Office of the Washington State Climatologist

December 4, 2012

# November Event Summary

November temperatures were warmer than normal statewide, and precipitation totals were variable. The monthly precipitation totals were less than normal in the Cascade Mountains, northern Olympic Peninsula and the northern Puget Sound area. Elsewhere, November precipitation was above normal, especially in the central Olympic Peninsula and eastern WA.

## In this Issue



November started out mild, with unusually warm daytime and nighttime temperatures recorded in many eastern WA locations. For example, Omak (61°F), Ephrata (65°F), Pullman (65°F), Wenatchee Pangborn Airport (64°F), and Walla Walla (71°F) all recorded new daily high temperature records for November 5. Temperatures dropped shortly thereafter, however, and a cooler than normal period occurred from November 8th through the 11th/12th (west side/east side). Figure 1 illustrates this shift in the weather pattern on the daily temperature trace from Spokane Airport. Olympia Airport recorded a record low minimum temperature on the 10th (20°F). Some snow fell in eastern WA during this period, but dry conditions prevailed west of the Cascade Mountains.

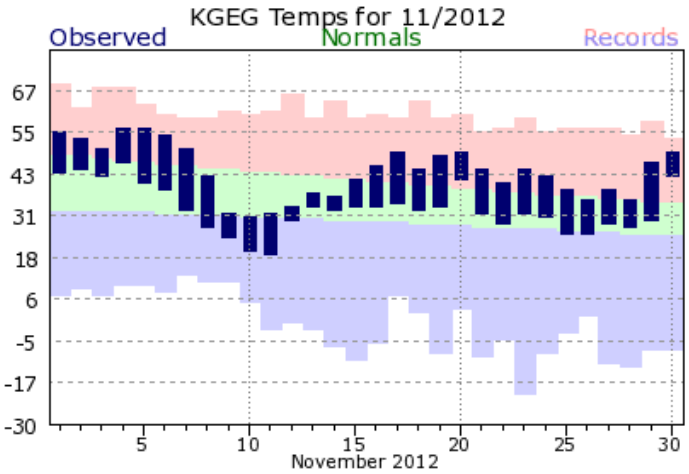



**Figure 1: The daily high and low temperatures at Spokane Airport for November along with the daily records (red and blue) and normals (green). Note the dip in temperatures from the 9th through the 12th.**

The dry conditions were short-lived in western WA, as rain returned on the 11th, and then heavy rain persisted from the 17th through the 21st. Heavy rain fell across the state particularly on the 19th; daily maximum rainfall records were set at SeaTac Airport (2.13") and the Seattle Weather Forecasting Office (WFO; 2.60"). A 24-hour maximum precipitation record was set at Republic (1.70", ending at 6 pm on 11/19) and at Mazama (1.66", ending at 10 am on 11/19). The wet weather caused flooding at a handful of western WA rivers, urban flooding, and mudslides (e.g., a closure of the rail-

road line between Everett and Seattle; Seattle Times, 11/19). Strong winds on the coast caused extremely hazardous conditions for traffic on the Astoria Bridge, and a semi-truck was actually blown over on its side. The driver fortunately sustained only minor injuries. Figure 2 shows just the 1-day precipitation totals ending between 7 and 9 am on November 20th in the Seattle-metro area from CoCoRaHS observers. Though there were a few dry days during the last week of the month, November ended on a typically soggy note.

