The Inland Northwest Informer

Information For Storm Spotters, Cooperative Observers And Everyone

A Publication Of WFO Pendleton, Oregon

Spring/Summer 2016 - Volume 18

Snow and Wind Event of December 2015

By Doug Weber, Meteorologist

On December 21st and 22nd 2015 a powerful low pressure system tracked across southern Washington State bringing rain, heavy snow and damaging winds to much of the National Weather Service (NWS) Pendleton's forecast area (CWA). Heavy snow was reported over the East Slopes of the Washington & Oregon Cascades, the Kittitas & Yakima Valleys, parts of Central Oregon, and the Blue & Wallowa Mountains. In addition to the snowfall, strong wind gusts and wind damage was reported in central & north-central Oregon, the Columbia Gorge, the Columbia Basin of Oregon, and the Blue Mountain Foothills. Numerous watches, warnings and advisories were posted prior to and during this event.

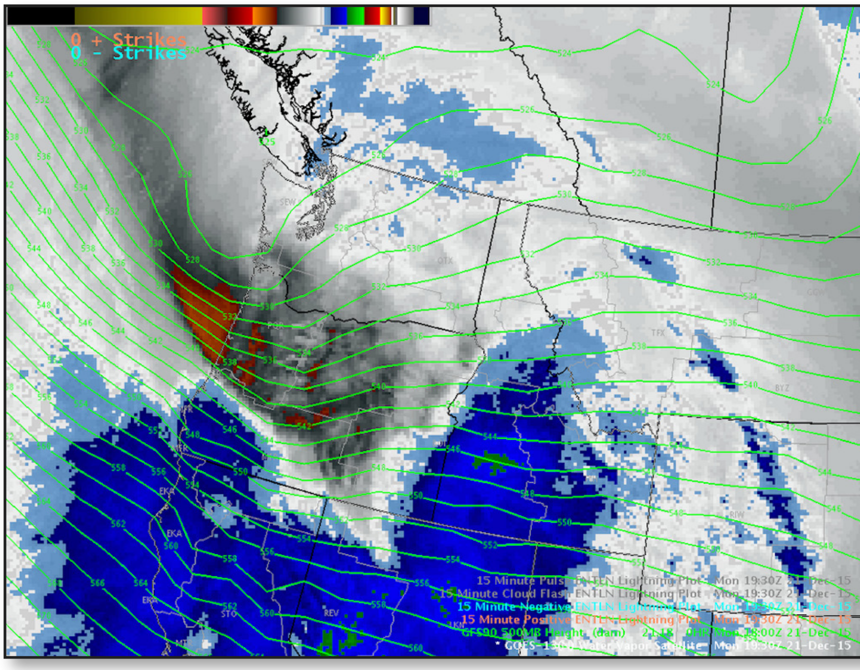

Figure 1. A well-defined shortwave trough digging through the area on the water vapor imagery from 1930 UTC.

This was a well-defined storm system on both satellite and radar (Figures 1 and 2). A deep surface low pressure system centered near Astoria, OR moved to just north of Pasco, WA during this event. The surface low was analyzed at 986 mb near Astoria and 987 mb near Pasco, WA. Much of the steady and even heavy stratiform precipitation occurred along a warm front that moved through the area during the morning and midday hours on December 21st. A powerful cold front moved through during the afternoon and evening hours of December 21st. This is what brought the strongest winds to the affected areas. Lingering winds and mountain snow showers continued into December 22nd behind the cold front.

Between the high wind and heavy snow event, we issued 23 total warnings. We got the message out early for the High Wind Warnings. The overall average heads up we gave the public was 23 hours and 15 minutes. High wind reports ranged from: 48 kts to 79 kts. Additionally the OR Cascade east slope had reports of trees down and damage. For the Winter Storm Warnings, the overall average heads up we gave the public was 25 hours and 30 minutes. Heavy snow reports ranged from as high 14 inches in the Blue Mountains, to 5.5 inches in the Kittitas Valley.

