



## Office of the Washington State Climatologist

February 3, 2012

### January Event Summary

For January as a whole, it was cooler than normal across much of Washington. It was also mostly wet on the west side, and dry on the east side, relative to the normals for the month. More details on the overall climate and weather patterns during the month can be found in the climate summary, and in this month's highlight on the snow and icy weather in western WA.

The first day of the new year was rather mild and dry throughout the whole state. The Seattle Weather Forecasting Office (WFO) recorded a high temperature of 56°F on the 1st, setting a new daily record high. Mild temperatures continued for some locations east of the Cascades. Walla Walla recorded a record high temperature of 69°F on the 4th while Goldendale recorded a record high of 54°F on the same day. The pleasant weather did not last long in western WA, however, with the arrival of a wet and windy storm on the 2nd, and another low pressure system that brought heavy rain on the 4th. Heavy rain tapered to showers in western WA for the next several days until a large ridge of high pressure started to build on the 10th.

As during much of December 2011, this ridge brought a dry spell featuring air stagnation advisories from the 11th through the 14th. Fog was also common over this period. A shift in the weather pattern occurred on the 14th though, as wintry weather descended on the state. Details of how this event played out in western WA are described in a separate section of this newsletter. This event impacted eastern WA as well, mainly from the 17th through the 20th. Heavy snow fell on the 18th, setting record daily 24-hr snowfall at Grand Coulee Dam (5"), Lind (6"), Odessa (5"), and Lacrosse (12"). Note that these records are not for the calendar day as the measurements are taken in late afternoon. The Lacrosse record is the most snowfall in a 24-hr period since records began in 1931. Snow continued into the 19th, setting new 24-hr snowfall records at Mazama (7.6"), Conconcully (7.3"), and Ritzville (6"). These stations measured daily snowfall totals in the morning hours of the 19th.

Meanwhile, precipitation changed to rain for most locations west of the Cascades on the 20th while it continued to snow on the east side of the mountains. The snow changed to rain for the whole state over the weekend (21/22), causing some minor flooding issues. Overall, the month ended on a wet note, with several systems bringing precipitation as rain on the west side of the Cascades and as snow on the east side.

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## Climate Summary

Average January temperatures were at least 1°F below normal throughout most of Washington, with some locations, such as Olympia, SeaTac, and Wenatchee, between 1 and 3°F below normal (Table 1). Omak was a cool spot for the state, with an average January temperature 3.3°F below normal. Other locations in the state had close to normal January temperatures, such as Spokane, Bellingham, and Vancouver (Table 1). Very few of the population centers exceeded 1°F above normal despite a good portion of southeastern WA residing in the 0-3°F bracket in the temperature departure map from the High Plains Regional Climate Center below.

The precipitation anomalies for January varied throughout the state, making it difficult to make generalizations for the area. The map below shows the January precipitation percent of normal from the High Plains Regional Climate Center. Most locations east of the Cascades had below normal precipitation, with Grant County as the dry spot with less than 50% of normal precipitation. Ephrata, for example, only received 26% of its normal January precipitation (Table 1). The dryness in this and the surrounding areas in combination with the dry conditions over the last 90 days or so prompted the US Drought Monitor to label this area with moderate drought (Figure 1). For January, the San Juan Islands and western Whatcom County had between 50 and 70% of normal precipitation (Bellingham - 66% of normal; Table 1). There were pockets of below normal precipitation (between 70-90% of normal) dispersed throughout western and central WA, but otherwise those areas received close to normal to above normal precipitation (between 90 and 130% of normal). Western Okanogan County and western Whitman County received much above normal January precipitation (150-200% of normal), with an area in southwestern WA receiving between 200 and 300% of normal precipitation.

The snow event summarized in the highlight below resulted in extraordinary percent of normal snowfall numbers for western WA locations (1012% of normal snowfall for Olympia AP, for example). While Spokane had near-normal snowfall, numbers that were available for some other eastern WA locations also showed above normal snowfall for January. For example, Yakima and Pasco had 306 and 417% of normal snowfall, respectively (Table 1).

