



Office of the Washington State Climatologist

December 3, 2009

November Precipitation Records

Western WA was extremely wet this November, and some monthly records were broken. Table 1 shows the precipitation amount received this November, the ranking, and the record wettest November for 4 locations in western WA. November 2009 ranked as the second wettest November in Quillayute and Hoquiam, the 4th wettest November at the Seattle Weather Forecasting Office (WFO), and the 10th wettest November at SeaTac Airport (AP).

November 2009 also ranks high among all months at Quillayute and Hoquiam. With all 12 months considered, November 2009 still ranks as the 4th wettest month at Quillayute (1st: November 1983; 29.14 inches) and the 6th wettest month at Hoquiam (1st: January 2006; 23.46 inches).

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Station	November 2009 Precipitation (in)	Rank	Record Wettest November (in)
Quillayute	26.55	2	29.14; 1983
Hoquiam	18.93	2	21.17; 2006
SeaTac AP	8.96	10	15.63; 2006
Seattle WFO	8.53	4	11.56; 2006

Table 1: Monthly precipitation received this November at 4 western WA locations, the rank of 2009 compared to other Novembers, and the record wettest November year and precipitation amount (in inches).

November Weather Highlights

Very strong winds were measured as several strong cold fronts moved through the state. For example, on November 17, a strong front produced maximum gusts around western WA: 70 mph at Hoquiam Airport; 58 mph at Bellingham Airport; 46 mph at Quillayute and Everett; 38 mph at Shelton and Tacoma; 36 mph at Olympia and SeaTac Airport. In the mountains, gusts of 115 mph were reported at Crystal Mountain and 88 mph at Mount Baker. High peak

winds were again recorded on November 18, with winds ranging from 32 to 61 mph at low-land stations.

The series of storms during November brought heavy rain and caused flooding in western WA. The Skokomish River near Potlatch (Mason county) reached flood stage a few times in the second half of November, and other rivers flooded as well (i.e. Puyallup River near Orting, Willapa River near Willapa, Satsop River near Satsop, Naches River near Cliffdel, Stillaguamish River near Arlington, Bogachiel River near La Push, and the Dungeness River near Sequim).

Eastern and central WA, however, were very dry for November (see the Climate Summary section for more information). Some snow did fall, and Spokane received 3.2 inches of snow on Nov 22, tying the previous daily record set in 1946. Figure 1 shows the new snow measured on the morning of November 14 from CoCoRaHS observers. A trace to 2.5 inches of snow was measured in Chelan county, about an inch of snow in Spokane, and up to 3.8 inches in Stevens county.