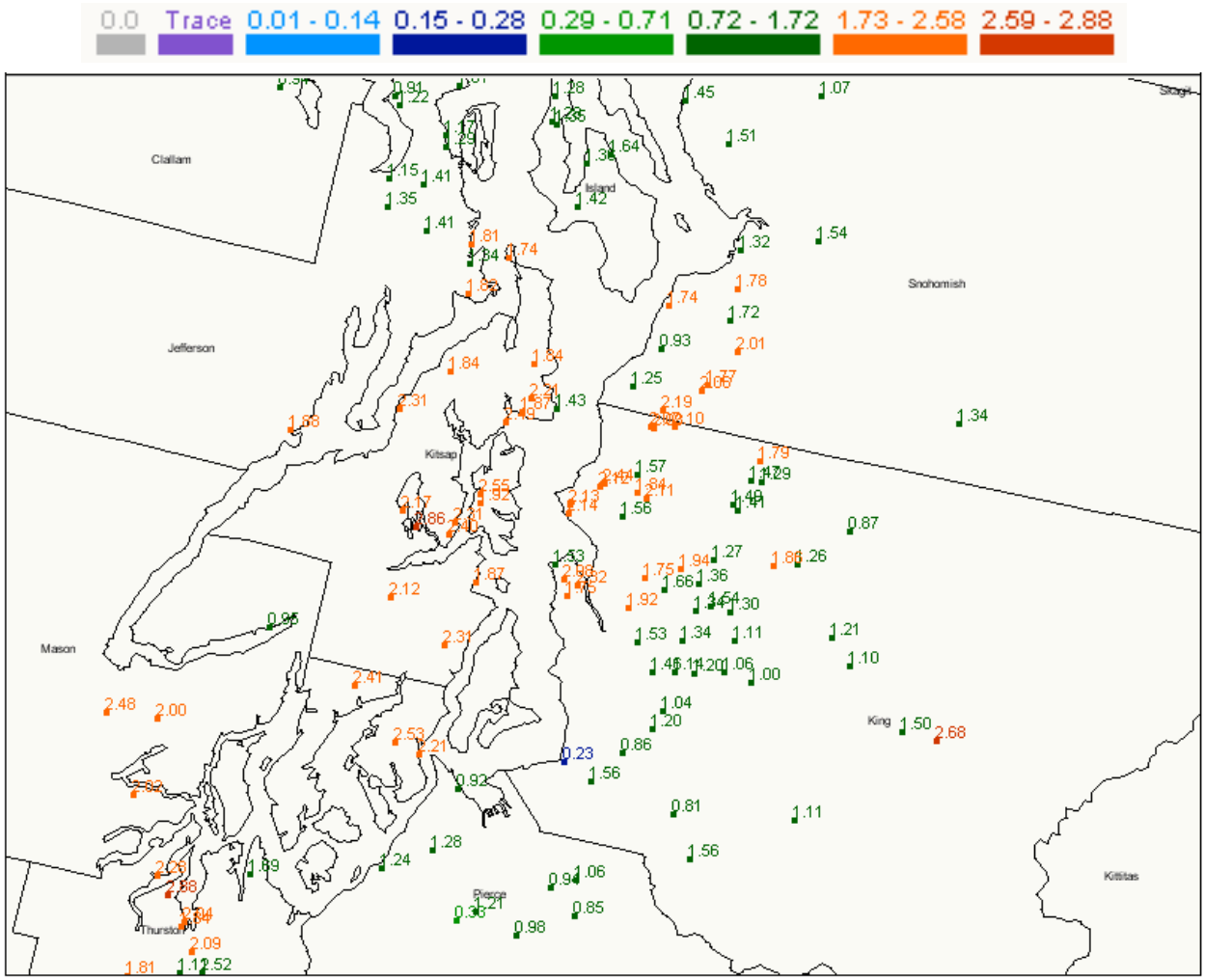



**Figure 2: The 24-hour precipitation observations (inches) ending between 7 and 9 am on November 20, 2012 for the Seattle metro area.**

# Snowpack Summary

The distribution of early season snowpack resembles the precipitation percent of normal for the month of November (shown later). Figure 3 shows the snow water equivalent (SWE) percentage of normal as of December 3, 2012. The Olympic, North Puget Sound, Upper Columbia, Central Columbia, and Lower Yakima Basins are all above normal for this time of year, ranging between 119 and 273% of normal. However, the Central Puget Sound, South Puget Sound, Upper Yakima, Lower Columbia, Spokane, and Lower Snake Basins all have had a slow start, with currently only between 64 and 87% of normal SWE. There is still plenty of snow season left, of course, and at this time, the lower than normal values are not a concern.

