



Office of the Washington State Climatologist

February 8, 2010

January Warmth & Highlights

The average temperature for January 2010 for many locations in WA broke into the top ten warmest Januarys since records started being kept. The average January temperature at SeaTac Airport was 47.0°F, ranking as the warmest January on record since 1891 (includes when records were kept at the Federal Building downtown), and 6.1°F above the normal average January temperature. Bellingham's January average temperature (45.3°F) tied 1986 for the warmest January since records began in 1949. The average January temperature in Olympia (43.7°F), Quillayute (46.3°F), and Hoquiam (46.5°F) all ranked as the second warmest January since records began in 1948, 1966, and 1953, respectively. Eastern WA was also warmer than normal in January, and the average temperature in Walla Walla (41.6°F) ranked as the 6th warmest since 1949. Spokane (35.1°F) and Yakima (36.0°F) both ranked as the 8th warmest January since 1881 and 1946, respectively. Finally, the average January temperature in Wenatchee was 34.2°F, ranking as the 12th warmest since 1931.

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The warm weather in Washington resulted from a combination of factors. Moderate El Niño conditions are currently present in the tropical Pacific Ocean, which generally implies warmer temperatures in the Pacific Northwest. Looking at the SeaTac January temperature record, the average temperature during recent El Niño years (1958 through 2005) is 41.7°F, or 0.8°F above the normal of 40.9°F. This year's January average temperature at SeaTac, 47.0°F, greatly exceeded that, so El Niño is only part of the story. An important factor was a period of unique weather in the middle of the month. During this time, an anomalous low pressure center formed off the WA and OR coast (discussed further below). This system produced winds from the southeast, drawing warm air up from CA and producing warm, downslope winds along the Cascades. Furthermore, the global average temperature was among the warmest during January, and the overall warming of the climate is also playing a role in the local trend of warmer temperatures.

Besides the record warmth experienced in January, a low pressure system situated offshore and a high pressure system over WA on Jan 7 caused wind gusts up to 100 mph at some locations along the western Columbia Gorge. That low pressure system finally came onshore on Jan 11, and along with two subsequent systems, heavy rain fell over the Olympic

Peninsula that caused some minor flooding in the region. The heavy rain on the Peninsula also caused a mudslide on January 18 on Hurricane Ridge Road at the Olympic National Park, closing a 17-mile stretch of the road.

Besides contributing to the record January warmth in WA, the anomalous, persistent low pressure (combined with high astronomical tides) caused high sea levels throughout the Puget Sound and the coastal regions. Figure 1 (top) shows the composite mean of the sea level pressure from Jan 18 through Jan 23. The lowest pressure falls between 980 mb and 984 mb, right off the coast of WA. Figure 1 (bottom) shows the composite anomaly from Jan 15 to Jan 23 using the 1968-1996 normal. The low sea level pressure was a remarkable 24 mb lower than usual, hence providing less weight on the ocean and allowing the sea levels to rise. Pictures of the high tides can be seen on the Department of Ecology's website: http://www.ecy.wa.gov/climatechange/ipa_hightide.htm.