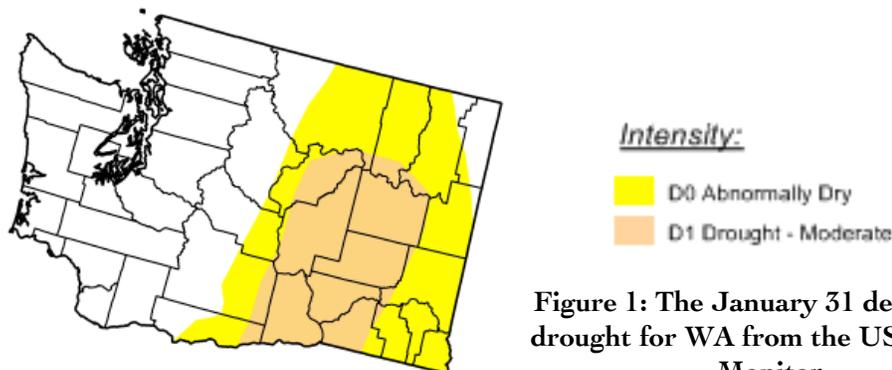
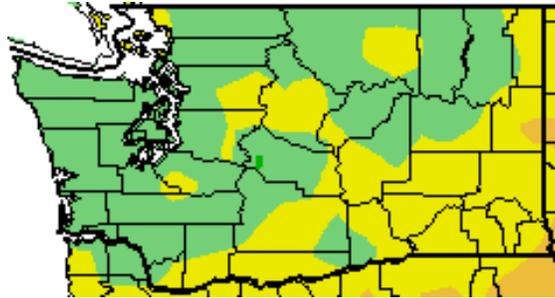
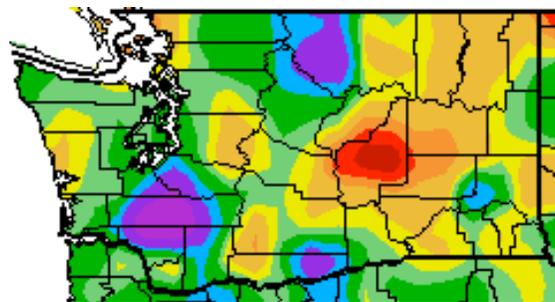


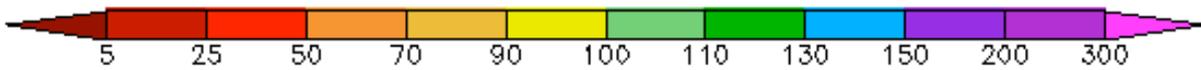
Figure 1: The January 31 depiction of drought for WA from the US Drought Monitor.



Temperature (°F)



Precipitation (%)



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

	Mean Temperature (°F)			Precipitation (inches)			Snowfall (inches)		
	Avg	Norm	Departure from Normal	Total	Norm	% of Norm	Total	Norm	% of Norm
Western Washington									
Olympia	37.4	39.8	-2.4	8.72	7.84	111	16.2	1.6	1012
Seattle WFO	40.3	42.1	-1.8	5.26	4.81	109	7.7	0.4	1925
Sea-Tac	39.7	42.0	-2.3	6.83	5.57	123	9.6	1.4	686
Quillayute	40.1	41.6	-1.5	15.59	14.61	107	M	2.0	-
Bellingham AP	39.3	39.2	0.1	3.09	4.67	66	M	3.4	-
Vancouver	40.9	41.6	-0.7	6.61	5.50	120	M	M	-
Eastern Washington									
Spokane AP	30.0	29.5	0.5	1.81	1.79	101	11.8	11.4	104
Wenatchee	27.6	29.5	-1.9	0.95	1.06	90	M	9.8	-
Omak	23.5	26.8	-3.3	1.12	1.69	66	M	M	-
Pullman AP	32.5	31.6	0.9	2.89	1.82	159	M	M	-
Ephrata	27.7	28.8	-1.1	0.24	0.91	26	M	4.8	-
Pasco AP	33.9	35.5	-1.6	1.01	1.08	94	2.5	0.6	417
Yakima AP	29.4	31.0	-1.6	1.18	1.15	103	16.2	5.3	306

