

# Office of the Washington State Climatologist

June 3, 2014

#### May Event Summary

Average May temperatures were warmer than normal statewide. Total precipitation, however, was vastly different for the two sides of the state. Conditions were much drier than normal east of the Cascade Mountains and wetter than normal west of the Cascade Mountains. The wet May conditions for western WA were largely a result of a handful of very wet days, as opposed to rainy conditions throughout the whole month. Western WA has been wetter than normal for each of the last four months.

#### In this Issue

May Event Summary.......1
Blob of Warm Water......2
Snowpack Summary......4
Climate Summary......6
Climate Outlook......8

Though it's a rather obscure statistic, the precipitation at SeaTac Airport since Feb 1 already ranks as the wettest February through July period on record with 22.88" through May 31 with 2 months still left to go (Figure 1). Note that while this is a wet 6-month period, it's nowhere near the wettest 6 months on record when considering all possible months. It's also important to point out that many other stations in western WA did not qualify for this record; 1972 was the wettest February through July for many stations.

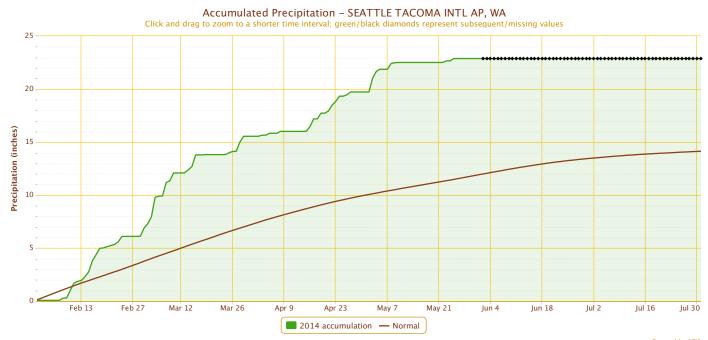


Figure 1: The accumulated precipitation (green line and shaded green) at SeaTac Airport from Feb 1 through July 31, 2014, assuming no more precipitation falls in June or July. The red line is the 1981-2010 normal.

May began rather summer-like across Washington State, with record high maximum temperatures on May 1 at Vancouver (88°F), Olympia (88°F), SeaTac Airport (85°F), Quillayute (83°F), Walla Walla (83°F), Hoquiam (80°F), and Bellingham (78°F). Eastern WA saw some daily record high temperatures the following day with 85°F at both Wenatchee and Ephrata. A shift occurred for western WA on the 3rd, however, as many stations had their rainiest day of the month. Daily maximum precipitation records were broken at SeaTac Airport (1.31"), Hoquiam (1.21"), Quillayute (1.10"), and the Seattle Weather Forecasting Office (0.95") on May 3 and at Bellingham (0.86") on May 4. Most of the rain that fell during the month occurred in the first week and a half. May 8 was another wet day statewide, especially in Hoquiam where the daily maximum precipitation record was broken with 1.16". The remainder of the month was rather calm, and temperatures got back up to the low to mid-80s on the 14th, breaking some daily records once again in western WA. There were some more days with showers in the second half of the month, most notably on the 18th and the 25th, with some heavy rain showers at times on Memorial Day (the 26th) as well. Finally, there was minor flooding that occurred frequently during the month on the Okanogan, Stehekin, and Pend Oreille rivers due to snowmelt.

## The Blob: Warm Water off the Coast of the PNW and What it May Mean for Our Summer Weather

#### A message from the State Climatologist

The Pacific Northwest experienced a period of seasonally quiet and dry weather from October 2013 into February 2014. This period also featured anomalously weak cooling of the upper ocean off our coast for the time of year. The result was what will hereafter be referred to as the "blob", a large mass of water that was ~3°C warmer than normal in February 2014

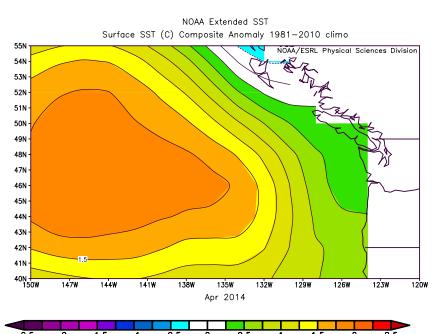


Figure 2: The SST anomaly pattern (compared to 1981-2010) off the coast of Washington and Oregon for April 2014 (from ESRL). and is still prominent (Figure 2). Ocean temperature anomalies have the potential to affect the thermodynamic properties of the low-level atmosphere over Washington state, especially if regional circulation anomalies are not prominent. So could the blob potentially impact our summer weather? It is expected to hang around, and may even be reinforced by the El Niño that appears to be developing.

