



# Office of the Washington State Climatologist

October 5, 2010

## September Event Summary

Washington State experienced near normal temperatures in September. Precipitation, on the other hand, was much above normal for most of the state. September ranked in the top five wettest Septembers for many stations around the state. A sampling of those stations can be found in Table 1. September precipitation at SeaTac Airport ranked as the 3rd wettest September, for example, with 1st place occurring in 1978 (5.95") and 2nd in 1969 (5.57"). This September was the 2nd wettest for Olympia (1st in 1978 with 7.59").

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	2010 September Precipitation	Ranking	Records Began
Olympia	5.80	2	1948
SeaTac AP	4.80	3	1948
Bellingham	4.46	3	1949
Quillayute	8.85	4	1966
Kennewick	1.47	4	1894
Yakima	0.88	5	1946

**Table 1: September precipitation totals for a few locations around WA (in inches), the ranking of the year when compared to other years, and the year that the records began at that station.**

(0.44"), Ephrata (0.51"), Moses Lake (0.36"), Kennewick (0.40"), and Pullman Airport (0.39") and tied for Omak Airport (0.53").

A particularly wet storm occurred on the 17th through the 19th.

Numerous daily rainfall records were broken on the 17th in western WA (SeaTac recorded 1.49", Seattle WFO recorded 0.59", and Olympia recorded 1.67"), and the heavy precipitation continued into the 18th. Figure 1 shows the CoCoRaHS map for the 24-hour precipitation ending on the morning of the 19th, with the heaviest precipitation amounts in orange. The southern Puget Sound through Clark County got the most precipitation on the 18th, but the heavy precipitation continued through the 19th for parts of eastern WA. Daily rainfall records were broken on the 19th for Wenatchee