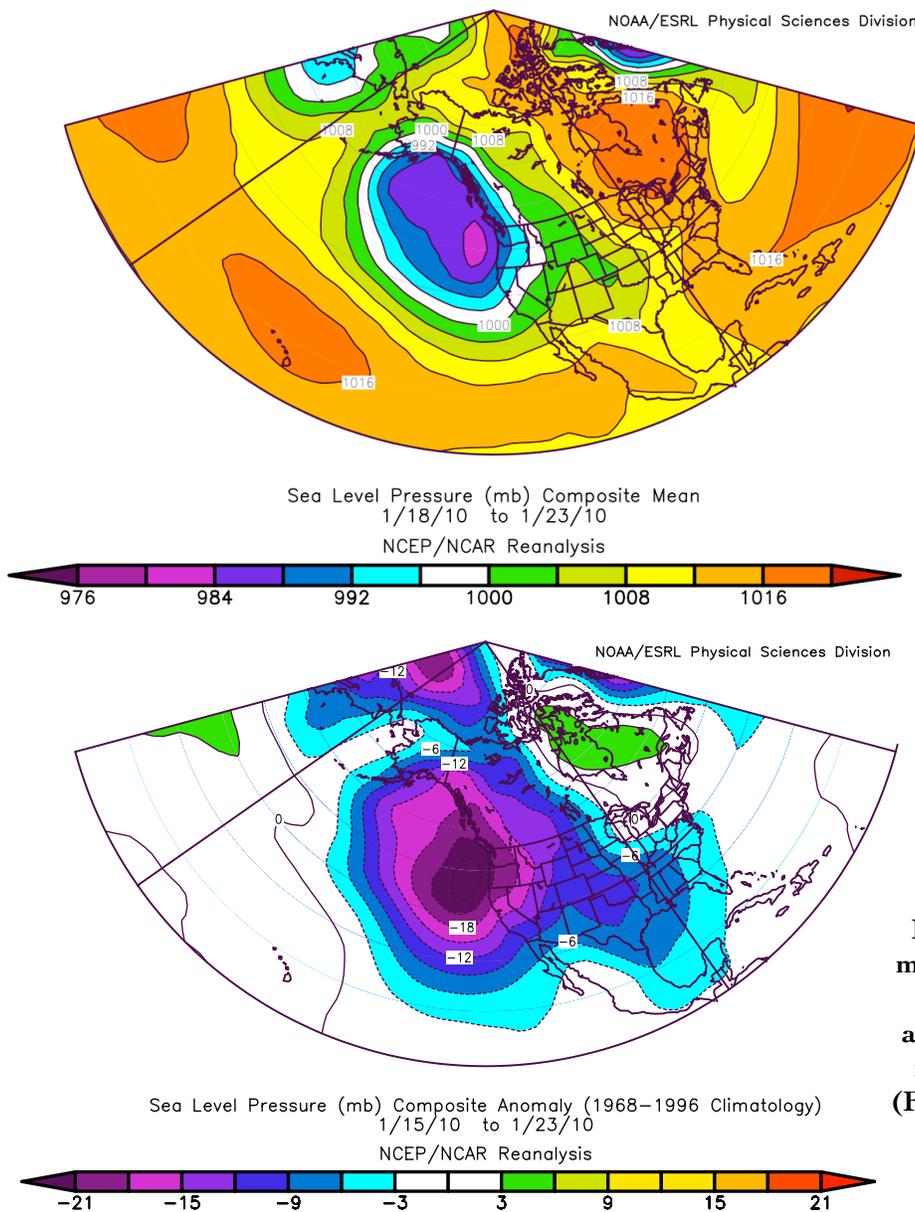


Figure 1: (Top) Composite mean of SLP from Jan 18-23 and (bottom) composite anomaly from Jan 15-23 using the 1968-1996 normal. (Figures produced by ESRL).

Snowpack Report

Even though precipitation was normal or above normal for a majority of the lower elevation sites in Washington, the mountains (with the exception of the Olympics) received below normal precipitation. The Olympic Mountains still have above normal snow water equivalent (114% of normal), but the rest of the state is below normal. A combination of the dry December and the dry January for the Cascades has put the snow water equivalent between 54 and 87% of normal for this time of year. The Climate Prediction Center's seasonal outlook does not look promising for catching up to normal.

