



Office of the Washington State Climatologist

July 3, 2012

June Event Summary

June 2012 was wetter and colder than normal throughout Washington State, and in some places, it was the wettest June on record. Northeastern WA was especially wet with Republic, Colville, Boundary Dam, and Newport all recording monthly totals well above the previous records. Colville, for example, topped the previously held 1913 record by 1.74". Figure 1 shows the 24-hr CoCoRaHS precipitation totals on the morning of June 7th, illustrating the wet June conditions that contributed to the record-breaking month. Table 1 has more details on the June rainfall records around the state. June 2012 was

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Station	June 2012 Precipitation	Rank	Year Records Began
Boundary Dam	8.30"	1	1966
Newport	6.24"	1	1910
Colville	6.09"	1	1900
Republic	4.21"	1	1900
Walla Walla	3.50"	1	1949
Quillayute	7.00"	3	1967
SeaTac AP	2.96"	5	1948
Bellingham AP	3.13"	6	1949
Everett COOP	4.37"	9	1895
Spokane AP	2.86"	11	1881

Table 1: The June 2012 precipitation totals for locations in WA, along with the rank and the year that records began.

wet in western WA as well and many daily rainfall records were broken there. For example, maximum daily rainfall records were set in Vancouver (0.61") on June 4 and in Quillayute (0.94"), Olympia (0.63"), and the Seattle Weather Forecast Office (0.53") on June 7.

Precipitation wasn't the only noteworthy aspect of the month. The average June temperatures ranked among the top ten coolest at several locations as well (Table 2). (The average temperature at SeaTac ranked as the 12th coolest June and is not included in the table).