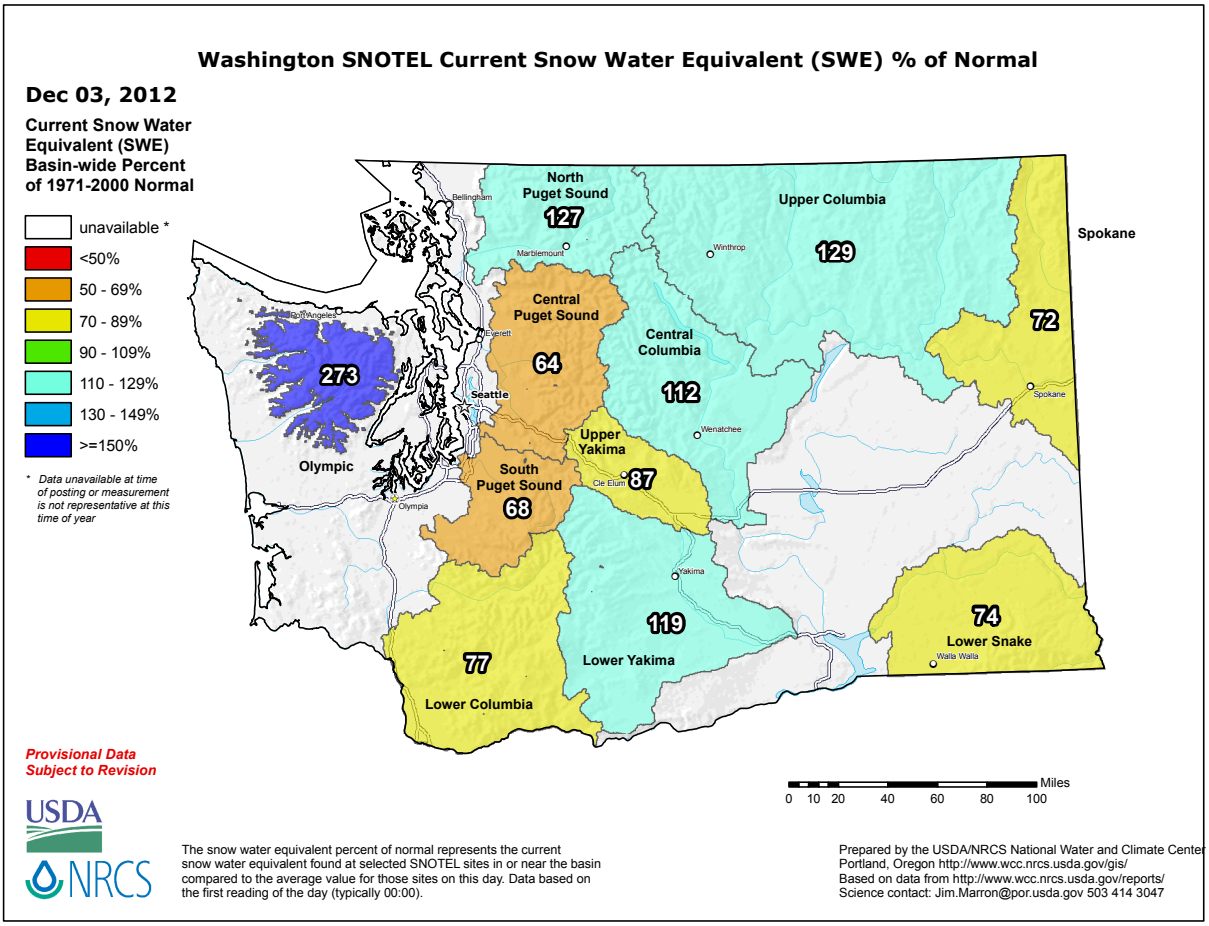



**Figure 3: Snowpack (in terms of snow water equivalent) percent of normal for Washington as of December 3, 2012. Image is from the National Resources Conservation Service (NRCS).**