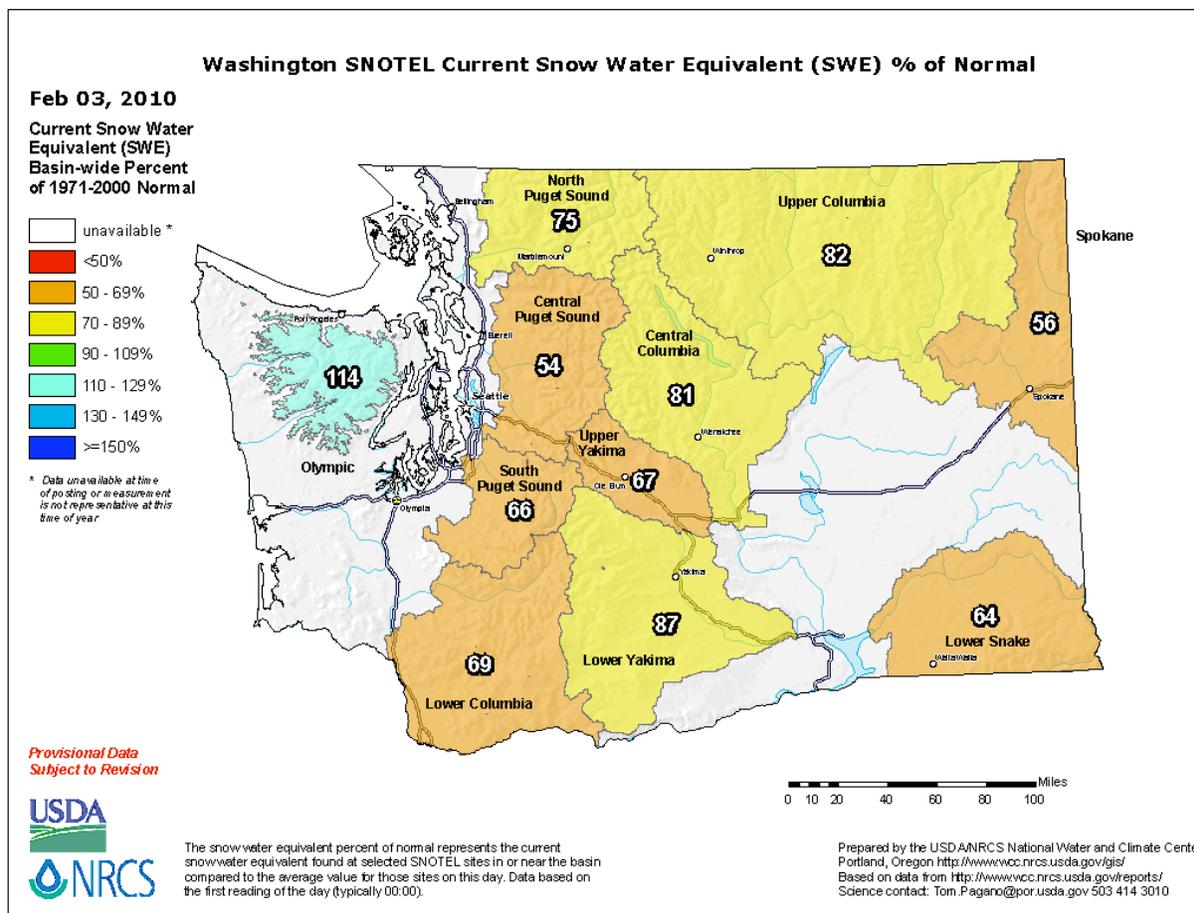


Figure 2: Snowpack (in terms of snow water equivalent) percent of normal for Washington as of February 3, 2010. Image is from the National Resources Conservation Service.

Webpage Updates

- The Mountain Snow Depth Plotting utility on our webpage had not been working properly for the 2009-2010 snow season (<http://www.climate.washington.edu/snowdepth/>), but it is now functional. The 2009-2010 snow depth values have been inputted, and now plotting is available for 11 sites.
- Our Fun Climate Facts page (<http://www.climate.washington.edu/facts.html>) has been updated to include new record confirmed by NCDC: the record for maximum snow depth in WA was observed on March 10, 1956 at Rainier Paradise. 367 inches of snow was on the ground.
- The 2010 water year precipitation at two sites near Howard Hanson Dam is continuing to be updated (<http://www.climate.washington.edu/events/2009howardhanson/>). The two sites reflect the state of affairs for most of the state: the mountain station (Cougar Mountain) has below normal precipitation for the water year, while the lower elevation station (Landsburg) has normal precipitation for the water year.

