Office of the Washington State Climatologist

December 5, 2011

November Event Summary

In an overall sense, Washington State experienced cool and dry conditions during November. Precipitation amounts were especially low across much of the eastern portion of the state. The weather in Fall tends to be wet during La Niña (a weak-moderate event is in progress) but that this fall is turning out to be on the dry side is not without precedent. The winter snowpack in the mountains did get off to a good start. More details on the weather events that occurred in November are included below.

In this Issue

The first week of the month started out with chilly temperatures and precipitation mostly in the form of scattered showers around the state. Temperatures warmed to above normal on the 9th and 10th before a strong cold front moved in on the 11th. Rain, with snow in the mountains, and strong winds on the coast and near the Strait of Juan de Fuca were associated with that front. There were even some localized reports of hail and lightning strikes on evening of the 11th. Veteran's Day weekend was wet, with some snow measured in Spokane County and northeastern WA. Another system brought heavy snow in the mountains, snow throughout most of eastern WA, and considerable rain to western WA lowlands on the 16th. Yakima recorded a new daily maximum snowfall record on the 16th with 1.3 inches. A colder weather pattern followed with the potential for a bit of western WA lowland snow on the 18th, but only some locations reported snowfall. Cool conditions persisted for a couple of days with the Seattle Weather Forecast Office (WFO) setting a record low on the 20th with a temperature of 29°F.

Probably the most interesting weather of the month, however, came on the 21st as a very warm and moist air mass moved over WA. Several systems impacted WA the 21st through Thanksgiving, producing heavy rain, high winds, and flooding. Record daily maximum precipitation records were set at SeaTac Airport (1.76"), Seattle WFO (1.84"), and Hoquiam (2.68") on the 22nd. Peak winds for the 21st into the 22nd for western WA were impressive; some examples include 41 mph in Olympia, 55 mph in Hoquiam, 70 mph in Bellingham, and 83 mph at Crystal Mountain. Flood conditions were also reported in western WA for the series of storms. For example, the Stillaguamish River (Snohomish), Skokomish River (Mason), Puyallup River (Pierce), Newaukum River (Lewis), Deschutes River (Thurston), and Chehalis River (Lewis & Thurston) all reached flood level.

Another fairly wet and warm system moved through on the 27th. Record high temperatures were recorded at Seattle WFO (53°F; tied), SeaTac Airport (56°F; tied), and Bellingham (60°F) on the 27th. Compared to the stormy week of Thanksgiving, the weather at the end of the month was docile as a high pressure started to build over the region.

CoCoRaHS

Thank you, CoCoRaHS observers, for your critical observations during November. As usual, the input provided by CoCoRaHS was highly valuable during the heavy rainfall west of the Cascades and snowfall east of the Cascades during the week of Thanksgiving. Figure 1 shows impressive CoCoRaHS precipitation observations on the morning of the 23rd for the previous 24-hours for one of the wet systems that moved through the week of Thanksgiving. All of the precipitation shown on this map fell as rain. To learn more about CoCoRaHS, visit www.cocorahs.org or email wash.cocorahs@gmail.com.

