1	3.6	15.84	10.83	146	0	0.7	0
Hoquiam	47.8	46.0	1.8	13.25	6.99	190	0	0	0
Bellingham AP	48.8	44.2	4.6	3.84	3.22	119	0	0.7	0
Vancouver AP	49.0	48.0	1.0	5.19	3.57	145	0	M	-
Eastern Washington									
Spokane AP	42.7	40.2	2.5	3.30	1.61	205	0.6	3.5	17
Wenatchee	45.9	44.1	1.8	2.29	0.64	358	M	1.0	-
Omak	44.8	41.5	3.3	2.66	1.19	224	M	M	-
Pullman AP	42.6	40.6	2.0	3.46	2.05	169	M	M	-
Ephrata	45.3	43.0	2.3	1.60	0.68	235	M	0.8	-
Pasco AP	47.7	46.3	1.4	1.18	0.79	149	0	M	-
Hanford	48.1	46.5	1.6	1.01	0.57	177	0	0.4	0

Table 2: March 2016 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.

Climate Outlook

El Niño conditions in the tropical Pacific Ocean are still present, according to the Climate Prediction Center (CPC). Sea surface temperature (SST) anomalies in most of the central and eastern tropical Pacific have decreased relative to normal since last newsletter and are now about 1.5°C. The "El Niño Advisory" released by the CPC over a year ago (5 March 2015) is still in effect, and the ENSO forecast models show the El Niño will continue to weaken through the spring. By the 3-month period of May through July, the chances of El Niño (~40%) finally drop below the chances of neutral conditions (~50%). Neutral conditions are most likely during summer, and La Niña development is slightly more likely than neutral conditions by next fall.

The CPC seasonal outlook for April is calling for increased chances of above normal temperatures for the entire state (and all of the Pacific Northwest). The outlook for April precipitation calls for increased chances below normal precipitation, with chances exceeding 50% on the three-tiered forecast system (so chances of above normal or near-normal precipitation for the month are at about 25% chance each).

The April-May-June (AMJ) CPC outlook is similar, calling for above normal temperatures and below normal precipitation. The chances of warmer than normal temperatures are high (at least a 60% chance on the three-tier system), while the probability of below normal precipitation is lower. The southeastern corner of WA State actually has equal chances of below, equal to, or above normal precipitation for April-June.

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

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