The dry weather in the Pacific Northwest during the fall and early winter of 2013-14 involved much higher than

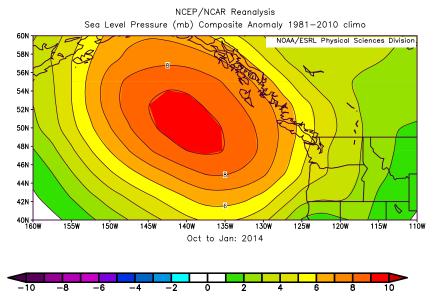


Figure 3: The mean SLP anomaly pattern (compared to 1981-2010) for Oct 2013 through Jan 2014 (from ESRL).

normal pressure over the eastern North Pacific Ocean, as illustrated in the sea-level pressure (SLP) anomaly map shown in Figure 3 and discussed in previous issues of this newsletter. This pattern meant fewer and weaker storms making landfall into our neck of the woods (and rather cold weather east of the Rocky Mountains). From an upper ocean perspective, a key aspect was weaker than usual westerly winds. The consequence included reduced surface sensible and latent heat fluxes, less mixing of cold water from below into the upper mixed layer, and

reduced equatorward Ekman transports (i.e., less cold advection in the mixed layer). All of these mechanisms acted in a similar sense. As an aside, OWSC is participating in an ongoing project to evaluate the relative contributions of the different mechanisms using moored buoy and hydrographic observations from a Canadian research ship.

The blob may strengthen due to El Niño, particularly if the eastern equatorial Pacific continues to warm over the next couple of months. A time series of SST in the region of the blob (Fig. 4) shows that past instances of abnormally warm water off our coast have tended to occur with El Niño. That being said, as shown in Figure 4, there have been a number of El Niño events that formed by late summer that were accompanied by near normal or even somewhat chilly SSTs. While there are certainly no guarantees, a strong consensus of the global climate models used for seasonal weather prediction is that the SSTs in the region of the blob will continue to be well above normal during the late summer of 2014. And that could have implications for not just the marine ecosystem but also our weather.

It has tended to be relatively warm and rainy during previous August-September periods during which exceptionally warm water was present off our coast, as shown in composite maps for the 6 years with the highest SST (Fig. 5). We are not claiming that the regional SST was necessarily the primary cause, or even a critical factor, in the late summer weather of those years. They included mean negative SLP anomalies off the coast of up to ~ 3 mb and weak southerly wind anomalies of ~1 m/s off the mouth of the Columbia (not shown). Presumably these pressure anomalies, and associated winds were more due to a remote response to El Niño rather than a local response in the circulation to the underlying SST. The teleconnection or "atmospheric bridge" between the equatorial Pacific and the northeast Pacific is generally weaker in summer than in winter, but El Niño does tend to be associated with regional circulation anomalies. The bottom line is that the presence of warm SSTs, and the climate model forecasts of their continuation, supports the idea that the Aug-Sep period will

be warmer than normal, as also indicated by the climate models as a group. It would also seem that the warming and moistening of the low-level atmosphere that is liable to occur this summer will also favor the development of more thunderstorms than usual. Perhaps it was just a coincidence, but the late summer of 2013 featured both very warm SSTs and enhanced convection. So perhaps we can look forward to some of that kind of weather, recognizing that the atmosphere always has some tricks up its sleeve.

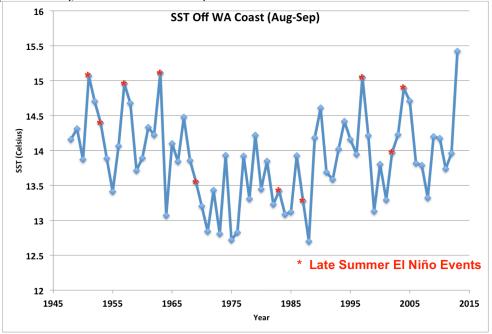


Figure 4: Mean August-September SSTs for the region of the blob from 1948-2013. The red asterisks represent years in which an El Niño had already developed by late summer.