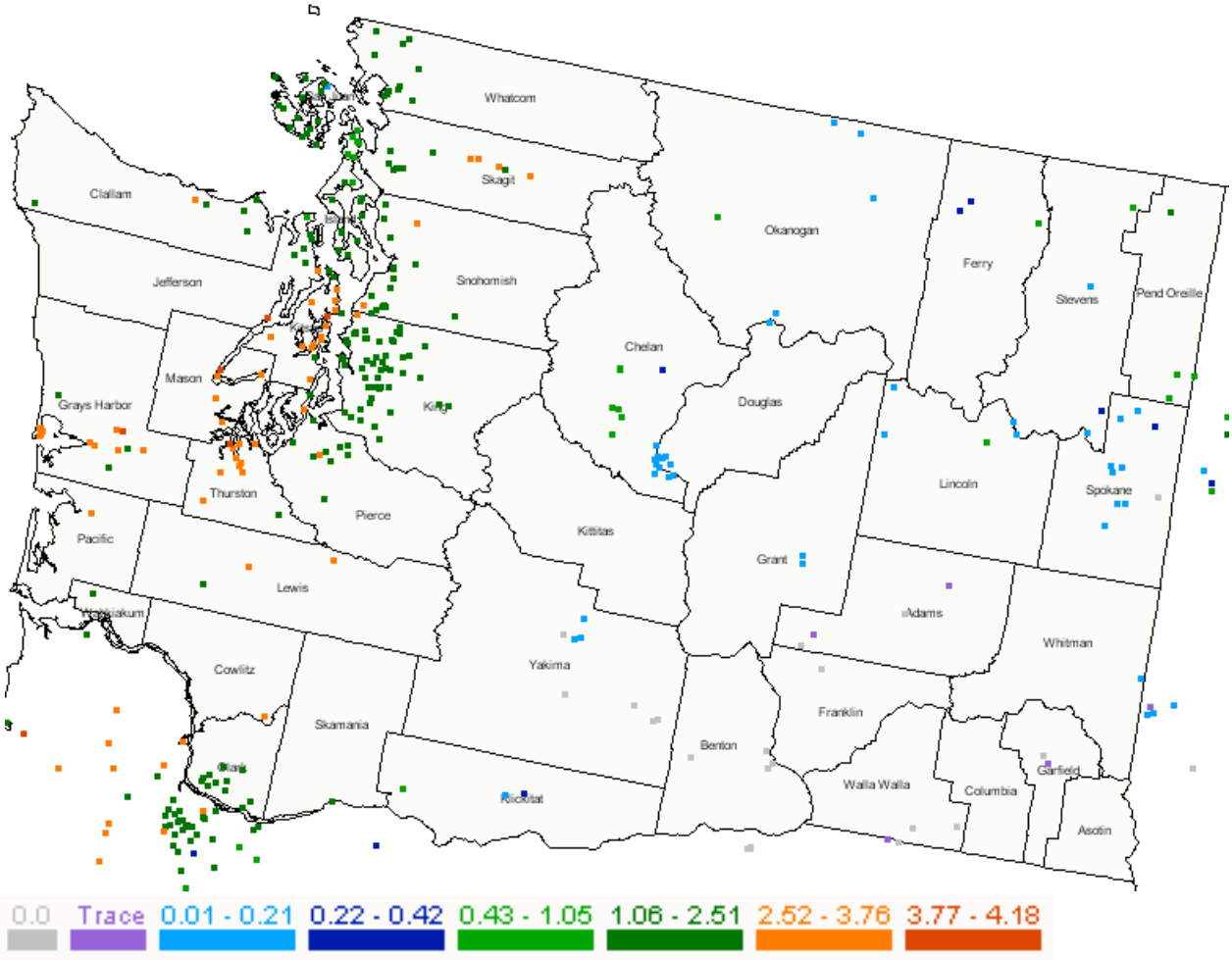


Figure 1: 24-hour precipitation measurements ending around 7 am on November 23 from the CoCoRaHS network.

What is the Chance of a White Christmas?

A message from the State Climatologist

Many WA residents feel the same as Bing Crosby (born in Tacoma and raised in Spokane) and dream of a white Christmas. Others are not so keen on the idea, with memories of the treacherous streets and roads across most of Washington State during the holiday season of 2008. Here we take a look back at the record and see just how often we get to delight in, or suffer through, snow on Christmas.

There are two ways to define a snowy day. Arguably, a snowy day must include actual snow falling, but conceivably, measurable snow on the ground is what actually matters. In the colder parts of the state snow on the ground often persists over long periods, and just because there is the ammunition for a snowball fight, from some perspectives that is not enough to make it a snowy day. On the other hand, especially in the lowlands west of the Cascades, it often snows at temperatures slightly above freezing and while lovely to watch, the snow does not accumulate and cause the attendant joy and angst. This is a matter of dictum on which OWSC is not inclined to make a stand. Instead, we will examine the data from both perspectives. Specifically, for 12 cities around the state we have considered daily weather summaries going back to 1950 and computed the frequency of years for which snowfall was recorded on either 24 or 25 December, and separately the frequency of years for which a snowdepth of 1 inch or greater was recorded on 25 December.