This was a complex, rare and intense weather event for the NWS Pendleton's area. It is not very common for a 986 mb low pressure system to track over the Columbia Basin. The strongest winds from this system generally occurred along and just behind the cold front (within the area of rapid pressure rises, dry mid-level air, and strong cold air advection). There was just enough cold air trapped along the East Slopes of the Washington Cascades,

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Yakima and Kittitas valleys to allow for a heavy, wet snow to fall. This ended up being a ‘perfect storm’ as the marginally cold air combined with moderate to heavy warm frontal precipitation to bring warning criteria snow to these zones.

Overall both the model guidance (Figure 3) and the NWS forecasts handled this weather event well. NWS Pendleton was able to issue watches, warnings, advisories and decision support information with ample lead time, in the right locations and for the correct time period. This weather event had the added challenge of having both warning criteria snow and winds within the Pendleton CWA. ❖

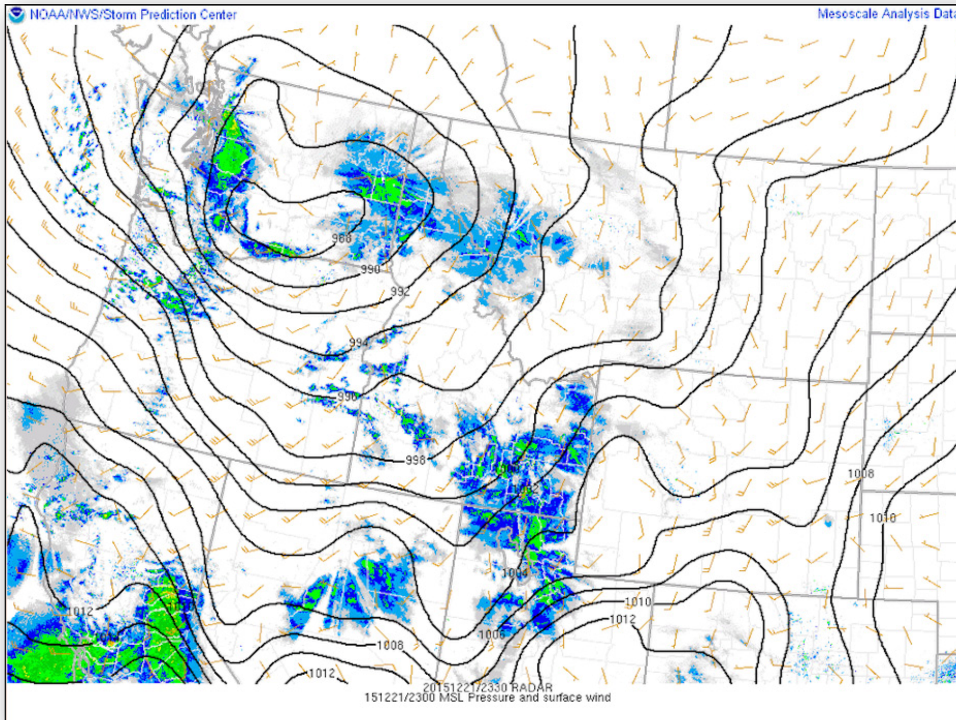

Figure 2 (right). Surface pressure in millibars (mb) with the radar data overlaid at 2330 UTC. Central pressure about 987mb just west of Pasco.