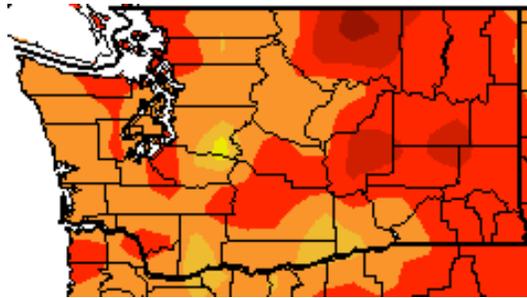
CoCoRaHS

Thank you, CoCoRaHS volunteers, for your participation! Please join me in welcoming Raleigh Chinn as our new local county coordinator for Okanogon county. He will serve as another contact for CoCoRaHS questions, as well as help to recruit more volunteers in Okanogon county. If you have friends or family that are interested in potentially joining CoCoRaHS, it may help to show them this informational video that has been linked to by the Western Regional Climate Center (http://blip.tv/play/hI1_gcLdNwA%2Em4v) and made by our CoCoRaHS partners in North Dakota. If you're interested in joining, then please sign up at www.cocorahs.org.

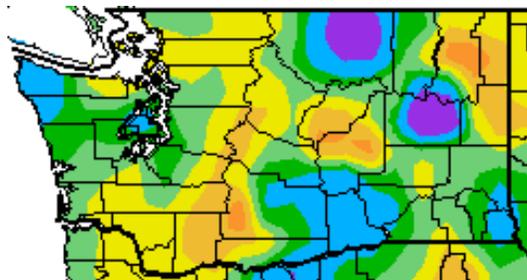
Climate Summary

Unlike December's below normal temperatures, January was warmer than normal for the entire state as illustrated by the maps below from the High Plains Regional Climate Center. The average temperature for January broke into the top ten warmest Januarys for many locations across the state, as discussed above. Most of the sites were 5 to 7°F above normal, but some cities in eastern WA were even warmer. Omak was an impressive 9.2°F above normal and Ephrata was 8.3°F above normal for January (Table 1).

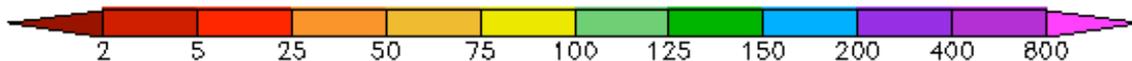
Precipitation, on the other hand, was mixed throughout the state. Much of the lowlands received normal precipitation (see Table 1) or above normal precipitation (i.e. Yakima, Quilayute, and Omak), but the Cascades and the northeastern mountains were below normal. There were some dry locations in the lowlands as well with Ephrata only receiving 59% of normal precipitation and Wentachee only 43% of normal.



Temperature (°F)



Precipitation (%)



(January temperature (°F) departure from normal (top) and January precipitation % of normal (bottom). Source: High Plains Regional Climate Center (<http://www.hprcc.unl.edu>).

	Mean Temperature (°F)			Precipitation (inches)			Snow (inches)		
	Avg	Norm	Departure from Normal	Total	Norm	% of Normal	Total	Norm	% of Normal
Western Washington									
Olympia	43.7	38.1	5.6	6.78	7.54	90	M	M	M
Seattle	46.1	40.8	5.3	6.28	4.49	140	0	M	M
Sea-Tac	47.0	40.9	6.1	6.17	5.13	120	0	2.4	0
Quillayute	46.4	40.7	5.7	22.54	13.65	165	M	M	M
Vancouver	46.7	39.0	7.7	6.54	5.81	113	M	M	M
Eastern Washington									
Spokane	35.1	27.3	7.8	1.54	1.82	85	1.4	12.5	11
Wenatchee	33.2	27.9	5.3	0.49	1.14	43	M	M	M
Omak	32.2	23.0	9.2	2.48	1.16	214	M	M	M
Ephrata	36.3	28.0	8.3	0.49	0.83	59	M	M	M
Pasco	39.0	33.9	5.1	1.46	1.05	139	0	1.9	0
Yakima	36.0	29.1	6.9	1.97	1.17	168	1.5	6.7	22

Table 1 - January Climate Summaries from around Washington from NWS (climate normal baseline is 1971-2000). M denotes missing data.