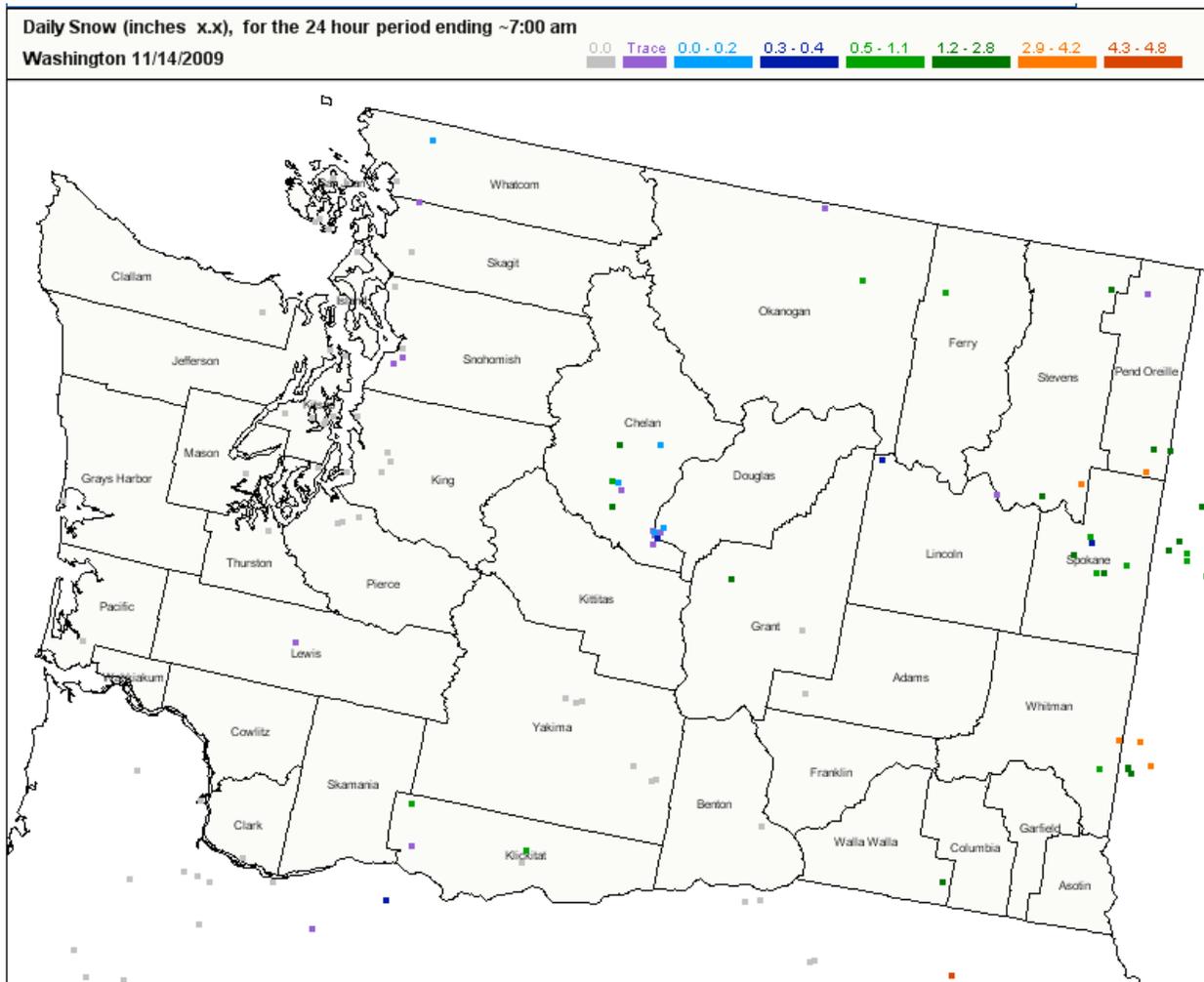


Figure 1: New snow measured on the morning of November 14 by CoCoRaHS observers.

Howard Hanson Dam Update

Despite the heavy rain that fell during November, flooding was not an issue on the Green River. In fact, water did not need to be stored at the reservoir at all. The predominant air-flow that brought western WA storms in November was southwesterly, and westerly flow is needed to get a heavy rain event at the Howard Hanson Dam. The Green River is often shielded from heavy rain during southwesterly flow events by the rain shadow of Mt. Rainier and other high mountains.

OWSC is still monitoring the situation, however, and Figure 2 shows that the accumulated precipitation at Cougar Mountain (upstream of the Dam) is right at the 30-year normal. This plot, and the accumulated precipitation at another nearby location, is updated frequently and can be found here: <http://www.climate.washington.edu/events/2009howardhanson/>. Thankfully, the Army Corps. of Engineers has downgraded the risk of flooding in the Green River Valley to a 1 in 25 chance from a 1 in 4 chance due to the success of the temporary dam fixes.