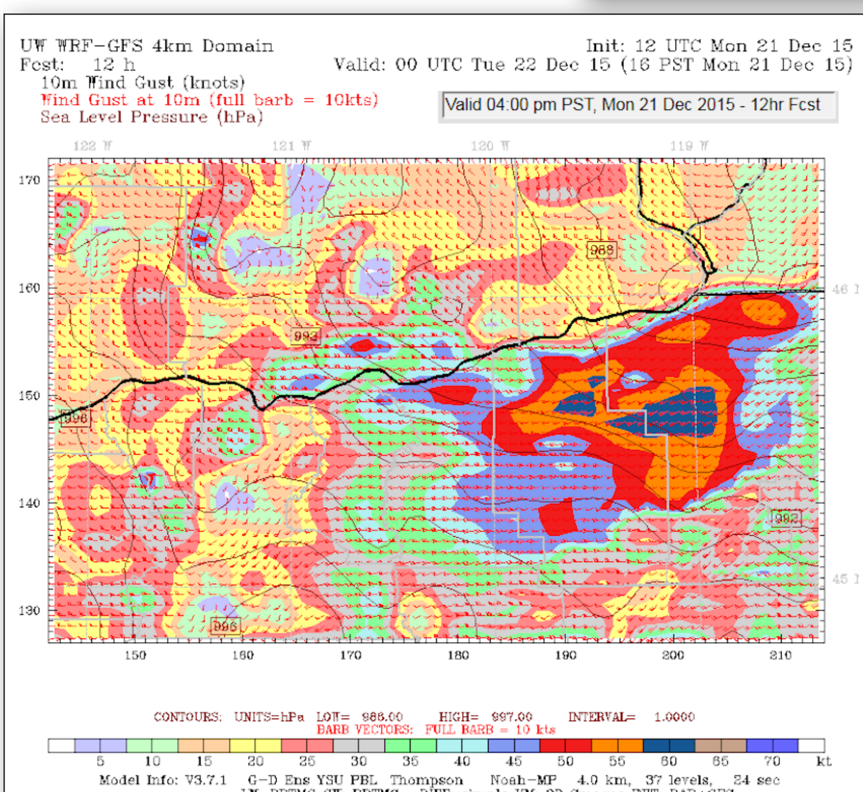

Figure 3 (left). The 0000 UTC wind gust forecast by the 4 km GFS model. See the large area of wind gusts greater than 50 kts (red, orange, dark blue) over the Oregon Basin and Foothills. Several wind gusts between 52 and 79 kts were observed in the mentioned area during the forecasted time period. This suggests that the model not only did well on pinpointing the area, but even had some bullseyes greater than 70 kts as we had 79 kt gusts recorded.

Climate Summary & Outlook
La Niña Likely to Develop

By Michael Murphy, Meteorologist

The winter of 2015-2016 will be remembered as a strong El Niño winter. The Oceanic Niño Index or ONI peaked in the three month period from November through January at +2.3°C, this tied 1997-98 as the highest ONI since records began in 1950. The Niño 3.4 region may have actually recorded a record high sea surface temperature anomaly, but as figure 1 shows, the uncertainty with the precision of the measurement prevents the announcement of an unequivocal record being set, although it appears 2015-16 may have just peaked out ahead of 1997-98 by a few hundredths of a degree.

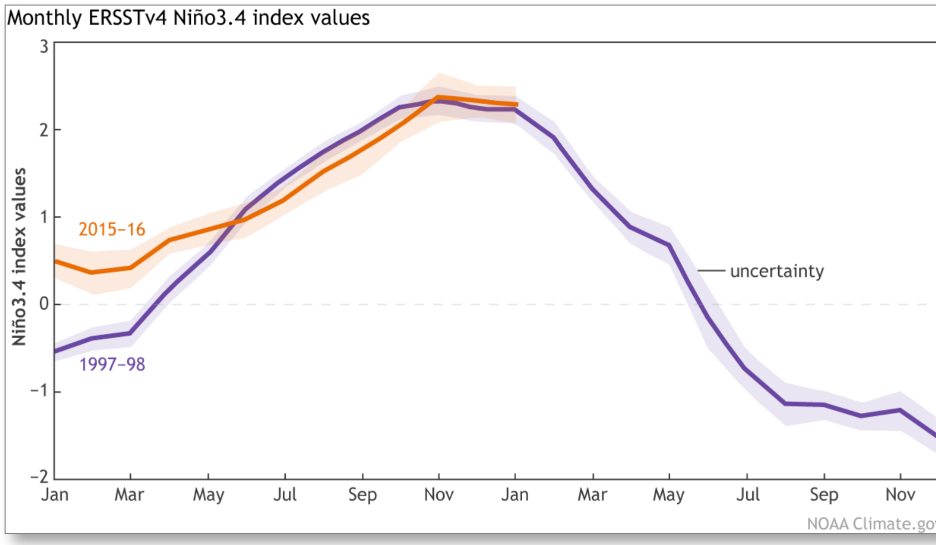

Figure 1: *Monthly Niño 3.4 index values for 2015-16 (Orange) and 1997-98 (purple). Uncertainty is shaded for both years.*