The results of this exercise are summarized in Fig. 2. As expected, the prospects of a white Christmas are higher in the eastern part of the state, especially in Spokane and Omak, along with places like Wenatchee and Yakima in the foothills of the east slopes of the Cascades. It is a bit surprising how low the numbers turned out for Vancouver, and that Hoquiam has been completely shut out. It is possible that the cold-air outbreaks at Christmas time for the Pacific Northwest have brought more freezing rain than snow to Vancouver, but further analysis is beyond our present scope. It is also noted that snow can certainly fall at the Washington coast; at that time of year for Hoquiam the overall frequency of snow on the ground, and snowfall is 4% and 6%, respectively, with slightly higher odds farther north at Quillayute. It just has not happened to occur right on Christmas Day for Hoquiam in its record extending back to 1953.

A weak-moderate La Niña is occurring this winter, which tilts the odds in favor of wetter and cooler weather in Washington. This also generally means a better chance of low elevation snowfall, but the timing of these events within the winter season is basically random. This randomness due to the "noise" in the daily to weekly weather, along with the small number of La Niña events in the historical record, hampers statistical analysis. Essentially, the statistics of snow on Christmas Day in La Niña years lack sufficient robustness to be meaningful. Recent La Niña winters have been accompanied by both snowy (e.g., 2008) and unremarkable (e.g., 2010) weather at Christmas time. We will just have to wait to see how the upcoming holiday season plays out.

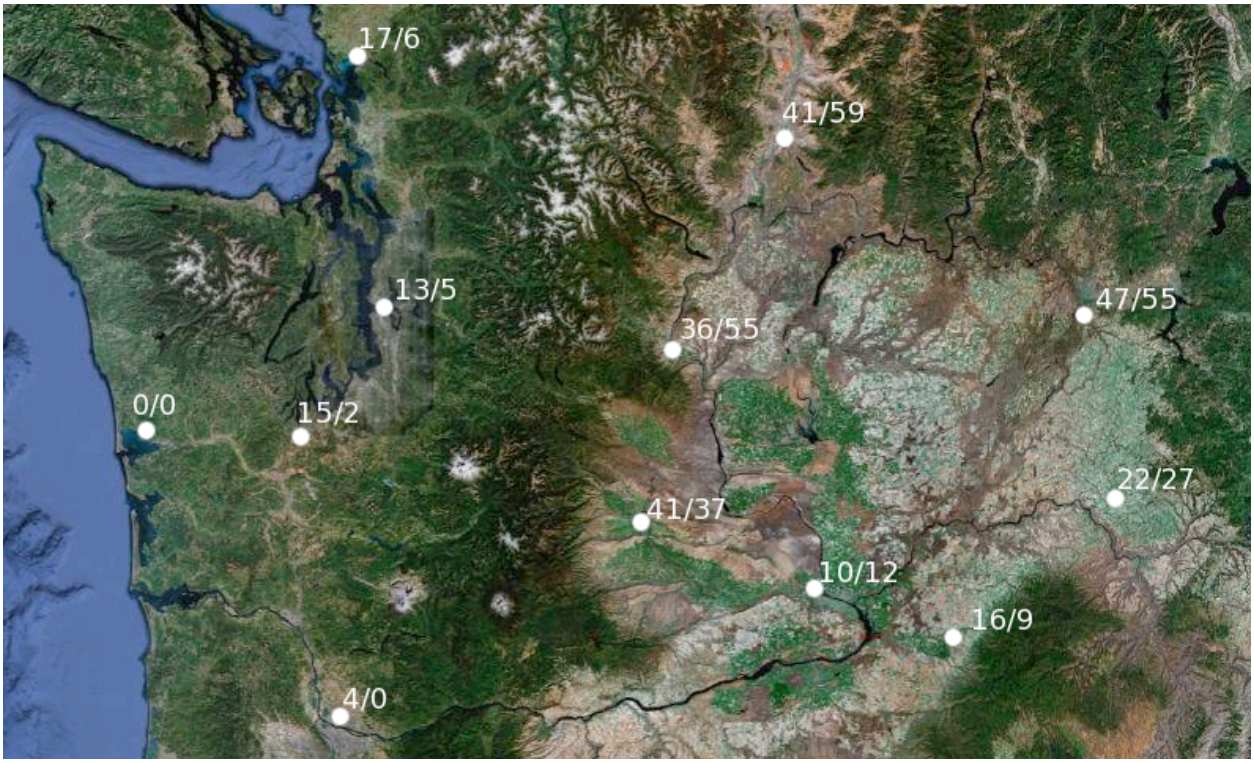


Figure 2: The probability of snow falling on Christmas Eve or Christmas Day (first number) and the probability of snow on the ground on Christmas Day (second number) for 12 WA cities: Hoquiam, Olympia, Vancouver, Seattle, Bellingham, Omak, Wenatchee, Yakima, Richland, Walla Walla, Pullman, and Spokane. The data are from the airport sites spanning 1950 to 2010.