# Temporal Characteristics of Winter Precipitation in WA

## A message from the State Climatologist

The period from mid-November through early December is often the rainiest part of the year for Washington. It is no secret that the west side of the state is typically blessed with more rainy days than the east side, but to what extent? And what percentage of the time is it actually precipitating? How long **can** it rain without letting-up? While it clearly rains more often, does this time of year also include the storms with the greatest rain rates? These topics are addressed here in a follow-up to a paper on Seattle rainfall authored by Phil Church (the founder of the Department of Atmospheric Sciences at the University of Washington) that was published in Weatherwise in 1974.

The analysis is based on time series of hourly precipitation observed at SeaTac International Airport (SEA) and Spokane International Airport (GEG) for the period of 1990-2010 as provided by NOAA/NCDC (http://www.ncdc.noaa.gov/cdo-web/). This data was used to calculate frequency of hours during which precipitation was recorded, the time of year of the most intense rain storms (specifically those hours with rainfall exceeding 0.30"), and the duration of the longest-lasting events of continuous precipitation, specifically, the number of consecutive hours with precipitation of either trace or measurable amounts.

The chances of measurable precipitation during a 24-hour period from mid-November through mid-December are about 60% at SEA and 45% at GEG. We suspect most west-siders do not realize that the days with precipitation occur so often in Spokane. Broadly speaking, this location can be considered to be in the low foothills of the west flank of the Rocky Mountains, and thereby experiences gentle upslope flow during periods of low-level winds from the west. The Columbia basin portion of eastern Washington is decidedly drier. Ephrata, for example, receives measurable precipitation on average during only about 33% of the days the same time of year.

The percentage of hours with precipitation recorded at SEA and GEG during Nov-Dec for the years of 1996-2010 are illustrated in Figure 4. The average frequency is 31% at SEA and 22% at GEG; those hours with just trace amounts are about 13% of the time at each location. The resulting 18% of the hours that have measurable rain at SEA is virtually identical to the findings of Church (1974), which indicated average frequencies of 18% and 19% for November and December, respectively. We agree with Church's rather testy statement, "While many visitors . . . and others . . . in Seattle complain that it rains all the time, simple arithmetic shows it rains a mere 11% of the time [when averaged over the whole year]". This quote reminds us of the delightful book "Rains all the Time" by David Laskin, which is recommended for those interested in Pacific Northwest weather from the human perspective. Getting back to the numbers, it is interesting that there were two years (2000 and 2008) during which it actually precipitated more often at GEG than at SEA. It is also striking how much year-to-year variability there is in the overall frequency of precipitation. Note that it rained more than twice as often at SEA in 1998 than during 1997 and 2000, and similarly for GEG there is greater than a factor of two between the year with the most frequent precipitation (2008), which also featured a very snowy December, and years of the lowest fre-

quencies (1997 and 2004).

The records at the two locations reveal some interesting differences with regards to the time of year when it rains the hardest (Figure 5). SEA receives its heaviest rains disproportionately during the fall while downpours at GEG occur in spring and summer, presumably often in association with thunderstorms. Based on personal experience, the Puget Sound region can also receive some real cloudbursts during the spring, but apparently they rarely last long enough to produce more than 0.30" per hour in the rain gauge at SEA. On the other hand, there seems to be always enough rain around Puget Sound during spring to get folks grousing about the weather.