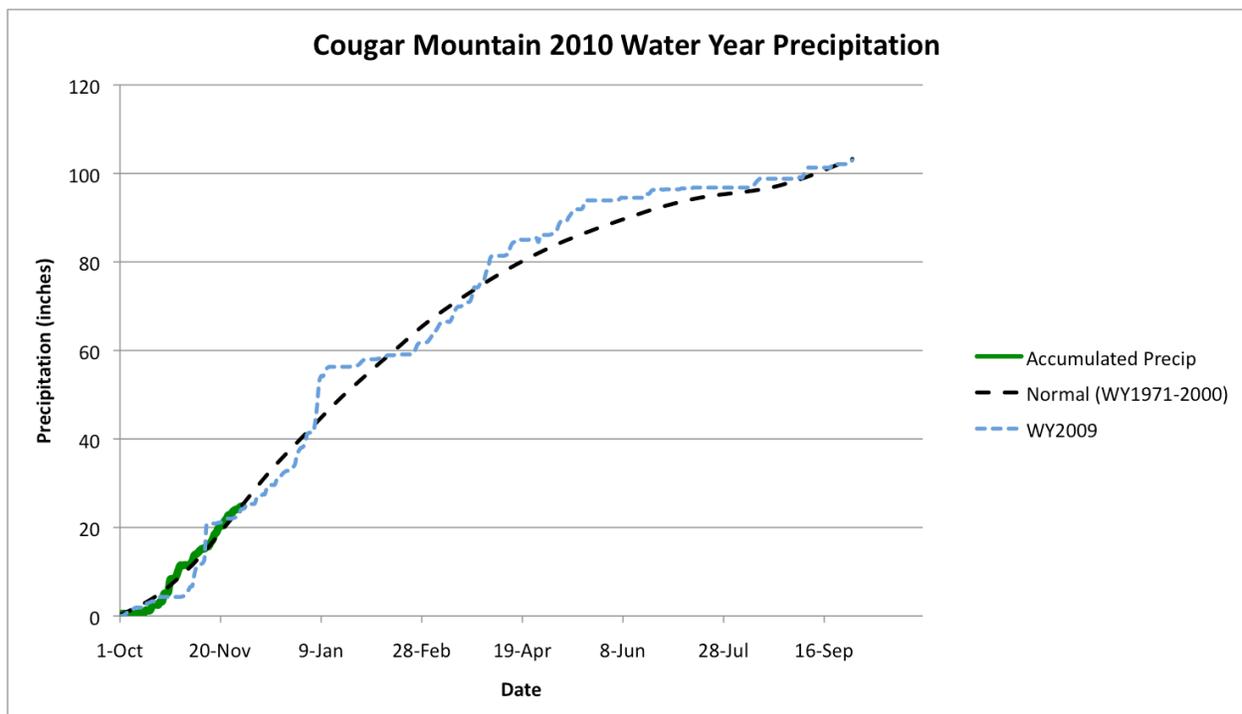


Figure 2: Current 2010 water year accumulated precipitation at Cougar Mountain SnoTel (green) compared to the 30-year normal (black - dashed) and the 2009 water year accumulated precipitation (blue).

Snowpack

The heavy rain in November got the state off on a good foot regarding snowpack. The snow water equivalent in the Olympic Mountains is at 262% of normal as of November 30 (Figure 3). The Cascade range snow water equivalent is also above normal for a majority of the basins. The South Puget Sound (109%) and the Upper Columbia (93%) basins are right at normal snow water equivalent. The eastern WA dryness has resulted in lower than normal snowpack, however, with Spokane basin only at 59% of normal and the Lower Snake at 60% of normal. This is not good news considering the drier conditions that are forecasted for January-February-March due to the strengthening El Niño.