**Table 1 - January 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.**

## Snowpack

Despite the continuation of drier than normal conditions in some parts of the state, the snowpack is in pretty good shape at the time of this writing. The storm systems that impacted the state in mid-January dumped several feet of snow in the mountains, helping to build the snowpack. Figure 2 shows the snow water equivalent (SWE) percent of normal as of 2 February from the National Resources Conservation Service (NRCS). Eight WA basins have normal snowpack for this time of year ranging between 90 and 109% of normal: Olympic, Central Puget Sound, South Puget Sound, Lower Columbia, Central Columbia, Upper Yakima, Lower Yakima, and Lower Snake. The other 3 basins are not much different. The North Puget Sound basin is slightly above normal, with 111% of normal SWE. The north-eastern WA basins are slightly below normal with the Upper Columbia and Spokane basins at 88 and 87% of normal SWE, respectively.

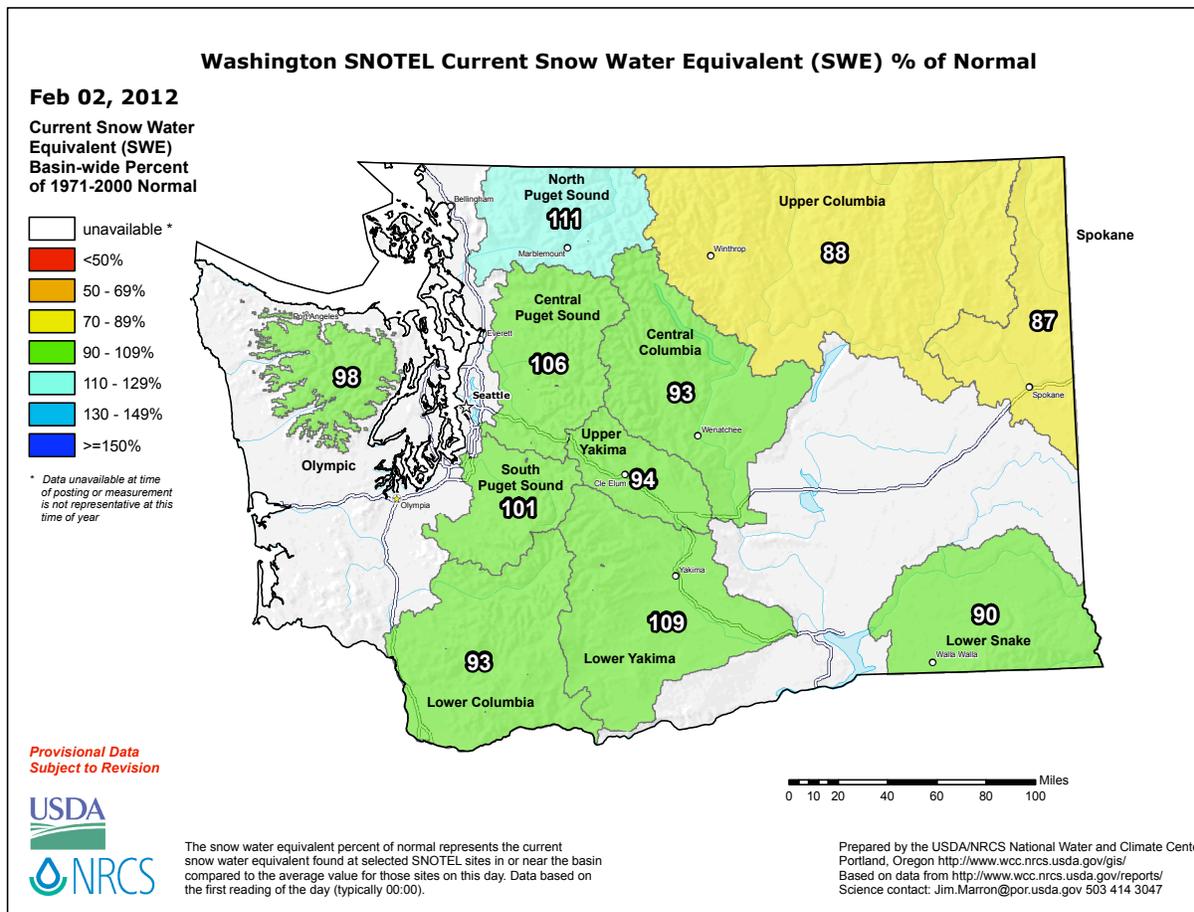


Figure 2: Snowpack (in terms of snow water equivalent) percent of normal for Washington as of February 2, 2012. Image is from the National Resources Conservation Service.