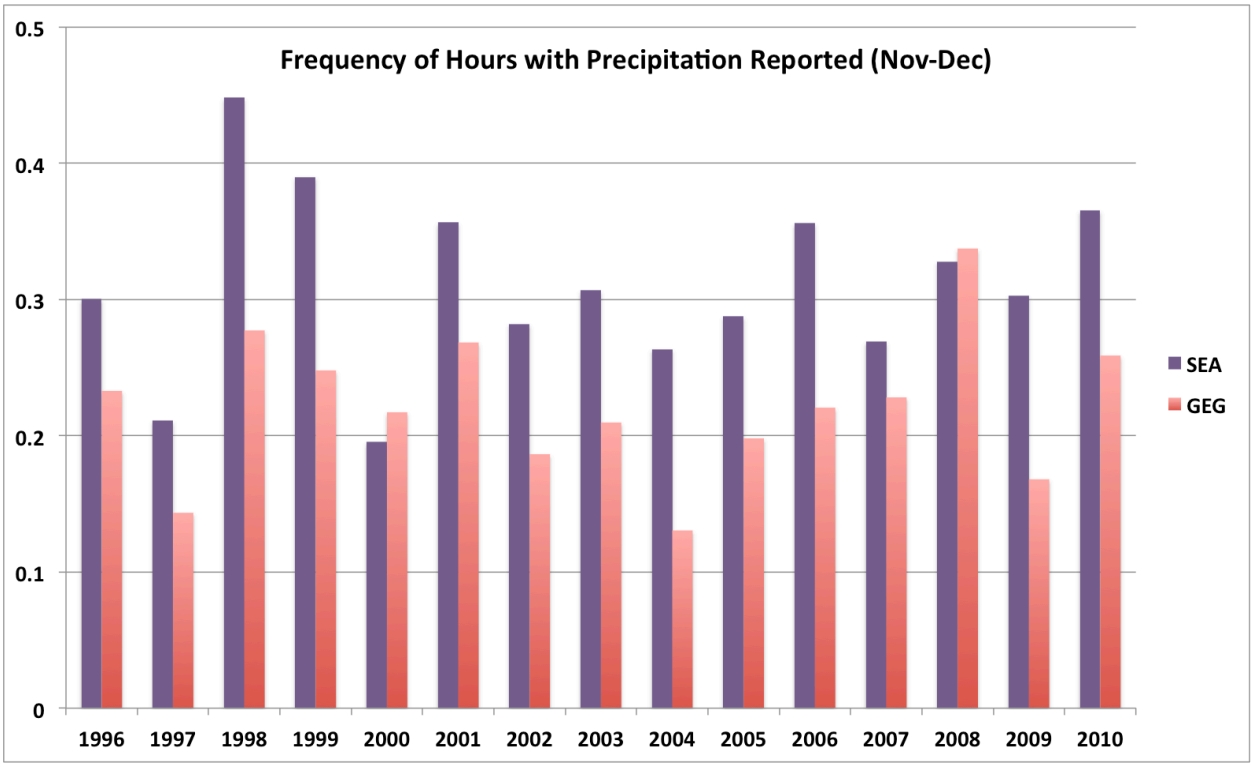



**Figure 4: The frequency of hours reporting precipitation (including traces) from 1996 through 2010 during November and December at SeaTac Airport (SEA) and Spokane Airport (GEG).**

The 20-year records include extremes in terms of duration of continuous precipitation of 59 hours at SEA during 11-13 November 1999, and 45 hours at GEG during 12-14 January 2006. We are impressed that such a prolonged rainfall event could happen at GEG. On the other hand, considering all the patches of moss masquerading as lawns in the Seattle area, we are not at all surprised that long rainfall events (rains of 53 and 54 hour duration occurred in December 1998 and January 2009, respectively) have been observed at SEA. Events of continuous precipitation, strictly speaking with consecutive hourly reports indicating precipitation of at least trace amounts, as long as 24 hours or longer occur on average almost 5 times a year at SEA and a bit more than twice a year at GEG.

We have certainly not exhausted all of the goodies in the hourly rainfall record. For example, how long is the typical rain storm? How much does the frequency of rain vary during the

summer? Given that the record can be extended back in time, are there any systematic trends in the occurrence of the heaviest rainfall events? Does the frequency or intensity of rain vary more between wet and dry locations in the state? Hopefully we will be able to address these kinds of questions in the future.