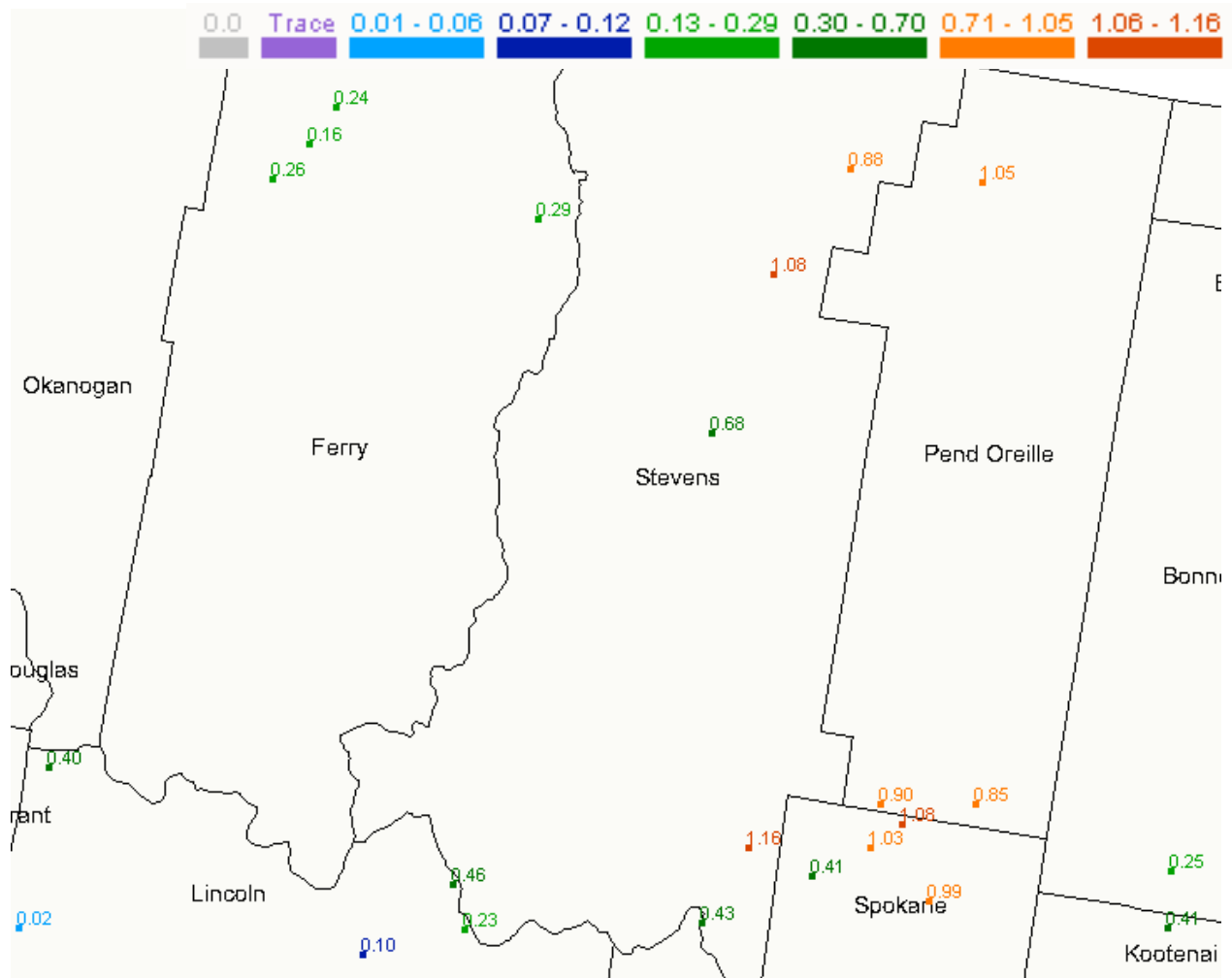


Figure 1: 24-hr precipitation totals from the CoCoRaHS network on the morning of June 7, 2012.

Station	June 2012 Average Temperature	Rank	Year Records Began
Quillayute	52.9	5	1967
Hoquiam	54.9	5 (tie)	1953
Bellingham AP	56.1	7	1949
Walla Walla	63.5	8	1949
Wenatchee AP	63.4	8	1960
Olympia	56.2	10	1948

Table 2: The June 2012 average temperature for locations in WA, along with the rank and the year that records began.

Weather in Washington State on the 4th of July

A message from the State Climatologist

There is the common impression that the weather on the 4th of July is generally crummy, at least on the west side of Washington State. Here we take the opportunity to critically examine that perception, and to compare the climatology of that day on the west versus east side of the Cascade Mountains. In addition, the conventional wisdom is that there is dramatic improvement in the weather shortly after the 4th, and hence it is also of interest to document just how much it typically changes over the course of the month of July.

Daily station data from 1981-2010 are considered for six western and six eastern Washington locations. The specific variables of interest are the probability of measurable precipitation (POP) and frequency of maximum temperatures reaching prescribed thresholds for the calendar days of the month. The maximum daily temperature thresholds used were arbitrarily set at greater than or equal to 70°F for the western stations and greater than or equal to 80°F

Station (ID)	POP (%)	Freq. of Warm* Days (%)
Forks 1E (452914)	40	40
Hoquiam (KHQM)	27	7
Bellingham (KBLI)	15	33
SeaTac (KSEA)	23	57
Olympia (KOLYM)	30	60
Vancouver 4NNE (458773)	17	77
Winthrop 1 WSW (WNPW1)	17	52
Wenatchee (KEAT)	7	63
Yakima (KYKM)	10	63
Spokane (KGEG)	30	47
Pullman 2NW (PLMW1)	10	43
Walla Walla (KALW)	8	73

Table 3: Frequency of measurable precipitation and warm days on the 4th of July at selected locations in WA State based on the 1981-2010 period. *Warm days are defined at those with maximum temperatures greater than or equal to 70°F (80°F) for locations west (east) of the Cascade Mountains.

for the eastern stations. In other words, a different standard was used for what constitutes a warm day in the west versus east part of the state. We present the 30-year averages for the POP and frequency of warm days on the 4th of July for the western stations at Forks, Hoquiam, Bellingham, SeaTac, Olympia, and Vancouver, and for the eastern locations of Winthrop, Wenatchee, Yakima, Spokane, Pullman, and Walla Walla. Time series of daily average POP and frequency of warm days for the month of July are plotted for Hoquiam and SeaTac, and for Yakima and Spokane. The NCEP Reanalysis data were used to examine various parameters that characterize the regional circulation; shown here are climatological mean distributions of the zonal (east-west) component of the wind at the 500 hPa level for the first week and for the last week of July.

The results for the 4th of July are summarized in Table 3. With regards to POP, as expected the coastal locations of Forks and Ho-

quiam checked in as the places that are more likely to experience a wet Independence Day. It was a surprise, however, to find that it has rained at least as often at Spokane (30% of the time) as at the interior western Washington locations. In particular, measurable rain occurred in Seattle (KSEA) only 8 times on this day of the year in the 30-year interval. The idea that “it usually rains on the 4th of July” in the Seattle area is a myth. There are also some quirks in terms of the frequencies of warm days. They have occurred on the 4th much more often at Forks than at Hoquiam; among the interior locations in the west it is more than twice as likely to get one at Vancouver than at Bellingham. Among the east side locations, maximum temperatures into the “warm” category (many of us wimps on the west side probably would call that “hot”) are most likely in Walla Walla and the Tri-Cities (not shown) and least likely in Spokane and Pullman. The driest station of this set was Wenatchee, but Yakima, Pullman and Walla Walla also have a 10% or less chance of rain based on this 30-year record.