Regardless of whether the 2015-16 El Niño was a record breaker or not, it certainly impacted weather patterns across North America; in both anticipated and unforeseen ways. Some areas across the Western US did in fact receive much needed, drought busting precipitation, such as here in the Pacific Northwest. Meanwhile, other areas, which typically do well in a strong El Niño situation, such as Southern California did not receive the ample amounts of the precipitation that was projected heading into the winter months last year.

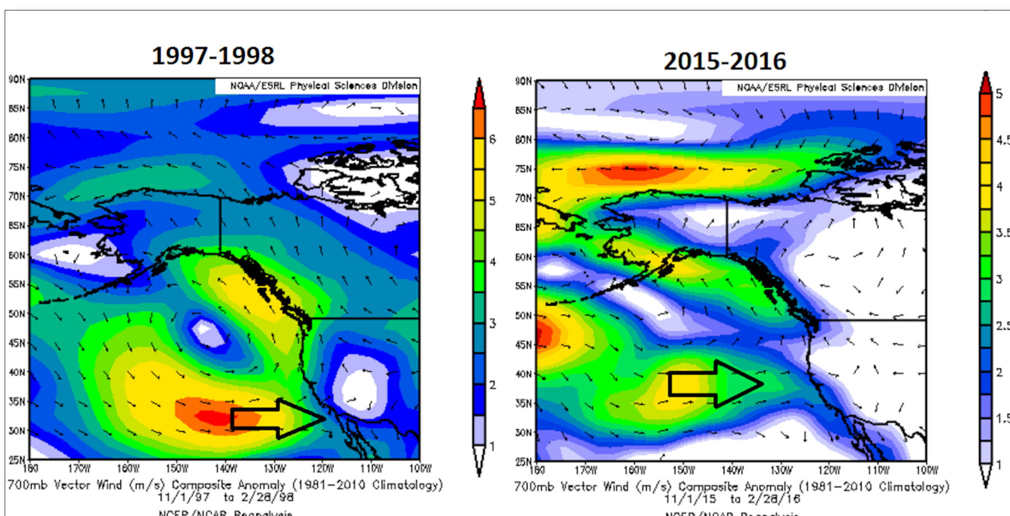

***Figure 2**: 700mb wind anomalies from November to February 1997-98. (Right) 700mb wind anomalies from November to February 2015-2016. Note that the wind anomalies were greater magnitude & further south in 1997-98 compared to 2015-16.*

It's important to keep in mind that the climatic record for strong El Niño events is short, only going back 50 to 100 years at best. During this time period there have only been a handful of strong El Niño events observed, and each of these strong events was characterized by a slightly different precipitation pattern across the United States. This past winter, there was indeed an enhanced jet stream over the Pacific Ocean, as expected. However, unexpectedly other factors shifted this jet stream, and associated moisture plume further north than just about any other strong El Niño event on record. This put Northern California and the Northwest in the bullseye for the heaviest and most persistent rounds of precipitation, while leaving Southern California relatively dry. Since the beginning of the water year on October 1st 2015 through the winter months the drought monitor has shown considerable improvement across much of the Pacific Northwest, with modest improvement southward

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into Northern California and Nevada. April was a very warm and abnormally dry month across the Northwest, and this acted to melt much of the lower and mid elevation snowpack that had been present earlier in the spring. May saw a return to a wetter and cooler spring weather pattern across the Northwest, helping to improve the prospects for a sufficient water supply through the summer months. See figure 3 for more details.