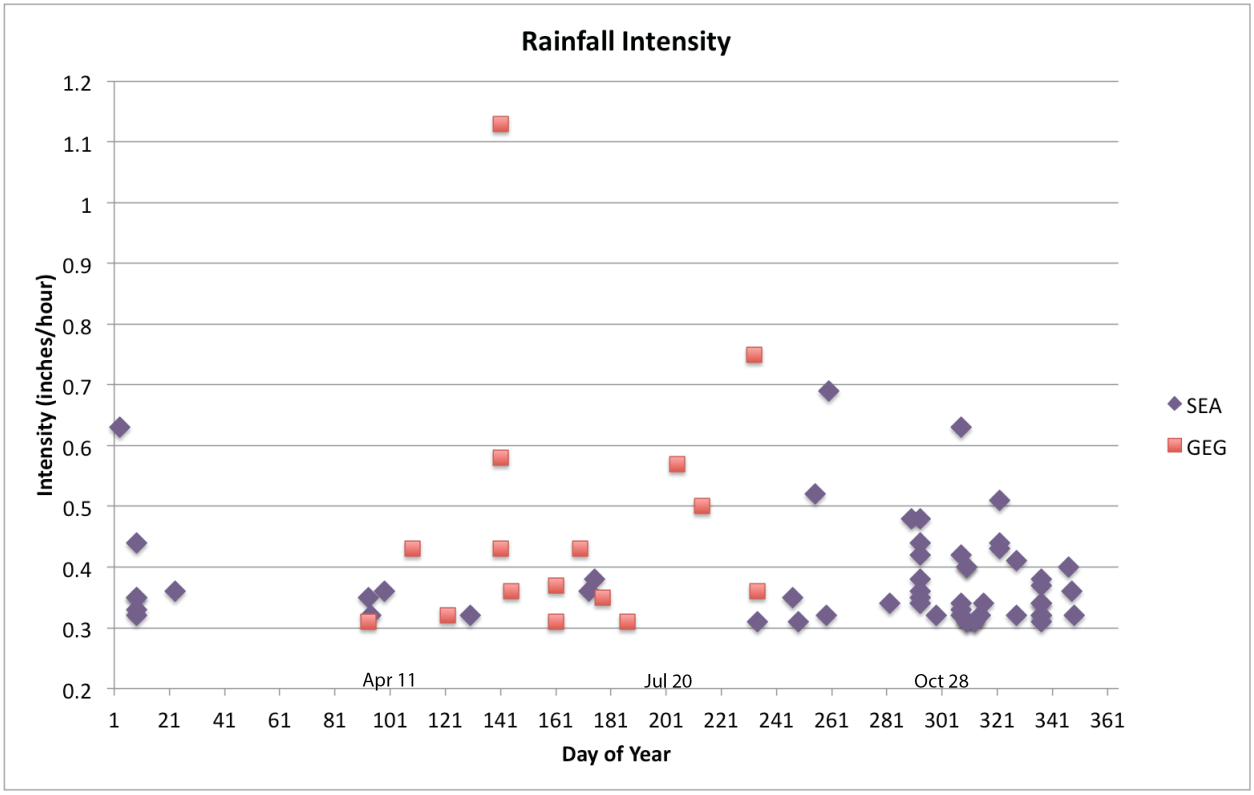



**Figure 5: The day of year of intense precipitation events (greater than 0.30" per hour) from 1990 through 2010 at SeaTac Airport (SEA) and Spokane Airport (GEG). Note that most of the points that are vertically stacked on the graph are from the same event.**

**References**:

Church, P., 1974: Some precipitation characteristics of Seattle. Weatherwise, 27, 244-251.