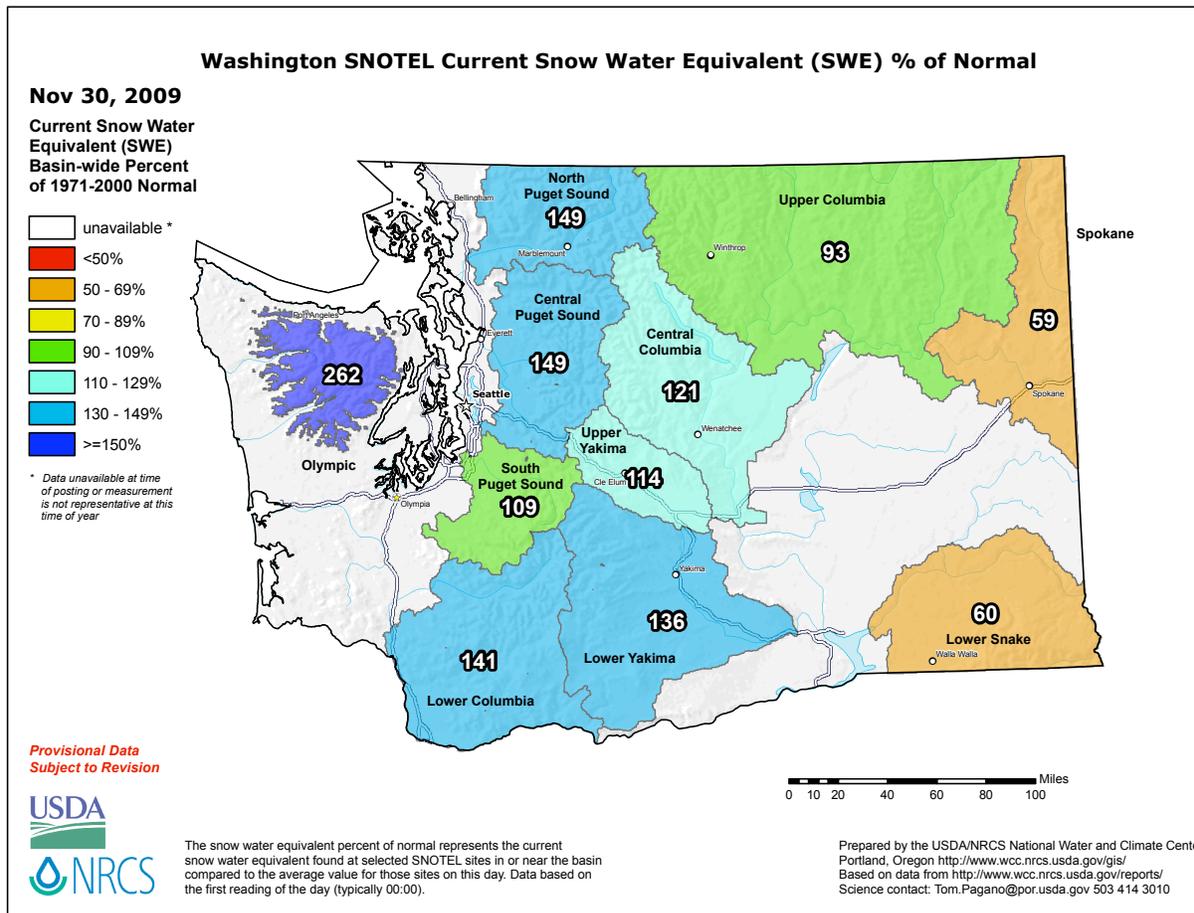


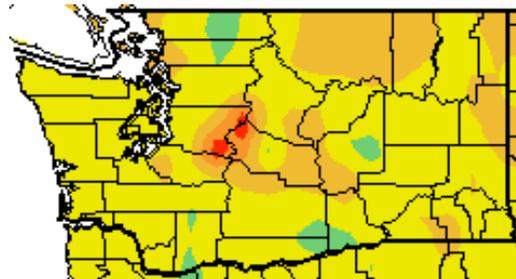
Figure 3: Snowpack (in terms of snow water equivalent) percent of normal for Washington as of November 30, 2009. Image is from the National Resources Conservation Service.