2009 in Review

From the National Climate Data Center's (NCDC) Climate-at-a-Glance, the mean temperature in 2009 averaged over the entire state of WA was 48.1°F. Therefore, 2009 was slightly below the 1971-2000 average of 48.27°F making the year's temperature right near-normal. For precipitation, however, the state was drier than normal. The averaged 2009 precipitation from the same source was 34.97 inches, below the 1971-2000 average of 38.78 inches. The graphs below from NCDC show the statewide average temperature and precipitation since 1895 (Figures 3 & 4). Table 2 shows the 2009 average temperature and total precipitation from a few locations around the state. The values show that the average annual temperature was very close to normal, and the total precipitation was also close to normal for these particular locations.

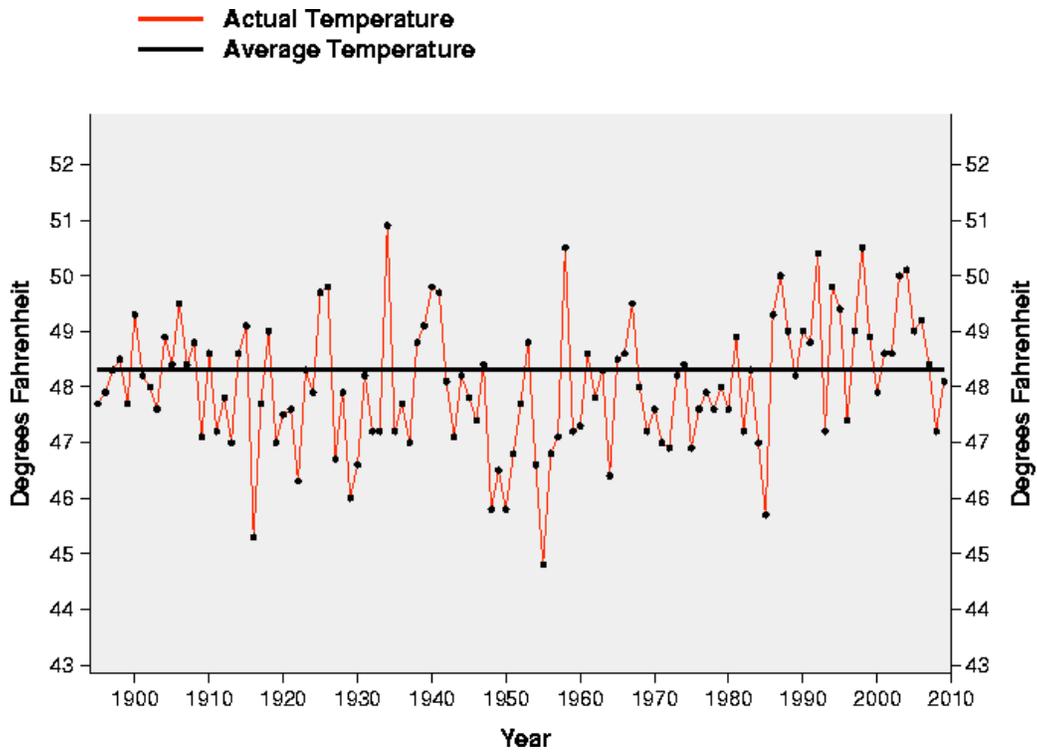


Figure 3: Average annual temperature for WA from 1895 through 2009 from NCDC. The 1971-2000 normal is plotted.