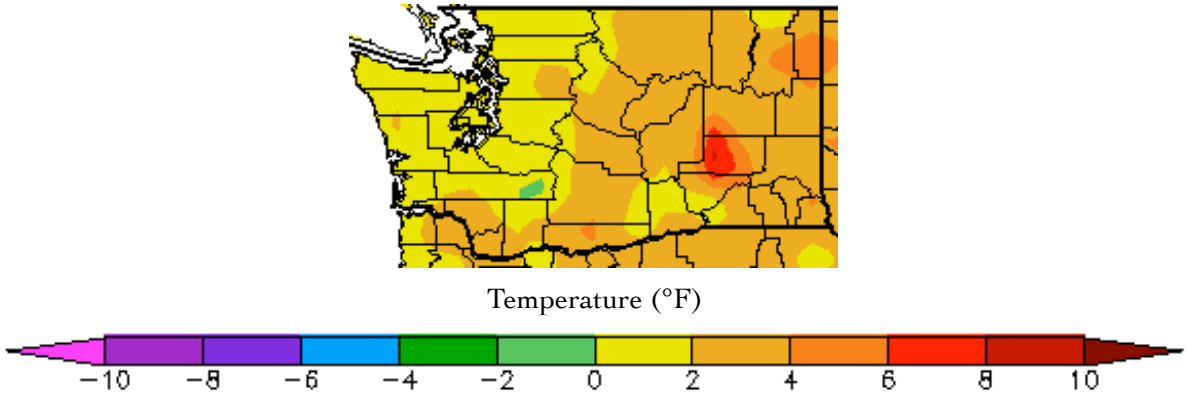
Laskin, D., 1997: "Rains all the Time: A Connoisseur's History of the Weather of the Pacific Northwest", Sasquatch Books, Seattle, WA.

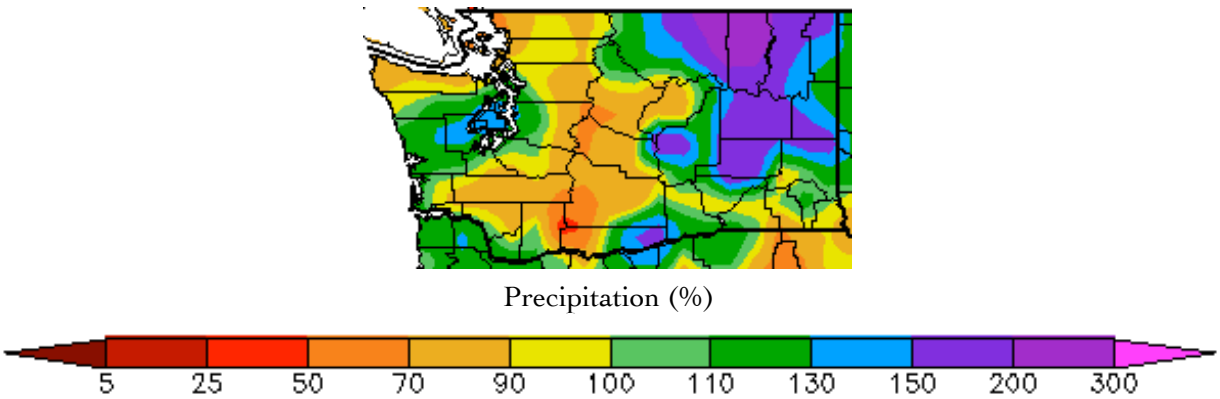
# Climate Summary

Average November temperatures were above normal throughout WA, as illustrated by the High Plains Regional Climate Center (HPRCC) temperature departure from normal map below. The departures from normal were larger east of the Cascade Mountains, where temperature were between 2 and 4°F above normal for most of the area. West of the Cascades, November temperatures were within 2°F of normal. Table 1 shows that many of these western WA towns and cities were close to 1.5°F above normal, with Bellingham the exception (3.1°F above normal).

November precipitation was mixed across the state relative to climatological averages. The HPRCC percent of normal precipitation map below shows that eastern WA and the central Puget Sound extending through the central Olympic Peninsula received higher than normal precipitation (between 110 and 300% of normal). The places in between, namely the Cascades, the northern Olympic Peninsula, and the northern Puget Sound received between 50 and 90% of normal November precipitation. There were a few drier spots - Table 1 shows Bellingham and Wenatchee with 45 and 48% of normal precipitation, respectively.