Climate Summary

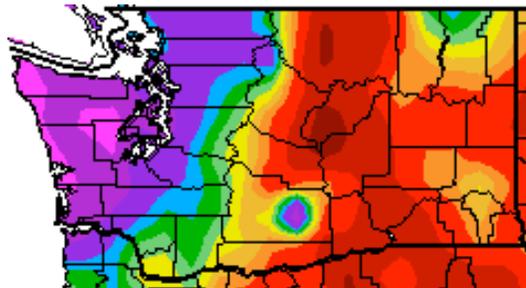
November temperatures were generally around normal throughout the state of Washington. As illustrated by the maps below from the High Plains Regional Climate Center, temperature departures from normal were between -2 and 2°F for a majority of the state. One station, Stampede Pass, reported an average temperature 6-8°F warmer than normal for the month, proving to be the aberration. Some other locations around the state, especially east of the

Cascades, had temperatures between 2 and 4°F warmer than normal for November (i.e. Vancouver, Omak, and Spokane - see Table 2).

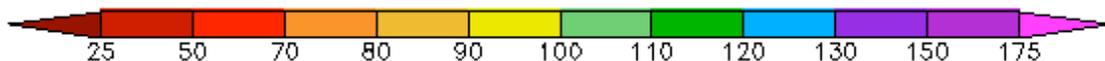
Total precipitation for the month of November was drastically different between eastern and western Washington. Western WA received above normal precipitation for the month, with majority of the area receiving 130-175% of normal. Vancouver was closer to normal in western WA receiving 91% of normal precipitation for the month. East of the Cascades, however, was very dry with some areas only receiving 25-70% of normal monthly precipitation. Ephrata only received 29% of normal precipitation and Pasco only 31% of normal (Table 2). Omak only received 34% of normal precipitation which has not helped to improve the lingering dryness in north central WA.



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)		
	Avg	Normal	Departure from Normal	Total	Normal	% of Normal
Olympia	44.4	42.4	2.0	10.08	8.13	124
Seattle	47.2	45.9	1.3	8.53	4.92	173
Sea-Tac	46.6	45.2	1.4	8.96	5.90	152
Quillayute	45.3	44.2	1.1	26.55	14.82	179
Vancouver	48.3	44.7	3.6	5.73	6.29	91
Spokane	36.9	34.9	2.0	1.31	2.24	58
Omak	37.9	34.6	3.3	0.49	1.45	34
Pullman	38.3	36.8	1.5	1.37	2.83	48
Ephrata	37.9	37.7	0.2	0.30	1.03	29
Pasco	41.2	42.5	-1.3	0.33	1.08	31
Yakima	38.1	37.0	1.1	0.55	1.05	52

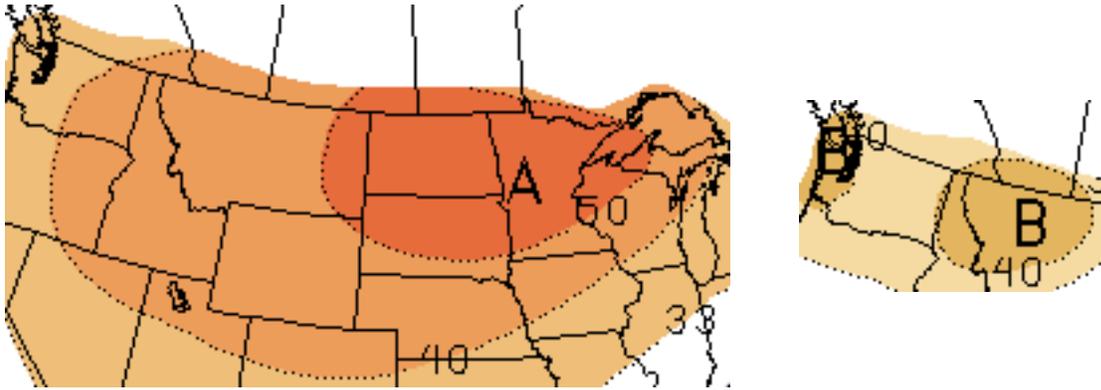
Table 2 - November Climate Summaries from locations in western Washington and eastern Washington (highlighted in orange) from NWS (climate normal baseline is 1971-2000).