Snowpack

Despite the drier than normal conditions throughout much of the state during November, snowpack was still able to get a great start in the mountains. Figure 3 shows the snow water equivalent percent of normal as of December 2. The Central Puget Sound, North Puget Sound, Upper Yakima, Olympic, South Puget Sound, and Lower Yakima basins all have above normal snow water equivalent, ranging from 116-179% of normal. The Lower Columbia, Central Columbia, Upper Columbia, and Spokane basins are all close to normal. The Lower Snake basin, encompassing the Blue Mountains, is the only basin with below normal snowpack at this point, with 84% of normal.

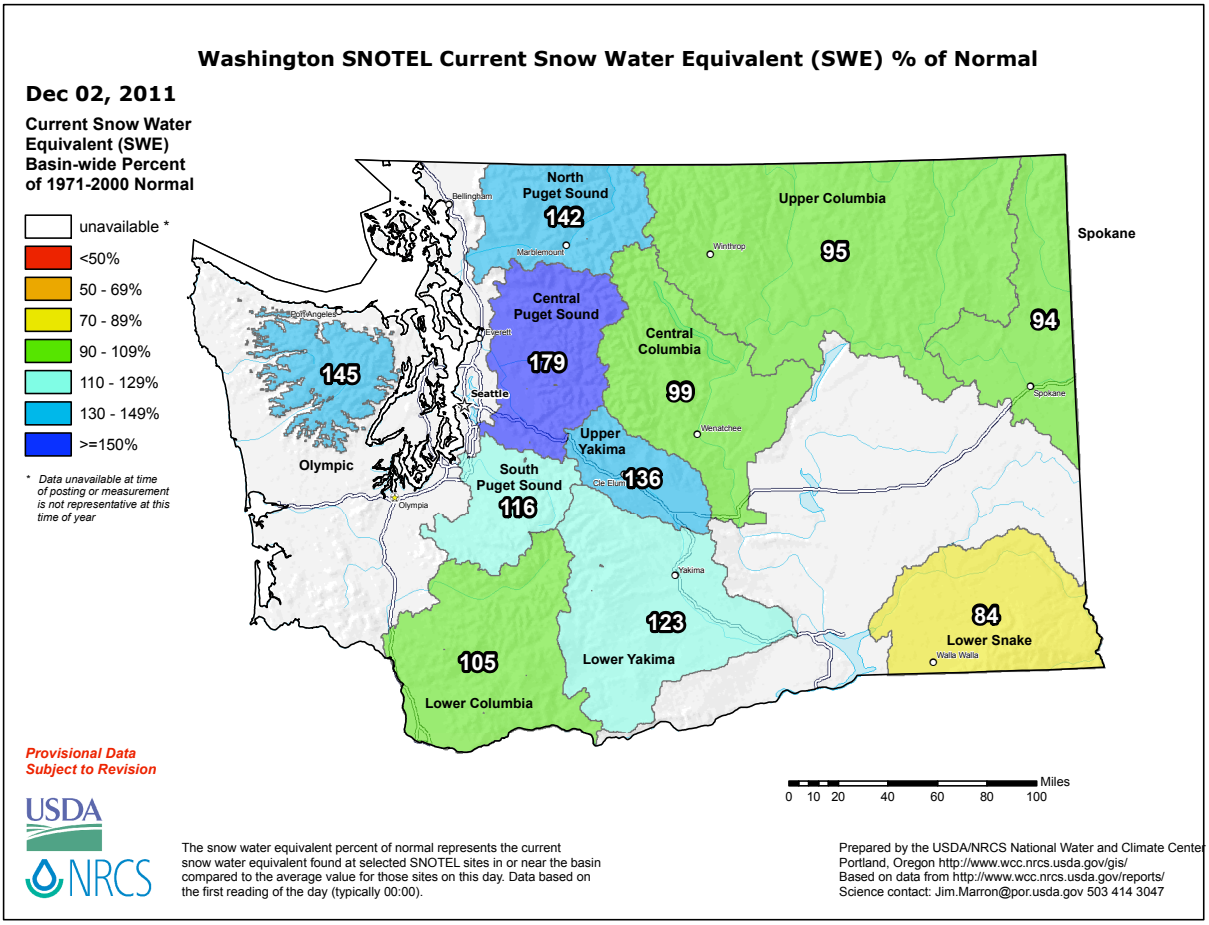


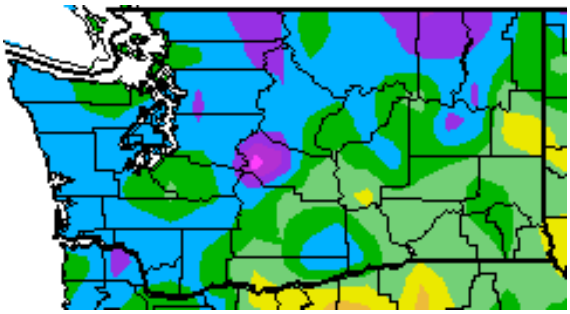
Figure 3: Snowpack (in terms of snow water equivalent) percent of normal for Washington as of December 2, 2011. Image is from the National Resource Conservation Service.

Climate Summary

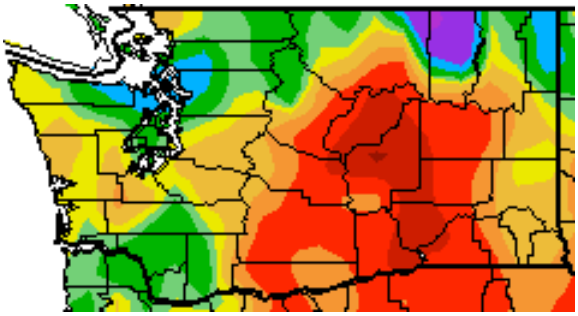
Average November temperatures were below normal for most of the state, with some areas in the Cascades and northeastern WA exceeding 3°F below normal. Omak and Pasco, for example, were both 4°F