## The Western WA Snow and Ice Event of January 2012

The period of 14-19 January 2012 featured some heavy snowfall, and significant freezing rain, in the lowlands of western Washington. An overview of the meteorology behind this event, snowfall totals, and some of the local impacts of the week of wintry weather will be explored in this newsletter highlight. A comparison is also made with the ice storm of December 1996. This summary can also be found in the "Climate Events" section of the OWSC website: <http://climate.washington.edu/events/2012snow/>.

Tables 2, 3, and 4 show snowfall totals for locations in the south and central Puget Sound region. The tables are separated based on the meteorological networks that the information came from. Table 2 shows snowfall totals from ASOS instrumentation: the observations are taken from midnight-to-midnight, so the daily amounts listed are for the calendar day. Table 3 consists of cooperative observer (COOP) stations where snow records existed for the time of interest: the times of these observations vary by volunteer observer and are listed in the Table. Table 4 lists observations taken by Community Collaborative Rain, Hail and Snow (CoCoRaHS) volunteers: these are 24-hr observations generally taken between 6 and 9 am on the date that the snow total is listed under. As evident by these tables, lowland locations in Thurston and Lewis County as well as Forks (in Clallam County) received the most snow from this event with some places measuring over 2 feet of snow in a 5-day period. The evolution of this weather event and potential long-term records that were broken are described below.

Snow showers were hit and miss across western WA over the Martin Luther King Jr. holiday weekend (14-16 Jan), with some areas receiving substantial snowfall where a convergence zone developed. For most Puget Sound locations, the most intense of these snow showers were on the 15<sup>th</sup> (Tables 2, 3, and 4), with accumulation ranging between half an inch to 3

inches. The approach of a low pressure system to the south of WA and northerly winds helped draw cold air down from Canada on the 17<sup>th</sup> setting the stage for a more widespread snow event. The warm front associated with the low pressure spread precipitation into western WA on the 18<sup>th</sup> – overrunning the cold air at the surface and causing the precipitation to fall as snow. The heaviest lowland snow fell in the southern Puget Sound with 1-day totals of about a foot in Lewis and Thurston Counties (Table 4). The photo (from KOMO news:



<http://www.komonews.com/news/local/Region-digs-out-from-largest-snow-storm-in-years-137619413.html>) shows a resident of Olympia clearing heavy snow from his driveway on 18 Jan.

Were the 1-day snowfall totals measured on the 18<sup>th</sup> record-breakers? Unfortunately, long snowfall records are hard to come by. Often, many years are missing within the record. With

these caveats in mind, the 18 January snowfall at Olympia Airport (11.0) ranks as the 3<sup>rd</sup> most accumulation in a single day since 1948 (not a continuous record). Since the CoCoRaHS observations are relatively new to WA State (since 2008 with new observers added all the time), those records need to be compared to other nearby stations with longer records to get an estimate of whether record snowfall occurred. Those comparisons indicate that the 24-hr snowfall measured on the morning of 18 Jan rank as a record for several locations in Lewis County and one in Grays Harbor County. The Montesano 4.2 ESE (10.2"), Winlock 0.5 W (16.0"), Curtis 1.3 SW (14.2"), and Chehalis 1.4 SSE (14.0") CoCoRaHS stations were compared to the COOP records at Elma, Toledo, Doty, and Centralia, respectively, and all of the 18 Jan measurements are higher than any other 1-day snowfall measurement since records began. Despite the missing years of data, there is still good evidence that the 18 January snowfall was among the top 1-day snowfall amounts in that region. Records began in 1943, 1948, 1979, and 1902 at Elma, Toledo, Doty, and Centralia, respectively.

Precipitation continued on 19 January, and with the cold air still in place in the central and northern Puget Sound, much of that precipitation fell as freezing rain or snow. The freezing rain was especially severe south of the Seattle metro area and is perhaps the more unusual aspect of this event. Over 250,000 customers lost power in King, Pierce, Thurston, and Snohomish Counties (Seattle Times, 1/19/12) due to downed trees affecting power lines. The WA Governor proclaimed a winter storm emergency on the 19<sup>th</sup> to enable state agencies to use funds for assisting local communities and to ensure that milk was delivered statewide by waiving restrictions on dairy truck driver's work hours. The weather provided relief on the 20<sup>th</sup> for much of western WA when a deeper warm layer of air moved in changing precipitation to rain. Many WA residents remained without power for several days after the freezing rain ended, however (Seattle Times, 1/25/12).