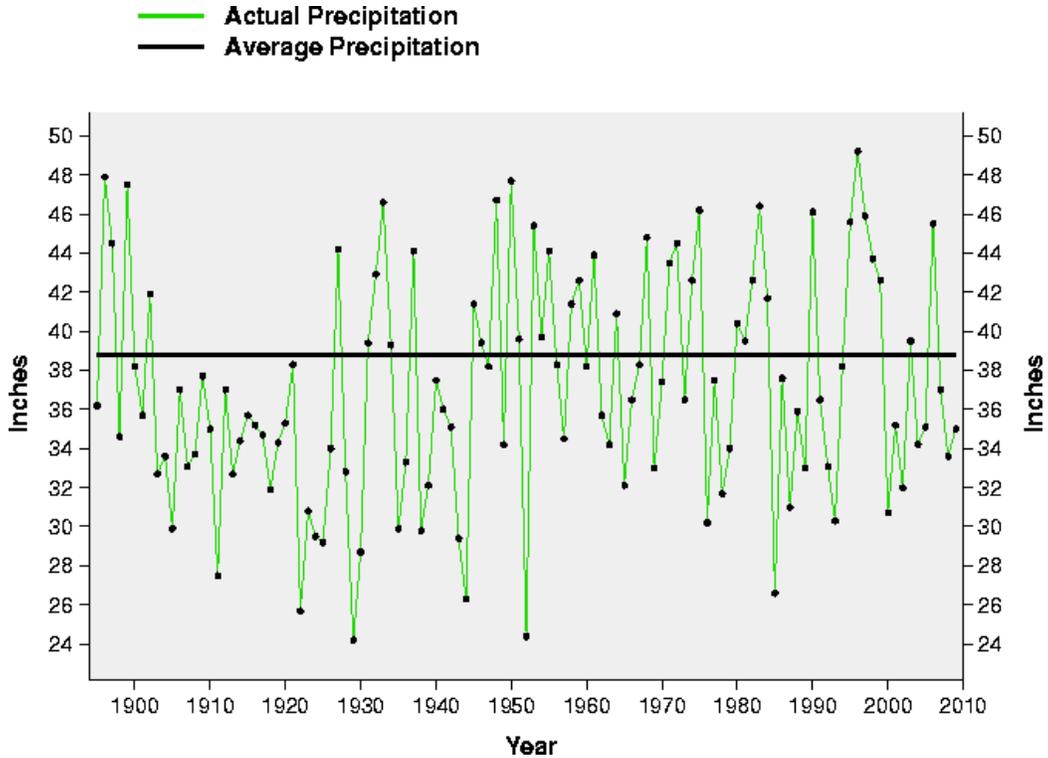


Figure 4: Same as Figure 3, but for precipitation.

Station	Temperature			Precipitation		
	Average	Normal	Departure from Normal	Total	Normal	% of Normal
Olympia	49.6	49.6	0	47.80	50.79	94
SeaTac AP	52.1	52.3	-0.2	38.44	37.07	104
Spokane	47.1	46.3	0.8	15.66	16.39	96

Table 2: 2009 average temperature and total precipitation for three locations in WA.

To summarize 2009:

January: In general, January temperatures were near normal throughout the state, and precipitation was above normal in the western half of the state (a majority from the early month heavy rain event) and below normal in the eastern half. Warm temperatures and heavy precipitation in early January (5th through the 8th) caused extreme flooding in western WA. Damage from the flooding was estimated at \$96 million in the areas affected. This event is also what alerted the Army Corps. of Engineers that there was a problem with the Howard Hanson Dam on the Green River.

February: In general, temperatures were about 2°F below normal for a majority of the state, and precipitation was much below normal (most of western WA and the northern Cascades were only between 25 and 50% of normal). The lack of snowpack caused drought concerns in the north central Cascades.

March: March was cool, with temperatures about 2 to 5°F below normal. Precipitation was near normal in western WA, causing a late season surge in snowpack, but not enough to make up for the earlier deficit. Precipitation in the Blue Mountains and the southeast was much above normal, bringing the snowpack in that area to normal, however.

April: It was generally cool around the state, with temperature departures from normal about 1.5°F. Typical of spring, there were some unseasonably warm temperatures throughout the month and the state, and also some cooler temperatures reminiscent of winter. Precipitation was below normal for the most part, and it was especially dry in central WA. Some restrictions on junior water users started in April in the areas of lower than normal snowpack.

May: The temperatures for a majority of the state in May were near-normal ($\pm 1^\circ\text{F}$). This was in part due to the contrasting conditions between the beginning and end of the month. May started off cool and wet, and most of western WA got its normal May precipitation in just a few storms. The second half of the month was warm and very dry, however, and May 20th marked the first day of an extended dry spell in parts of western WA. Parts of eastern WA were dry in May (i.e., Spokane, Ephrata) but other parts were just as wet as western WA (i.e., Yakima, Omak).