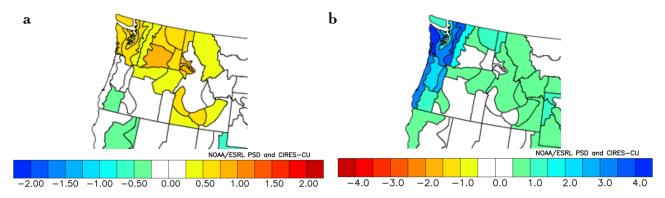


Figure 5: The mean (a) temperature and (b) precipitation patterns for previous Aug-Sep periods with warm SST anomalies off the coast.

### **Snowpack Summary**

Figure 6 shows the snow water equivalent (SWE) percent of normal as of 2 June from the National Resources Conservation Service (NRCS). The melting of the snowpack is well underway. Snowpack has decreased despite the percentage relative to normal increasing in some instances. The snowpack is still greater than usual for this time of year for most of the

basins. Despite this, the lack of low elevation precipitation over the season in eastern WA has warranted drought concerns in some areas. The US Department of Agriculture has designated Benton, Franklin, Chelan, Lincoln, and Walla Walla counties as natural disaster areas due to the dryness. The US Drought Monitor (Figure 7) has remained largely unchanged in the last month due to the dry conditions east of the Cascade Mountains during May. As we enter the drier summer months, it's unlikely that much improvement will be seen in this area.

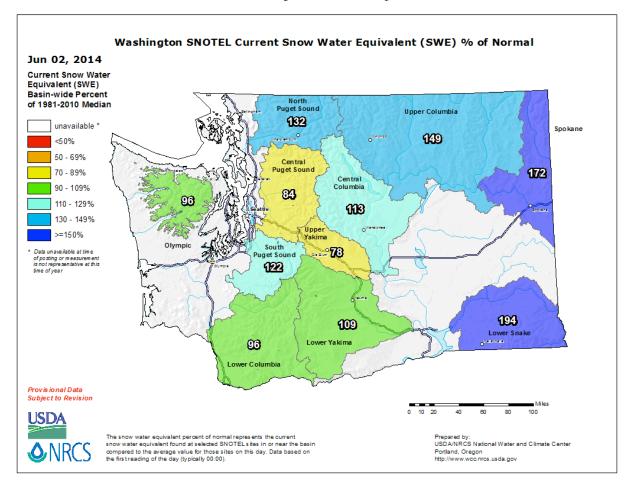


Figure 6: Snowpack (in terms of snow water equivalent) percent of normal for Washington as of 2 June 2014. Image is from the National Resources Conservation Service (NRCS).

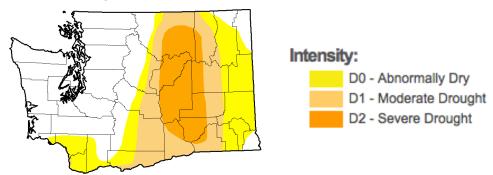
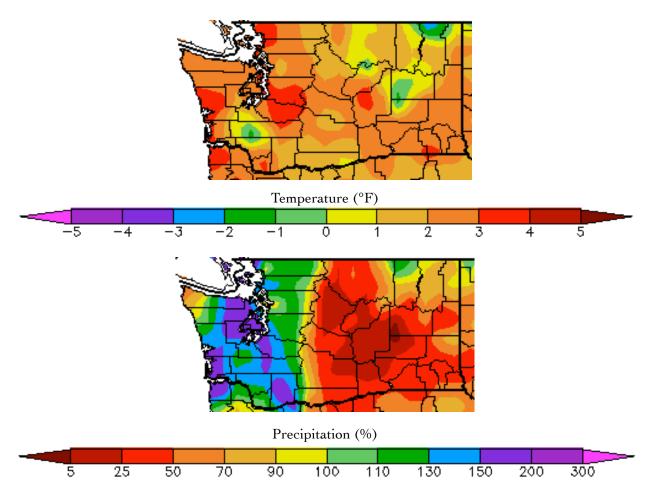


Figure 7: The 27 May 2014 edition of the US Drought Monitor (from the National Drought Mitigation Center).