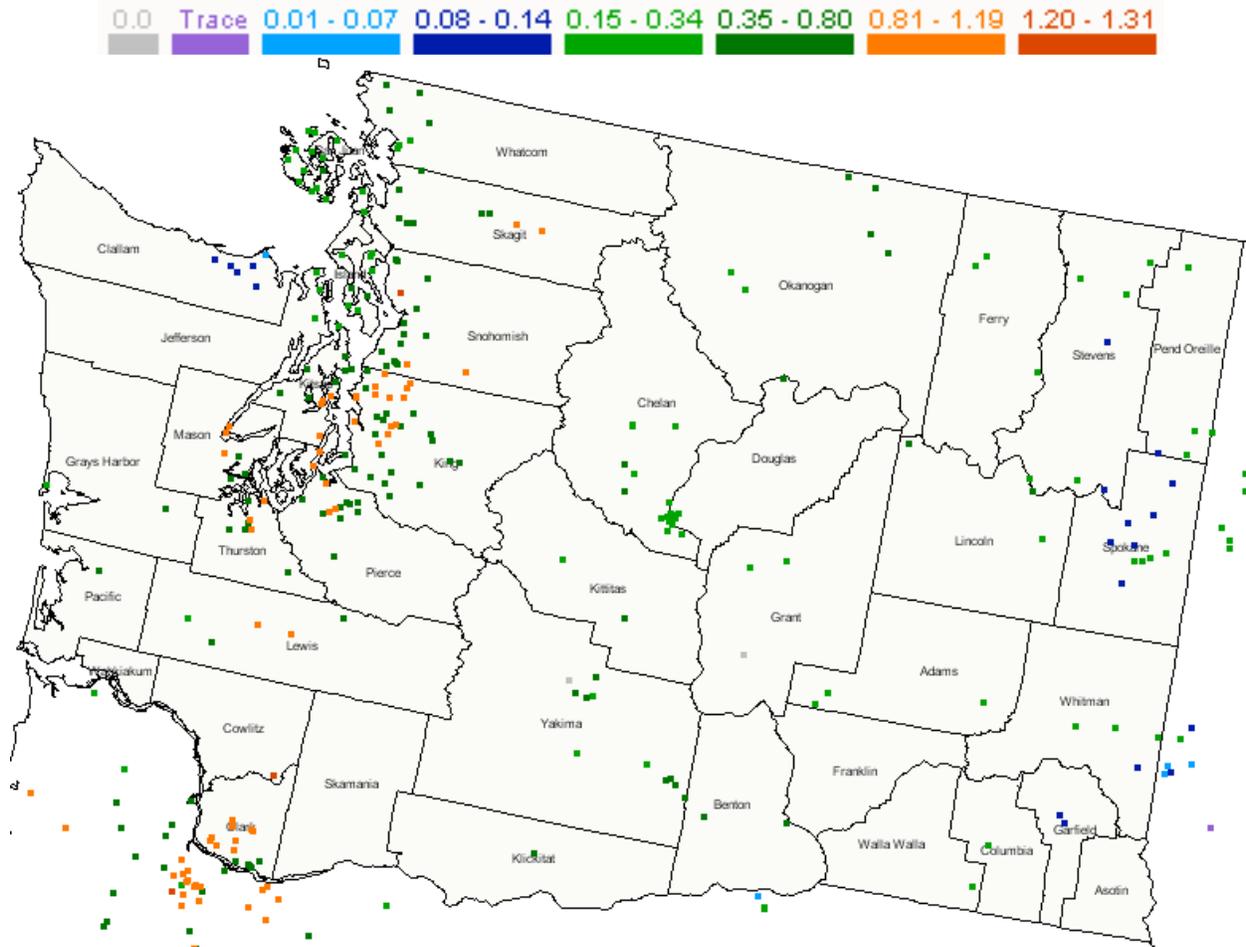


Figure 1: 24-hr precipitation totals measured by CoCoRaHS observers on September 19 at 7 am.

## CoCoRaHS

Happy Water Year! October 1st marks the first day of the water year, or the start of our wet season. This year, a CoCoRaHS computer program has automatically computed your total water year precipitation and other statistics. We're asking that you please check the report within the next month for errors. You can see your report when you log in to enter your observations, but also here: <http://www.cocorahs.org/wateryearsummary/>. If you do find any errors, please let us know.

The start of the water year also marks that it's time to get back into practice with recording your precipitation measurements daily (if September did not already warm you up). We're always looking for new volunteers, so please help spread the word to friends and relatives. They can sign up at [www.cocorahs.org](http://www.cocorahs.org). We still have some free rain gauges available for areas of the state that are scarce with observers, so please email [wash.cocorahs@gmail.com](mailto:wash.cocorahs@gmail.com) after signing up to see if your location qualifies.

## Cool & Wet Summer

No, it wasn't your imagination - on average, this past summer was cooler and wetter than normal. According to the National Climatic Data Center, the summer (June, July, and August; JJA) mean temperature averaged for the entire state of Washington was 63.1°F, half a degree below the long-term average temperature for the period of 1901-2000 (Figure 2a). Summer precipitation was above normal (Figure 2b) with a statewide value of 3.68 inches, 0.19 inches above the 1901-2000 mean.