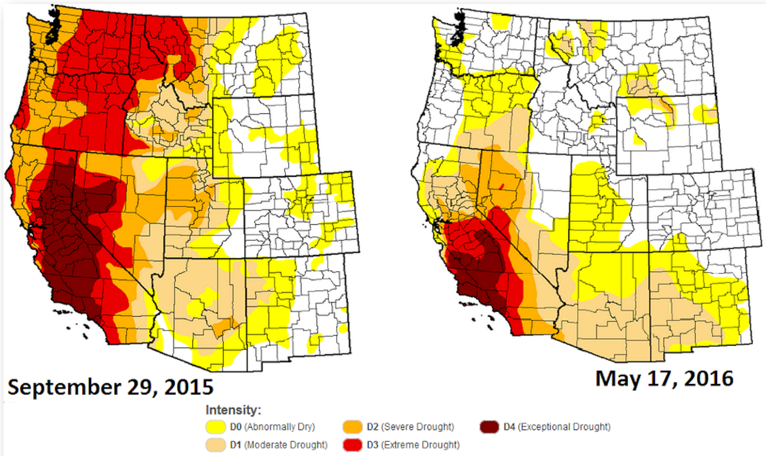
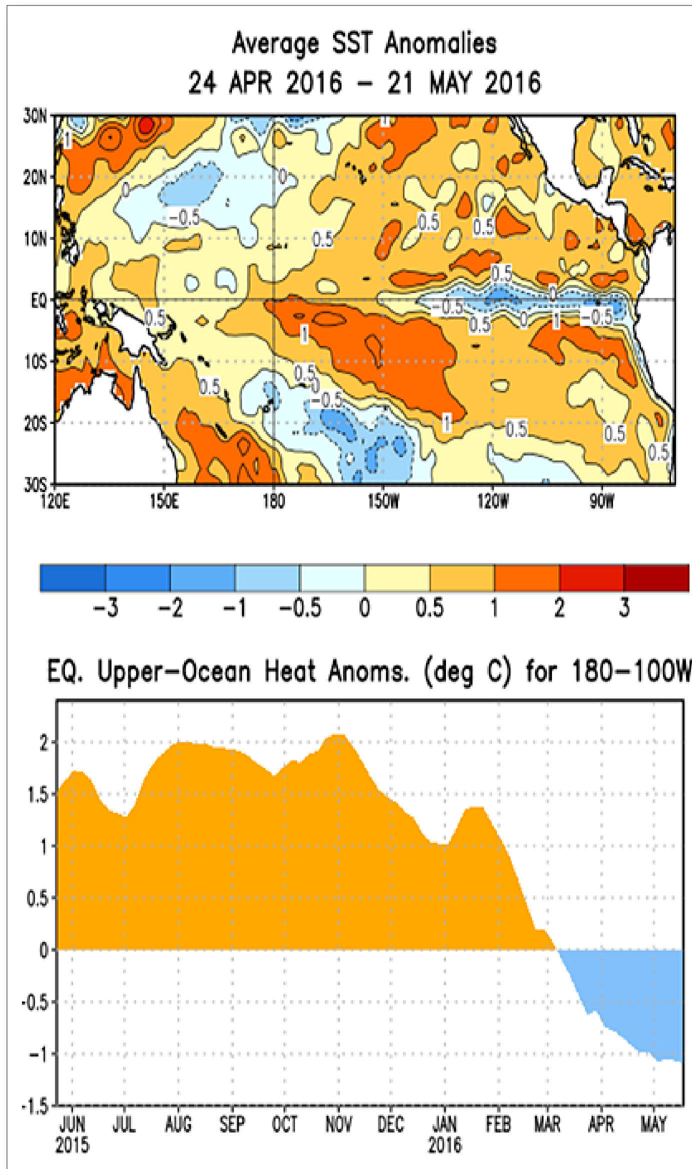


***Figure 3** (above): Western drought monitor from September 29th 2015 and May 17th 2016 showing improvement in water supply for some areas, namely the Northwest and Intermountain West. The drought lingers on in the southwest and especially southern California.*