Many locations in Washington State become noticeably drier and warmer after the first part of July. Time series of POP and frequency of warm days for Hoquiam and SeaTac (Fig. 2a) reveal marked decreases in POP during the first week of the month and then slow declines over the remainder of the month to values of about 15% and 10%, respectively. This drying out is accompanied by only a modest increase in the frequency of warm days at Hoquiam. On the other hand, 70+ F days in Seattle by the end of the month are a very good bet. The corresponding time series for Yakima and Spokane are shown in Figure 2b. Yakima tends to get slightly more rainy days early than late in the month. A more significant drop in POP was found for

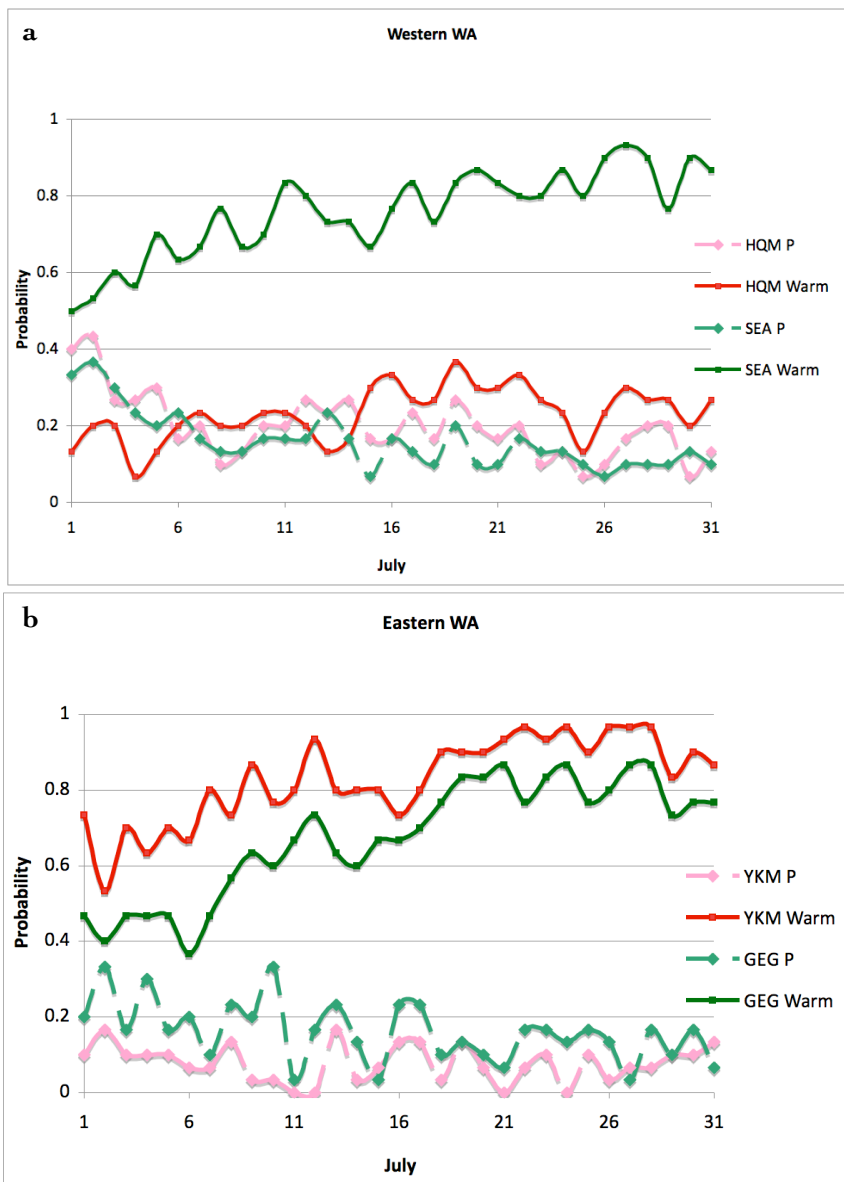


Figure 2: The July time series of the POP and frequency of warm days for Hoquiam and Seattle (a) and for Yakima and Spokane (b).

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Spokane. While the 4th at Spokane has been relatively rainy it is no real fluke; both 2 July and 10 July have even higher values of POP (33%) over the 1981-2010 period. Along with the drying over the course of the month, the chances of a 80+ F day in Spokane almost double from the beginning to end of July.