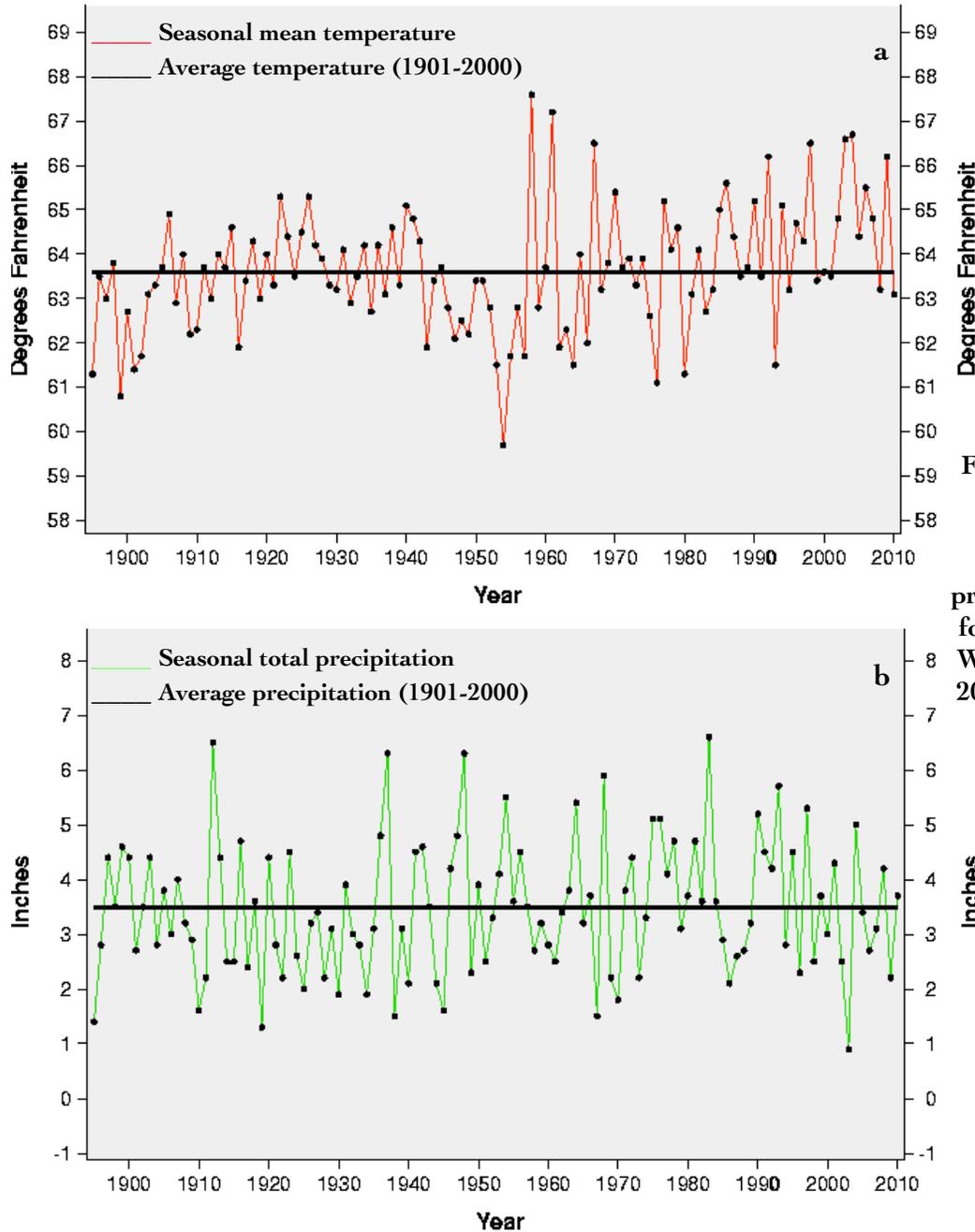


Figure 2: June-July-August (JJA) (a) mean temperature and (b) total precipitation averaged for the entire state of WA for 1895 through 2010 compared to the 1901-2000 mean.

## La Niña and the Weather of Washington State

### A message from your State Climatologist

The weather of the Pacific Northwest is influenced by the atmosphere-ocean system of the tropical Pacific. This region is currently experiencing what is termed La Niña, and this condition is expected to persist into 2011. This highlight will briefly describe La Niña, and how it is liable to impact the regional weather during the upcoming fall and winter.

In a nutshell, La Niña is associated with significantly cooler than normal upper-ocean temperatures in the central and eastern equatorial Pacific. The eastern portion of the equatorial Pacific is substantially colder than the western portion on average and this asymmetry is enhanced during La Niña. The atmosphere over the equatorial Pacific is tightly coupled to the state of the underlying ocean, in both a cause and effect manner. During La Niña, the easterly winds are stronger than normal across most of the tropical Pacific, and the deep cumulus convection associated with clusters of thunderstorms shifts westward. As a result, these thunderstorms are enhanced over the far western part of the tropical Pacific and Indonesia and are suppressed in the central portion. It is through the changes in the strength and location of this thunderstorm activity that La Niña (and El Niño, of course) impacts the atmospheric circulation and ultimately the weather in other parts of the globe.

The current La Niña began developing earlier this year on the heels of last winter's El Niño. The sea surface temperature (SST) anomalies in the central-eastern equatorial Pacific switched sign in May, with continued cooling relative to the usual seasonal cycle over the course of the summer of 2010. At the time of this writing, the SST anomalies are approximately -1.5 degrees C, which is highly significant from a statistical point of view. A variety of models have been developed to forecast the state of the equatorial Pacific atmosphere-ocean system; the consensus of these models is that the current La Niña will grow in amplitude and last at least through the end of the year. More details on current conditions and these model forecasts are available at the following website:

<http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml>.