cooler than normal (Table 1). Otherwise, much of the state was between 2 and 3°F below normal. Temperatures in parts of southeastern WA were closer to normal with temperatures within 1°F of normal (e.g, Pullman and Spokane were 0.4 and 0.6°F below normal, respectively).

Total November precipitation was much below normal in much of central and eastern WA. Pasco, Wenatchee, Omak, and Yakima only received 17, 23, 34, and 46% of normal precipitation, respectively (Table 1). Drier than normal conditions also prevailed through the central Cascades, southern Puget Sound, the Spokane and Pullman area, and parts of the Olympic Peninsula. The areas received about 70 to 80% of their normal November

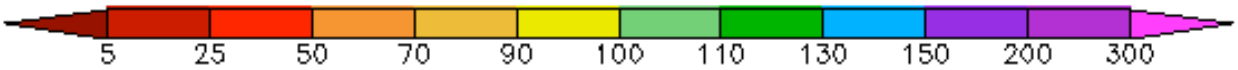
precipitation. Climatologically, November is the wettest month west of the Cascades (December tends to be wetter east of the mountains) so this lack in precipitation is substantial. On the other hand, the northern region of the state had above normal November precipitation (110-150% of normal) as well as the southwestern region of the state (e.g., Vancouver with 113% of normal).



Temperature (°F)



Precipitation (%)