Why is early July so much wetter and cooler than late July across much of the state? This transition in the weather is linked to evolution in the regional atmospheric circulation, mostly in the form of a poleward shift. For example, the mean 500 hPa zonal wind has a maximum across northern Oregon during the first week of July (Fig. 3a); this flow is weaker and has its maximum along the US-Canada border during the last week of the month (Fig. 3b). Over the same interval the axis of higher sea level pressure representing the eastward extension of the North Pacific High moves from across Washington state to across British Columbia in the mean (not shown). These changes are accompanied by a tendency for more sinking motion at mid-tropospheric levels, especially over the northern half of the state. As a bit of an aside, it bears pointing out that the onset of more consistently dry and warm weather here basically coincides with the onset of the monsoon in the desert southwest US. It would be a good thing if we could anticipate year-to-year variations in the timing of these shifts, such as the late occurrence in 2011, but their predictability on time horizons of more than a week or two is an open question.

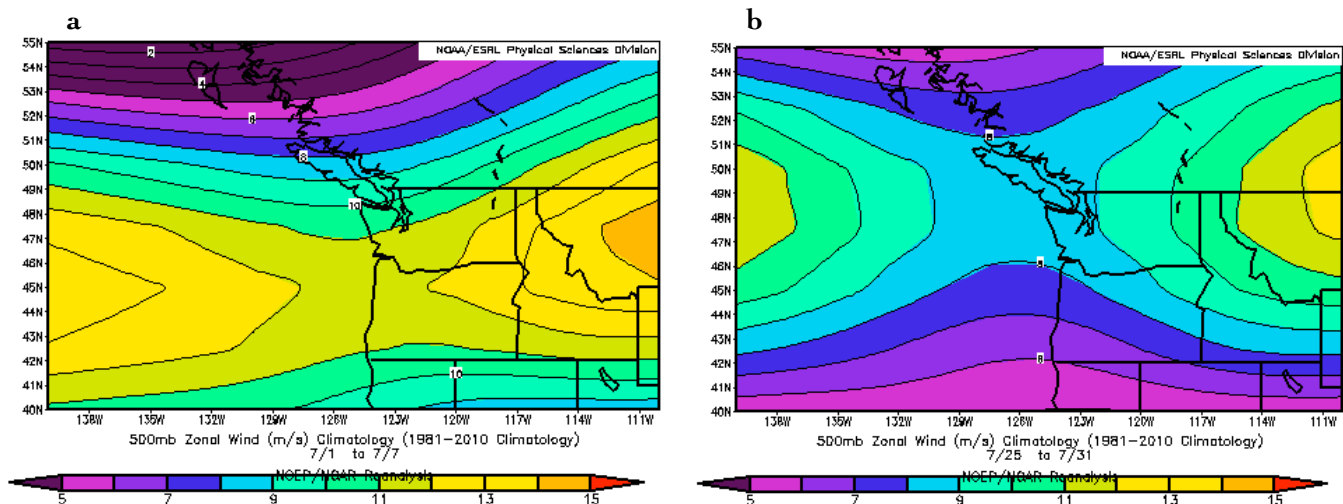
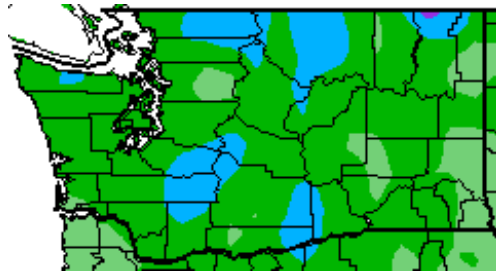


Figure 3: The 500 hPa zonal (east-west) wind for (a) the first week of July and (b) the last week of July.

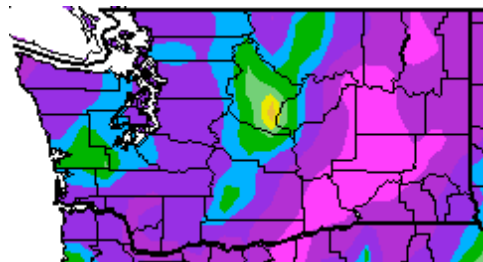
Climate Summary

Average June temperatures were much below normal in WA, with most of the state between 2 and 4°F below the 1971-2000 normal. Illustrated in the map below from the High Plains Regional Climate Center (HPRCC), some locations were even cooler, falling into the -4 through -6°F bracket. Omak was a cool spot, with temperature 4.5°F below the 1981-2010 normal (Table 4).