Well, that's enough about what happened this past winter and spring. Let's now look ahead to what could be coming our way for the summer months and into the fall/winter of 2016-2017. The latest update from the Climate Prediction Center (CPC) indicates the previous strong El Niño is now on a rapid decline in the Equatorial Pacific, with below average sea surface temperatures beginning to appear along the Equator out to about 150° west. The subsurface ocean temperatures within the top 300 meters have also shown an abrupt cooling trend since the start of March. This is a clear indicator of change, as the previous strong El Niño now transitions quickly to a La Niña oceanic pattern. The CPC states that there is approximately a 75 percent chance for La Niña conditions to develop by the fall or winter 2016-17. Therefore a La Niña watch has been issued. La Niña's typically do not have a significant impact on the summer weather patterns across North America (see figure 7). However, the impacts do begin to develop during the fall and winter months, when the Pacific Northwest typically sees cooler and wetter than average conditions. This can lead to increased snowfall, especially in the mountains, as the Pacific Jet moves over the area. For the latest details on El Niño or La Niña, visit www.climate.gov/enso .❖

***Figure 4** (right): Average Sea Surface Temperature Anomalies (top) over the Equatorial Pacific during the period from April 24 2016 to May 21 2016. Upper-Ocean (0-300m) Heat Anomalies (lower) from June 2015 through Mid-May 2016, note the significant downward trend by the beginning of March.*



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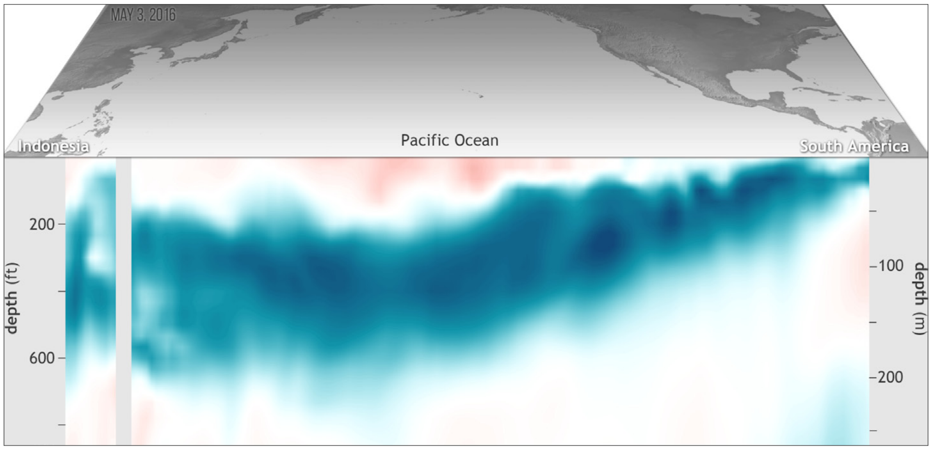


Figure 5 (left): *Graphical representation of sub-surface sea temperature anomalies across the Equatorial Pacific, from 0-300m depths. Blues represent below average sea temperatures, while oranges and reds indicate above average temperatures. Note that the above average area and depth is now rapidly shrinking, with the above average sea temperatures now only occupying the top 50 meters in the Central Pacific. Image date May 3rd 2016.*