As for snowfall, there wasn't any west of the Cascade Mountains during November at lowland locations, but eastern WA did see some snow for the month. Examples are listed in Table 1.




***November temperature (°F) departure from normal (top) and November precipitation % of normal (bottom).***
***(High Plains Regional Climate Center (http://www.hprcc.unl.edu); 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 | 44.4 | 43.3 | 1.1 | 9.15 | 8.63 | 106 | 0 | 0.9 | 0 |
| Seattle WFO | 47.4 | 46.2 | 1.2 | 9.17 | 5.84 | 157 | 0 | 0.3 | 0 |
| Sea-Tac | 46.9 | 45.4 | 1.5 | 8.28 | 6.57 | 126 | 0 | 1.2 | 0 |
| Quillayute | 46.1 | 44.2 | 1.9 | 13.84 | 15.52 | 89 | 0 | 1.4 | 0 |
| Bellingham AP | 46.3 | 43.2 | 3.1 | 2.63 | 5.80 | 45 | M | 0.9 | - |
| Vancouver | 47.9 | 46.4 | 1.5 | 7.16 | 5.91 | 121 | M | M | - |
| Eastern Washington | | | | | | | | | |
| Spokane AP | 38.9 | 35.7 | 3.2 | 3.24 | 2.30 | 141 | 5.9 | 7.4 | 80 |
| Wenatchee | 41.0 | 37.6 | 3.4 | 0.53 | 1.11 | 48 | M | 5.0 | - |
| Omak | 38.4 | 35.9 | 2.5 | 2.71 | 1.81 | 150 | 0.5 | M | - |
| Pullman AP | 40.8 | 37.0 | 3.8 | 2.75 | 2.29 | 120 | M | M | - |
| Ephrata | 39.3 | 37.0 | 2.3 | 1.09 | 1.06 | 103 | M | 2.6 | - |
| Pasco AP | 43.0 | 41.3 | 1.7 | 1.10 | 1.09 | 101 | 0 | M | - |
| Yakima AP | 41.4 | 37.3 | 4.1 | 0.66 | 1.05 | 63 | 0.7 | 3.5 | 20 |

**Table 1: November 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.**

# CoCoRaHS

As always, thank you for your valuable observations during such a rainy month. OWSC has (finally!) installed a CoCoRaHS gauge near its office on the University of Washington campus in Seattle. November 2012 is our first month of complete data, and we ended the month with 8.25" total. This is almost an inch below that the Seattle WFO which is only about 5 km away (Table 1), demonstrating the variability that is inherit in precipitation across short distances. All the more reason to recruit your friends! New observers can sign up at

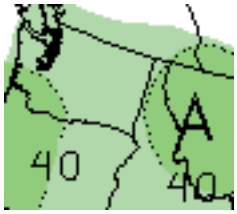
www.cocorahs.org, and we'll keep you posted on how the OWSC CoCoRaHS gauge "measures up".

# Climate Outlook

The conditions in the equatorial Pacific Ocean continue to be ENSO-neutral, and the weak El Niño that was originally forecast months ago now appears unlikely. The Climate Prediction Center's (CPC) has discontinued the "El Niño Watch" that was issued in early June (http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.html). During the last 4 weeks, sea-surface temperatures (SSTs) have been above normal in the western Pacific while SSTs in the eastern tropical Pacific have been below normal. The consensus of the model predictions is a continuation of neutral conditions through the winter.

The CPC three-class temperature outlook for December is a toss up: there are equal chances of below, equal to, or above normal temperatures. In regards to precipitation, there are increased chances of above normal precipitation for December statewide, with southwest WA having the highest chances of above normal precipitation.

The CPC 3-month seasonal outlook for December-January-February (DJF) temperature and precipitation both have similar outlooks: there are equal chances of below, equal to, or above normal temperature and precipitation for the whole state. This appears to be one of those times for which seasonal anomalies are less predictable.


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



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