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

	Mean Temperature (°F)			Precipitation (inches)			Snowfall (inches)		
	Avg	Norm	Departure from Normal	Total	Norm	% of Norm	Total	Norm	% of Norm
Western Washington									
Olympia	40.5	43.3	-2.8	8.78*	8.63	102*	0.2	0.9	22
Seattle WFO	44.1	46.2	-2.1	6.14	5.84	105	0	0.3	0
Sea-Tac	43.0	45.4	-2.4	5.16	6.57	79	T	1.2	0
Quillayute	42.1	44.2	-2.1	14.54	15.52	94	0	1.4	0
Bellingham AP	41.8	43.2	-1.4	4.49	5.80	77	M	0.9	M
Vancouver	44.9	46.4	-1.5	6.68	5.91	113	M	M	M
Eastern Washington									
Spokane AP	35.1	35.7	-0.6	1.73	2.30	75	6.6	7.4	89
Wenatchee	35.9	37.6	-1.7	0.26	1.11	23	M	5.0	M
Omak	31.9	35.9	-4.0	0.62	1.81	34	M	M	M
Pullman	36.6	37.0	-0.4	1.74	2.29	76	M	M	M
Ephrata	35.5	37.0	-1.5	0.11	1.06	10	M	2.6	M
Pasco AP	39.0	43.0	-4.0	0.17	1.00	17	0	M	M
Yakima AP	35.9	37.4	-1.5	0.48	1.05	46	4.2	3.6	117

Table 1 - November climate summaries for locations around Washington with a climate normal baseline of 1981-2010. Note that the Vancouver Pearson Airport 1981-2010 normal involved using surrounding stations in NCDC's new normal release, as records for this station began in 1998. *Olympia is missing several hours of precipitation data on the 21st and 22nd, both rainy days, so these totals are slight underestimates.

Climate Outlook

Weak-to-moderate La Niña conditions are present in the equatorial Pacific Ocean. Most of the eastern equatorial Pacific has had sea-surface temperature (SST) anomalies at least 0.5°C below normal during the last 4 weeks, according to the Climate Prediction Center (http://www.cpc.noaa.gov/products/precip/CWlink/MJO/enso.shtml; CPC). Figure 4 shows the SST anomalies in the Pacific Ocean for the last 4 weeks. The consensus among ENSO forecast models is for a continuation of weak-to-moderate La Niña conditions through the winter season.

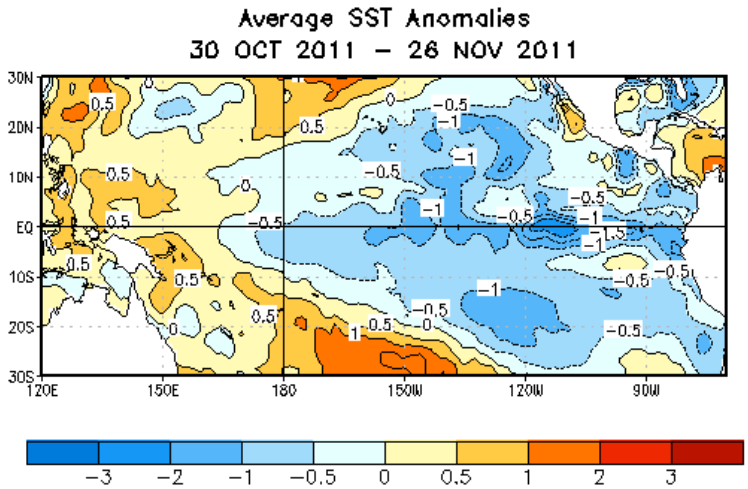
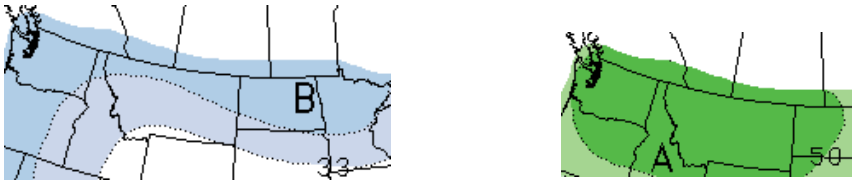


Figure 4: Average SST anomalies for the last 4 weeks (from CPC).

The December CPC temperature outlook calls for cooler than normal conditions statewide, with chances exceeding 40% on the three-class system. The CPC outlook indicates increased odds of higher than normal precipitation. This projection, however, was prepared in mid-November; recent weather and climate model simulations feature a dry weather pattern for the state for the first half of December.

The CPC 3-month seasonal outlook for December-January-February (DJF) calls for at least a 40% chance of below normal temperatures for the entire state. The winter precipitation outlook indicates increased chances of above normal precipitation for the whole state (exceeding 50% on the three-class outlook).

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



December-January-February outlook for temperature (left) and precipitation (right) from the CPC.