### **Climate Summary**

Mean May temperatures were warmer than normal throughout most of WA State, as shown in the map from the High Plains Regional Climate Center below. Average May temperatures exceeded 3°F above normal in many western WA locations such as Quillayute, Seattle, Bellingham, and Hoquiam (Table 1). Temperatures in eastern WA were mostly between 1 and 3°F above normal, though there are some exceptions. Wenatchee was 4.2°F above normal, for example. Parts of northeastern WA were much closer to normal for the month.

Total May precipitation in western WA and eastern WA were complete opposites; western WA was wetter than normal while eastern WA was much drier than normal for the month. In particular, precipitation was less than 25% of normal for much of the Columbia Basin. The individual stations of Ephrata and Wenatchee checked in with only 14 and 26% of normal, respectively (Table 1). On the other hand, precipitation ranged between 110 and 200% of normal for most of the area west of the Cascade Mountains. The exception is the northwest Olympic Peninsula where Quillayute, for example, only received 77% of normal precipitation.



May temperature (°F) departure from normal (top) and May precipitation % of normal (bottom). (High Plains Regional Climate Center (<a href="http://www.bprcc.unl.edu">http://www.bprcc.unl.edu</a>); relative to the 1981-2010 normal).

	Mean Temperature (°F)			Precipitation (inches)		
	Average	Normal	Departure from Normal	Total	Normal	Percent of Normal
Western Washington						
Olympia	55.9	54.2	1.7	3.34	2.33	143
Seattle WFO	59.6	56.0	3.6	2.30	2.16	106
SeaTac AP	59.1	56.0	3.1	3.15	1.94	162
Quillayute	54.5	51.3	3.2	3.91	5.11	77
Hoquiam	56.4	53.0	3.4	4.75	3.29	144
Bellingham AP	57.4	53.8	3.6	2.51	2.48	101
Vancouver AP	60.1	58.1	2.0	2.68	2.47	109
Eastern Washington						
Spokane AP	57.7	55.1	2.6	0.56	1.62	35
Wenatchee	51.8	48.4	4.2	0.18	0.68	26
Omak	59.5	58.1	1.4	0.48	1.31	37
Pullman AP	54.5	53.2	1.3	0.97	1.56	62
Ephrata	62.5	59.3	3.2	0.09	0.65	14
Pasco AP	62.8	60.7	2.1	0.29	0.73	40
Hanford	65.6	62.1	3.5	0.24	0.51	47

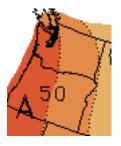
Table 1: May climate summaries for locations around Washington with a climate normal baseline of 1981-2010. Note that the Vancouver Pearson Airport and Seattle WFO 1981-2010 normals involved using surrounding stations in NCDC's new normal release, as records for these station began in 1998 and 1986, respectively.

#### Climate Outlook

The equatorial Pacific Ocean is still in the ENSO-neutral category, according to the Climate Prediction Center (CPC): <a href="http://www.cpc.ncep.noaa.gov">http://www.cpc.ncep.noaa.gov</a>. Averaged over the last month, seasurface temperatures (SSTs) were above normal throughout the entire equatorial Pacific Ocean, and the SSTs remain above normal in each Niño region. There is a consensus among the model predictions that an El Niño will develop as early as this summer, and the chances of the El Niño developing this summer have increased to about 65%. The "El Niño Watch" that was initially released by the CPC in early March is still in effect.

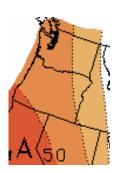
The Climate Prediction Center seasonal outlook for June has increased chances of warmer than normal temperatures statewide, with higher chances for warm temperatures in western WA. For precipitation, there are increased chances of below normal precipitation for the western two-thirds of the state. For the eastern one-third of WA, there are equal chances of above, equal to, or below normal precipitation.

The three-month summer (June-July-August; JJA) temperature outlook has higher chances of above normal temperatures for WA State while the precipitation outlook is calling for equal chances ("EC") of below, equal to, or above normal precipitation.





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





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