From the perspective of anticipating the weather in Washington State over the course of the approaching cool season, it can be assumed with a high degree of certainty that there will be La Niña, and hence a tendency for the weather that has accompanied these kinds of events in the past.

There have been about 8 La Niña events of moderate to strong intensity over the last 50 years (the exact number depends on the defining criteria). During those periods, the sea level pressure (SLP) in a seasonal mean sense has generally been higher than normal over a broad region of the central North Pacific Ocean basin. The consequence for Washington State has been more atmospheric flow out of the northwest than usual during the fall and winter. In terms of the tangible weather, past La Niña events have been relatively wet and cool, with the precipitation more systematically enhanced during the fall, and the temperature signal more robust in the winter. It bears emphasizing that there are considerable variations in how the different La Niña events have played out, with some cool seasons like 1998-99 being especially wet, and others, like 1988-89 including severe cold snaps. One can think of the

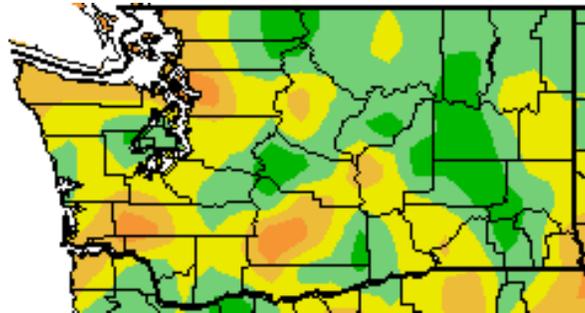
tropical Pacific, through La Niña or El Niño, as stacking the deck, but not guaranteeing a particular deal of the cards. The internal variability of the atmospheric circulation at mid-latitudes is substantial, and this variability can serve to reinforce, or counteract, the remote influences of the tropical Pacific in an unpredictable manner. A telling example is provided by the last La Niña, which occurred during 2007-2009. The winter of 2007-08 included much stronger La Niña conditions than the following year, which barely qualified as a La Niña winter, and by some definitions was just on the cool side of the normal range. Yet in many ways the weather was much more extreme in the latter winter, with unusually heavy lowland snows in December 2008 both to the west and east of the Cascade Mountains. It is also worth noting that La Niña influences the weather for the season as a whole. While it tends to cause a decreased chance of warm, moist southwesterly flow events with heavy rains and high snow levels, and an increased chance of northwesterlies with low snow levels and copious mountain snows, there will certainly be the usual day-to-day and week-to-week fluctuations in the weather.

In summary, La Niña is liable to bring us a relatively wet fall and cool winter. While this may sound like bad news for a region that often experiences rather unpleasant weather this time of year anyway, there are some payoffs. It is obviously good news for winter sports enthusiasts, but that is not all. A greater snowpack means more water for agriculture and hydropower generation and a better overall freshwater habitat for salmon. We will review the fall and winter weather next spring, so stay tuned to see how well 2010-11 compares with past La Niña events.

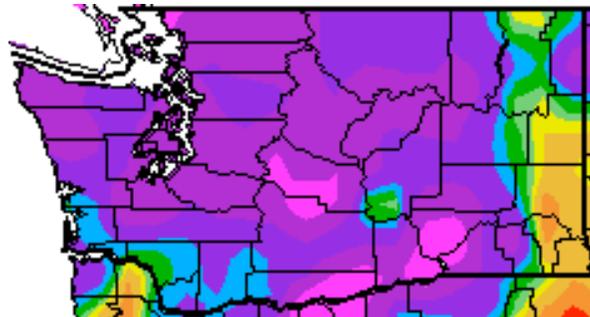
## Climate Summary

Average temperatures were generally near normal for the month of September. The High Plains Regional Climate Center (HPRCC) map below shows September temperature anomalies between 1 and 2°F below normal in parts of eastern WA and the Cascade Mountains. The northern portion of the Olympic Peninsula and the northern Puget Sound were between 1 and 2°F above normal, however, and Yakima was 2.2°F above normal (Table 2). The remainder of the state was within 1°F of normal as exemplified by most of the stations in Table 2 (e.g., SeaTac, Olympia, Vancouver, Spokane, Wenatchee, Pullman).