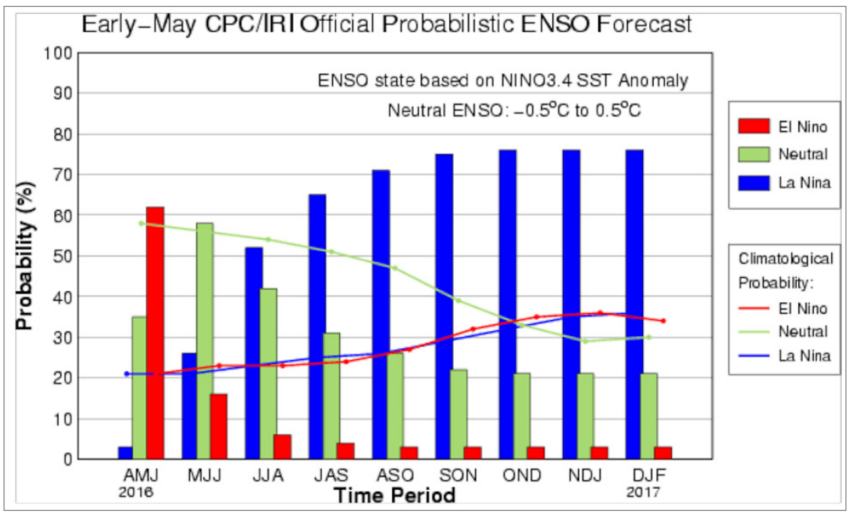
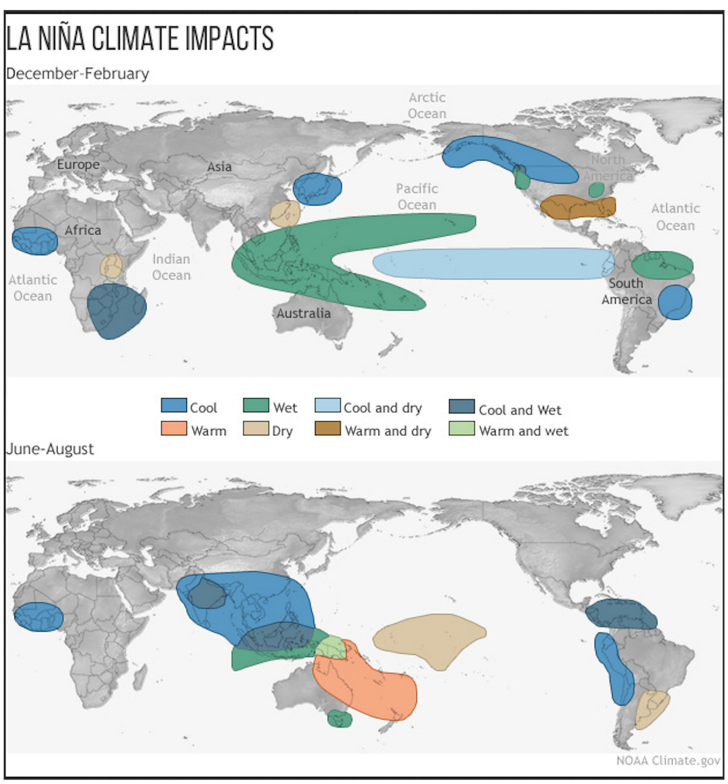
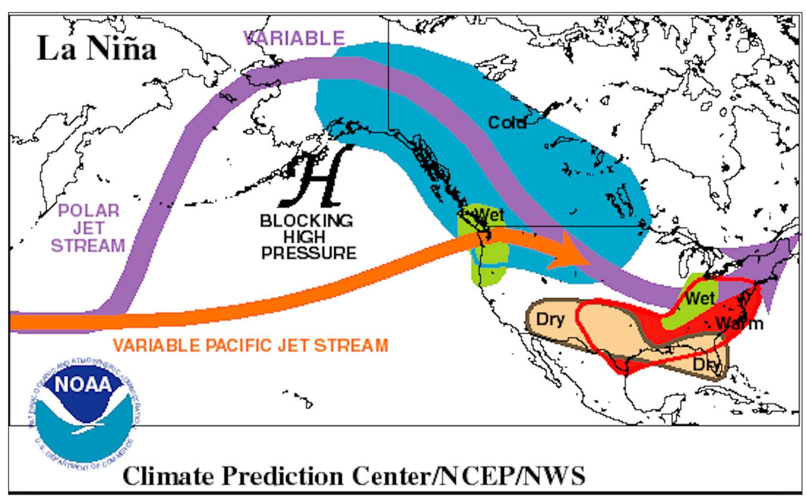


Figure 6 *(left): CPC/IRI official probabilistic ENSO forecast through DJF 2016-17. Note that the probabilities for La Niña (blue bars) increase substantially heading into the upcoming fall months, reaching 75 % by OND period.* ***Figure 7*** *(below-left): Global expected impacts during La Niña winters and La Niña Summer.* ***Figure 8*** *(below-right): Shows typical impacts over North America during a La Niña winter. The Pacific Northwest can typically expect a wet and cooler than average winter during La Niña conditions.*