Freezing rain is a relatively rare weather hazard for western WA except for in the immediate vicinity of the Columbia River gorge. Over the last few decades, there has been one case that resembles the recent event and that is the ice and snow storm of 26 December 1996. The set-up for this storm featured cold but not frigid air of Canadian origin over WA, with a surface low pressure center approaching the mouth of the Columbia River from the west. The precipitation began as snow in the central Sound and freezing rain in the south Sound during the late night/early morning hours on the 26<sup>th</sup> before transitioning to mostly freezing rain from Seattle southward. Precipitation rates reached as high as 1" in 6 hours in Tacoma. As in the January 2012 case, the cold air was deep enough to yield all snow from Everett north. There are also striking similarities in the contrast between the afternoon conditions at Hoquiam, WA versus those at Astoria, OR. During both events, Hoquiam experienced winds from the east and northeast and temperatures in the low 30s, while a mere 60 miles south Astoria had high temperatures in the low 50s, heavy rain and southerly winds. As might be expected, the freezing rain had implications in terms of tree damage and downed power lines for both events. Airport operations at SEA were hampered, to put it mildly. All in all, the duration, intensity, and area covered by the ice storm in December 1996 was greater for the region than any event going back to at least 1928. There are differences between the two cases in the weather that followed. The December 1996 ice and snow storm was followed by about a day and a half of dry, but cold weather before another storm moved in off the Pacific. This later storm was deeper and tracked farther to the north, and produced snowfalls of a foot or more from the

evening of the 28<sup>th</sup> into the morning of the 29<sup>th</sup> before a changeover to rain of moderate to heavy intensity. While our recent event did not exactly end with a whimper, given the blustery southerly winds on its heels, it was nothing like the bang of the warm up in 1996. The combination of all that ice and snow followed immediately by rain at rates of typically 0.1 to 0.2” per hour caused all kinds of problems including collapses of marinas, carports and other structures, urban flooding and major landslides.

The snow and ice storm of January 2012 was one of the highest impact weather events for western Washington in the last few years. It should be recognized that these impacts were minimized by the timely warnings from the National Weather Service and relatively effective and rapid responses by transportation departments and utilities. A small percentage of those that lost power had to wait a number of days for it to be restored. At least in part, that can be attributed to additional outages caused by strong southerly winds after it had warmed. We do not know if all the publicity last fall about a La Nina winter coming up had anything to do with the readiness, but it does seem that the region mostly “weathered” the storm.

	14 Jan	15 Jan	16 Jan	17 Jan	18 Jan	19 Jan	Total
SeaTac AP	T	2.4	0.1	T	6.8	0.3	9.6
Seattle WFO	0.2	1.8	T	0.8	2.7	2.2	7.7
Olympia AP	T	2.0	1.2	T	11.0	0.0	14.2

**Table 2: Calendar day (midnight-to-midnight) snowfall totals (inches) for SeaTac Airport, the National Weather Service Forecasting Office in Seattle, and Olympia Airport. The highlighted value indicates near-record snowfall.**

	Stn ID	15 Jan	16 Jan	17 Jan	18 Jan	19 Jan	Total	Time of Obs
Cushman Powerhouse 2	451939	0.2	T	0.5	7.0	1.5	9.2	5 pm
Forks 1 E	452914	9.0	4.0	10.5	4.0	-	27.5	4 pm
Indian Summer Golf Course	453915	1.0	0.5	1.0	10.5	2.0	15.0	8 am
Mc Millin Reservoir	455224	2.0	1.0	1.0	4.0	-	8.0	9 am
Poulsbo 1 NW	456706	T	0.1	T	1.7	3.0	4.8	6 am

**Table 3: 24-hour snowfall totals (inches) for 5 stations in western WA along with the time that the observation was taken. Note that Cushman Powerhouse is near Shelton, Indian Summer Golf Course is near Olympia, and Mc Millin Rsvr is east of Lakewood.**