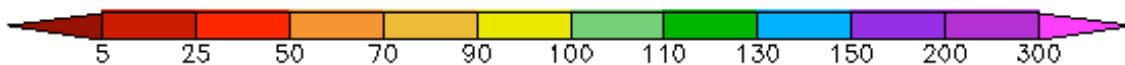
Total June precipitation was also consistently above normal throughout the entire state, and records that were broken are noted in the opening section of this newsletter. Parts of eastern WA received double their normal June precipitation, or in other words, exceeded 200% of normal. West of the Cascades was also wet, with most locations receiving between 150 and 200% of normal precipitation. The soggy June is illustrated in the HPRCC map below as well as in Table 4.



Temperature (°F)



Precipitation (%)



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

	Mean Temperature (°F)			Precipitation (inches)		
	Average	Normal	Departure from Normal	Total	Normal	% of Normal
Western Washington						
Olympia	56.3	59.1	-2.8	2.31	1.76	131
Seattle WFO	58.7	61.0	-2.3	3.39	1.63	208
Sea-Tac	58.3	60.9	-2.6	2.96	1.57	189
Quillayute	52.9	55.3	-2.4	7.00	3.50	200
Bellingham AP	56.1	58.5	-2.4	3.13	1.86	168
Vancouver	61.5	63.3	-1.8	3.15	2.47	128
Eastern Washington						
Spokane AP	59.6	62.1	-2.5	2.86	1.25	229
Wenatchee	63.4	66.7	-3.3	0.68	0.60	113
Omak	61.0	65.5	-4.5	1.76	1.23	143
Pullman AP	57.7	58.6	-0.9	2.31	1.08	214
Ephrata	64.2	66.6	-2.4	1.33	0.61	218
Pasco AP	65.0	67.5	-2.5	1.77	0.68	260
Yakima AP	63.0	63.9	-0.9	0.85	0.62	137

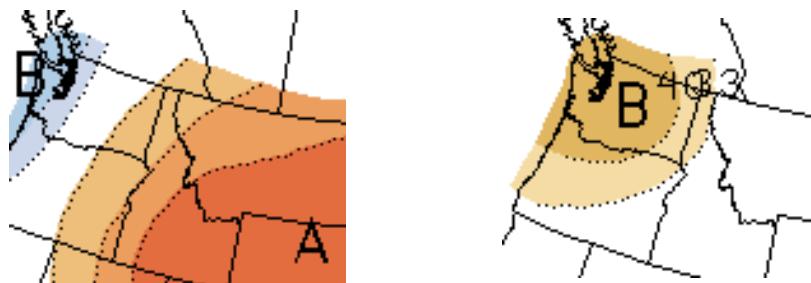
Table 4: June climate summaries for locations around Washington with a climate normal baseline of 1981-2010. Note that the Vancouver Pearson Airport and Seattle WFO 1981-2010 normals involved using surrounding stations in NCDC's new normal release, as records for these station began in 1998 and 1986, respectively.

Climate Outlook

The conditions in the equatorial Pacific Ocean continue to be ENSO-neutral. The Climate Prediction Center (CPC) released an “El Niño Watch” in early June, indicating that there’s about a 50% chance that an El Niño will develop by boreal autumn (http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.html). In the last 4 weeks, sea-surface temperature (SST) anomalies were becoming above normal, especially in the eastern Pacific (the Niño 3 and Niño 1+2 regions of the ocean), according to the CPC. ENSO forecast models are indicating a continuation of near-neutral conditions through the summer 2012, with about equal chances of an El Niño developing in the Fall or neutral conditions persisting. The chances of another La Niña occurring remain very small.

The CPC three-class temperature outlook for July calls for increased chances of below normal temperatures west of the Cascade Mountains due to below normal SSTs along the coast. Equal chances of below, equal to, or above normal July temperatures exist for central WA while eastern WA has higher chances of warmer than normal July temperatures. The July precipitation outlook is the same throughout the whole state; there is a higher chance of below normal precipitation. It is worth noting, however, that as of July 3, the latest numerical weather prediction model guidance indicates the development of anomalous ridging aloft, suggesting the next couple of weeks are liable to be on the warm and dry side.

The CPC 3-month seasonal outlook for July-August-September (JAS) has equal chances of below, equal to, or above normal temperatures for the western half of the state. Eastern WA has higher chances of below normal temperatures are the period. JAS precipitation is expected to be below normal for the state, with higher chances of below normal precipitation east of the Cascades.



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



July-August-September outlook for temperature (left) and precipitation (right) from the CPC.