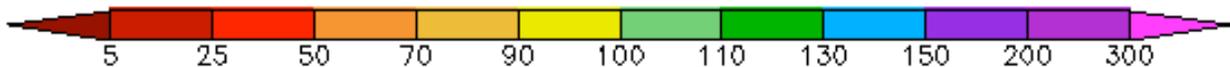
In contrast to July and August, September was a very wet month. Most of the state received more than 150% of their normal precipitation with some stations receiving 200% of normal precipitation (map and Table 2). Very far eastern WA was closer to normal, with a small portion of southeastern WA even slightly below normal (e.g., Spokane with 91% of normal).



Temperature (°F)



Precipitation (%)



*(September temperature (°F) departure from normal (top) and September 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 WA						
Olympia	59.1	58.3	0.8	5.80	2.03	286
Seattle	62.3	61.5	0.8	3.90	1.71	228
Sea-Tac	60.9	61.1	-0.2	4.80	1.63	294
Vancouver	64.1	63.4	0.7	2.52	0.84	300
Eastern WA						
Spokane	59.8	59.2	0.6	0.69	0.76	91
Wenatchee	62.9	63.8	-0.9	0.95	0.43	221
Omak	61.5	61.5	0.0	0.98	0.54	181
Ephrata	63.7	64.7	-1.0	0.63	0.37	170
Pullman	58.3	58.7	-0.4	0.98	0.88	111
Yakima	62.1	59.9	2.2	0.88	0.39	226

**Table 2 - September climate summaries for locations around Washington. The climate normal baseline is 1971-2000 except for: Seattle WFO (1986-2000) and Vancouver (1998-2009). Please be aware that the Seattle WFO and Vancouver climate normal periods are shorter than the usual 30-year period that is typically used for climatology.**

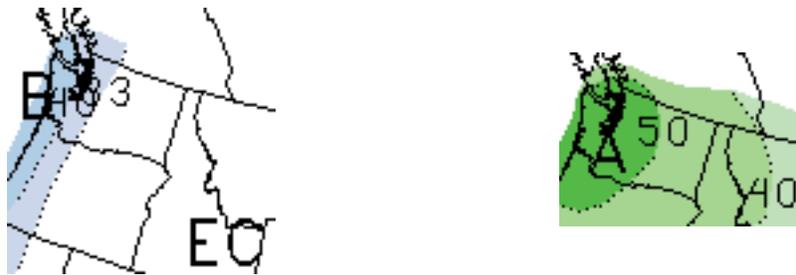
## Climate Outlook

As discussed in the La Niña spotlight article, La Niña conditions are present across the equatorial Pacific Ocean. Models are in agreement that the La Niña conditions will persist through the boreal winter, and the overall strength varies between a moderate and a strong event ([http://iri.columbia.edu/climate/ENSO/currentinfo/SST\\_table.html](http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html)). The La Niña is reflected in the Climate Prediction Center (CPC) seasonal outlooks. As a reminder, the seasonal forecasts put out by the CPC have three categories, separating the chances of below, equal to, or above normal temperatures or precipitation into equal probabilities of 33%.

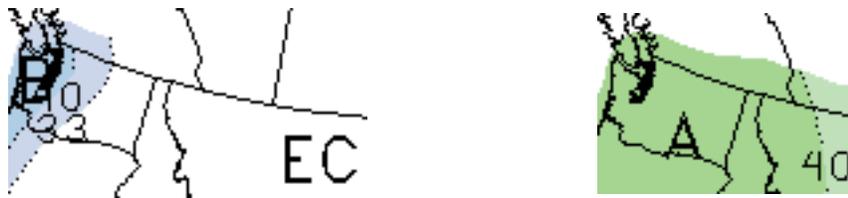
The CPC October-November-December (OND) outlook calls for at least a 33% chance of below normal temperatures for western WA and at least a 40% chance of below normal

temperatures for the Olympic Peninsula. The projection for the remainder of the state indicates equal chances of below, equal to, or above normal temperatures. Precipitation is expected to be above normal for OND, with chances exceeding 40% for eastern WA and chances exceeding 50% for western WA.

The November-December-January (NDJ) temperature outlook is very similar to the OND outlook; there is at least a 33% chance of below normal temperatures in western WA and at least a 40% chance of below normal temperatures on the Olympic Peninsula. The precipitation outlook exceeds a 40% chance of above normal precipitation for the entire state.



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



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