June: The dry spell continued in western WA, and unseasonably warm temperatures into the lower 90's were recorded in the beginning of the month. The entire state had above normal temperatures for June, and a majority of the state was drier than normal. Spokane, Pullman, and parts of eastern Yakima county were the exceptions, and actually received normal precipitation for the month.

July: Hot and dry was the theme for July, as high temperatures broke the all-time temperature records in western WA and the state was drier than normal. The dry conditions worsened the drought in north central WA, and low streamflows were experienced throughout much of the state.

August: Temperatures were back near normal in western WA in August, but the central part of the state and parts of eastern WA experienced warmer than normal temperatures. The dryness in July continued, however, and a majority of the state (except the southeastern portion) was much drier than normal. Water regulations continued in north central WA, and there were also a few impacts reported on the Olympic Peninsula from the lack of snowpack and continued summer dryness.

September: Temperatures were warmer than normal for the entire state in September, but there were finally some storms that moved into the state to partially relieve the dry summer conditions. Overall, eastern WA was still very dry for September and the precipitation still wasn't enough to make up the deficit, so the United States Drought Monitor downgraded the entire state to at least abnormally dry by the end of September.

October: In general, October was cooler and wetter than normal, finally shifting from the summer conditions. Drought-like conditions were alleviated in some areas, and it was a nice start to a new water year. The El Niño conditions were well-established in the tropical Pacific by this time of the year, and predictions for a warmer and drier winter were being made.

November: Total precipitation for the month in western WA broke into the top ten wettest Novembers, and the precipitation started the snowpack in the Olympics and the Cascades off to a good start. Precipitation in eastern WA was below normal, and that was also reflected in the snowpack. The temperatures were also above normal for the entire state.

December: A cold snap in the beginning of the month resulted in a cold and dry December on average. Daily low temperatures records were also broken around the state with the cold spell. The snowpack wasn't able to build and keep up with the normal due to the dry conditions.

For more information on any of these months, please see the individual newsletters.

Climate Outlook

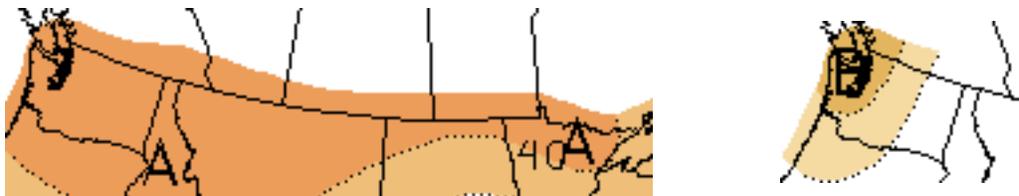
The El Niño conditions have persisted in the tropical Pacific Ocean as the most recent 4-week equatorial sea-surface temperature (SST) anomalies are between 1 and 2°C. The Climate Prediction Center (<http://www.cpc.noaa.gov/products/precip/CWlink/MJO/enso.shtml>), forecasts that the El Niño will last through spring. This situation provides some skill in predicting the winter season in the Pacific Northwest and much of North America. On average, winters during El Niño years are warmer and drier than typical conditions for WA state. This is not always the case, however, as some El Niño winters have been near normal, or cooler and wetter than average. Consequently, the seasonal prediction should be interpreted as a tilting of the odds towards a warm, dry winter.

The February-March-April (FMA) outlook has the chances of above normal temperatures exceeding 50% for a majority of the state. Parts of the Olympic Peninsula exceeds a 40% chance for above normal temperatures. There is at least a 40% chance of below normal precipitation for most of the state.

The outlook for March-April-May (MAM) calls for at least a 40% chance of above normal temperatures for the entire state. The precipitation outlook calls for at least a 40% chance of below normal precipitation for the Olympic Peninsula and the Puget Sound area, and at least a 33% chance of below normal precipitation through the Cascades and central Washington. There are equal chances of below, equal to, or above normal precipitation in eastern WA for MAM.



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



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