Climate Outlook

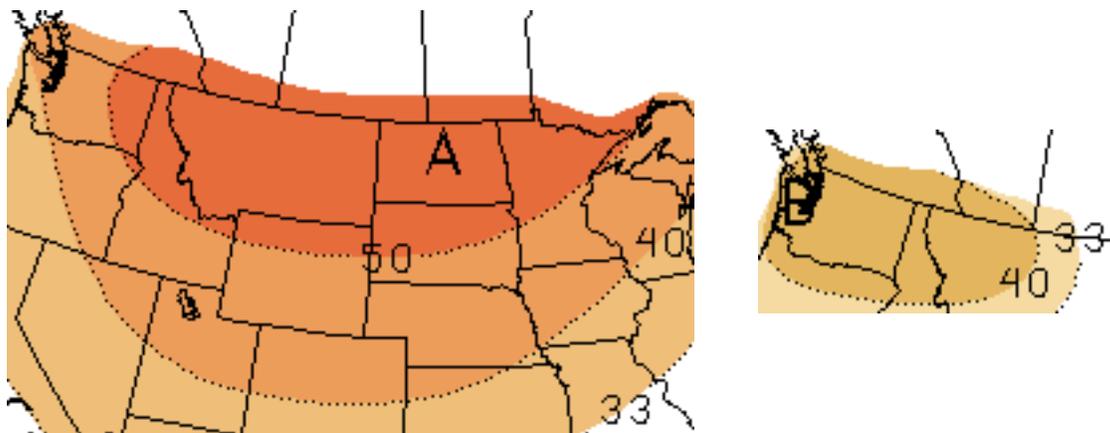
The El Niño conditions have strengthened in the tropical Pacific Ocean as the most recent 4-week equatorial sea-surface temperature (SST) anomalies were at least 1°C with some anomalies exceeding 2.0°C. According to forecasts from the Climate Prediction Center (<http://www.cpc.noaa.gov/products/precip/CWlink/MJO/enso.shtml>), El Niño is expected to last through the Northern Hemisphere winter. This situation provides some skill in predicting the upcoming 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 winter outlook (December-January-February) by the NOAA Climate Prediction Center reflects a strengthening of the El Niño pattern over the western United States with the chances of above normal temperatures exceeding 33% for the western half of the state and exceeding 40% for the eastern half of the state. Chances of below normal DJF precipitation exceed 40% for the Olympic Peninsula and 33% for the rest of the state.

Further strengthening of the El Niño is reflected in the January-February-March (JFM) outlook, with the chances of above normal temperatures exceeding 50% in eastern WA, exceeding 40% in central WA and parts of western WA, and exceeding 33% in the remaining portion of western WA. There is at least a 40% chance of below normal precipitation for the entire state in JFM.



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



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



CoCoRaHS News

Thank you, CoCoRaHS volunteers, for your continued participation during the heavy rain of November! As the chance for snowfall increases, I would like to review a few tips for measuring snow. Please remember:

- Take the funnel and the inner tube out of your rain gauge if snow is expected.
- To measure the liquid water equivalent of your snow sample, carefully add a measured amount of warm water to melt it. Once it's completely melted, read the gauge to the nearest hundredth and be sure to subtract the amount of warm water that you added from your total.
- Do not estimate the amount of snow that fell from the liquid water equivalent measured in your gauge. Please measure the snow with a ruler on the flat ground, and never from your gauge.
- If you have a snow board, wipe it clean after you measure the new snow that has fallen to be ready for the next storm.

We now have 4 county coordinators (Clark, San Juan, Skagit, & Snohomish counties) for WA state. Feel free to contact OWSC (wash.cocorahs@gmail.com) or your local coordinator (http://www.cocorahs.org/Content.aspx?page=coord_WA) if you have any questions. If you would like to sign up to volunteer then please visit www.cocorahs.org. We still do not have any volunteers in Asotin, Columbia, Franklin, or Wahkiakum counties, and volunteers from those under-represented areas will qualify for a free rain gauge. To see if you qualify, email wash.cocorahs@gmail.com after you sign up.