	County	15 Jan	16 Jan	17 Jan	18 Jan	19 Jan	Total
Ocean Shores 1.2 N	Grays Harbor	2.2	1.2	0.8	9.7	2.4	16.3
Montesano 4.2 NW	Grays Harbor	1.8	0.7	3.2	3.7	4.5	13.9
Cosmopolis 6.0 SE	Grays Harbor	4.3	1.5	1.8	10.0	0	17.6
Montesano 4.2 ESE	Grays Harbor	4.9	0.5	0.5	10.2	0	16.1
Renton 3.2 E	King	0	3.5	0.8	1.5	1.8	7.6
Mercer Island 1.5 NW	King	0	1.8	0	1.0	2.5	5.3
Bellevue 0.8 S	King	0.1	1.5	0	2.0	3.0	6.6
Sammamish 1.7 NNE	King	0.8	2.7	T	1.0	3.8	8.3
Onalaksa 2.8 NE	Lewis	4.0	1.5	5.7	13.5	1.5	26.2
Winlock 0.5 W	Lewis	1.6	0.6	7.4	16.0	2.0	27.6
Curtis 1.3 SW	Lewis	2.7	T	0.5	14.2	0	17.4
Mineral 0.2 S	Lewis	6.3	1.4	11.2	11.5	0	30.4
Chehalis 1.4 SSE	Lewis	M	M	M	14.0	0.2	-
Cinebar 1.7 SW	Lewis	3.0	2.0	5.5	9.0	0	19.5
Tacoma 3.1 NW	Pierce	0.3	0.6	1.1	3.1	6.9	12.0
South Hill 3.3 WSW	Pierce	0.5	0.5	1.5	4.0	1.0	7.5
Steilacoom 0.4 NW	Pierce	0.5	1.0	0.2	5.8	2.2	9.7
Olympia 1.3 S	Thurston	3.5	0	3.6	6.8	5.3	19.2
Rochester 1.3 NNE	Thurston	3.0	0.4	3.5	9.0	4.0	19.9
Olympia 6.5 SW	Thurston	2.7	2.2	7.5	14.2	3.3	29.9
Olympia 7.0 NNE	Thurston	0.3	0.3	2.0	8.0	2.0	12.6

Table 4: 24-hour snowfall totals (inches) ending between 6 and 9 am on the day listed from CoCoRaHS observers. The highlighted values indicate near-record snowfall.

## Climate Outlook

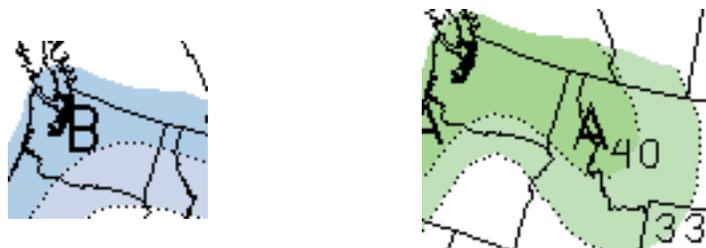
The weak-to-moderate La Niña is still present in the equatorial Pacific Ocean according to the CPC (<http://www.cpc.noaa.gov/products/precip/CWlink/MJO/enso.shtml>) and the La Niña Advisory that was issued in early September is still in effect. A majority of the ENSO forecast models indicate a continuation of the current La Niña into the spring with some weakening, followed by near-normal conditions in summer and autumn of 2012.

The February CPC temperature outlook has equal chances of below, equal to, or above normal temperatures statewide. In other words, the probability is split evenly into a 33% chance for each of the three outcomes. The odds are the same for the February precipitation outlook, with equal chances of below, equal to, or above normal precipitation. At the time of this writing (2 February), there is a consensus among the Numerical Weather Prediction (NWP) model runs available that a prominent ridge of high pressure will bring relatively dry weather to the state for the next 7-10 days. There is no reason to expect that conditions will last as long as they did in December 2011.

For the CPC 3-month seasonal outlook (February-March-April; FMA), however, below normal temperatures are expected for the whole state, with chances exceeding 40% for western and northeastern WA using the three-class system. The FMA precipitation outlook indicates increased chances of above normal precipitation for the whole state (exceeding 40% on the three-class system).



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



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