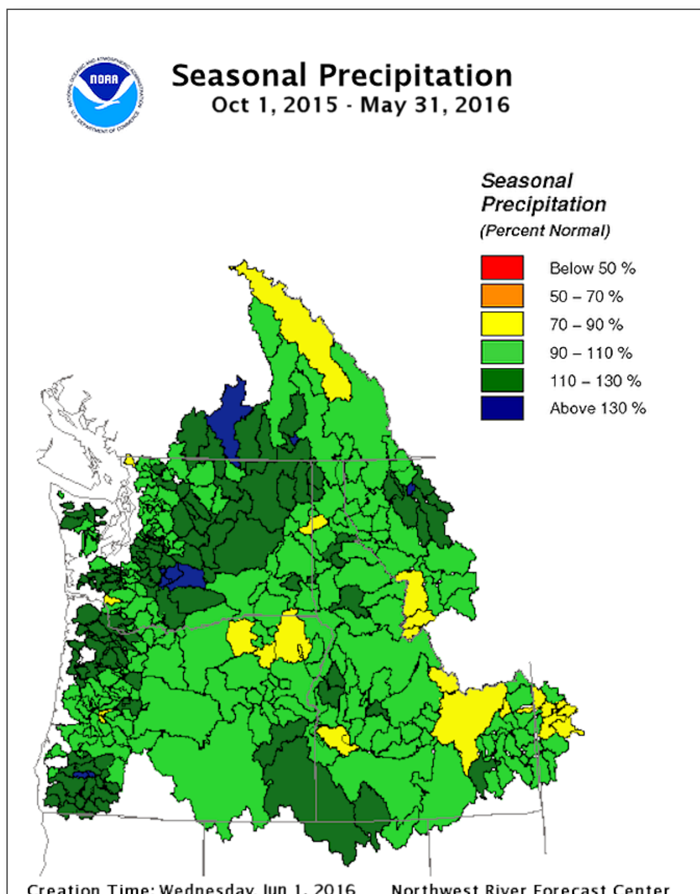
Water Year Precipitation and Snowpack Review

By Marilyn Lohmann, Service Hydrologist

Location	Amount In Inches	Percent of Normal
Bend	9.94	108%
Heppner	9.95	88%
John Day City	7.43	75%
La Grande	12.21	96%
McNary Dam	6.63	94%
Madras	6.72	79%
Meacham	32.21	116%
Milton-Freewater	13.09	97%
Mitchell 2NE	12.19	114%
Moro	11.44	117%
Pendleton Airport	10.02	94%
Prineville	9.45	111%
Redmond Airport	7.75	114%
The Dalles	16.45	125%
Wallowa	10.38	73%
Wickiup Dam	16.79	93%
Cle Elum	26.63	137%
Dayton	17.18	107%
Ellensburg	12.05	164%
Hanford	6.22	109%
Mt Adams RS	57.30	135%
Prosser	7.49	103%
Selah	11.02	159%
Sunnyside	13.12	131%
Whitman Mission	13.12	110%
Yakima Airport	10.10	149%

Overall, most locations for the water year so far, October 2015 through May 2016, reported near to above normal precipitation. The weather started off in October with drier than normal conditions over the region with exception of the Washington Cascades, where very heavy precipitation occurred at the end of the month. November had near to above normal precipitation. December was warmer and wetter than normal. January also had near to above normal precipitation followed up by drier than normal conditions in February. March was warmer and wetter than normal, while April was much drier than normal. May was much drier than normal along the Cascades with areas adjacent to the Cascades seeing above normal precipitation, while the remainder of the area had slightly below normal precipitation.

The snow season got off to a slower start in November with most mountain basins locations having 40 to 70 percent of normal snowpack by the end of the month. The Blue Mountains of Oregon fared better with amounts from 70 to 90 percent of normal. As December was wetter than normal, snowpack measurements at the end of December, showed slightly above normal amounts across the region. The snow continued in January, with month end measurements showing amounts 120 to 140 percent of normal. Snowpack amounts decreased slightly during February and March, but remained near to slightly above normal. During April, the snowpack had large decreases due to the well above normal temperatures. At the end of April, amounts had fallen to only about 50 to 70 percent of normal with a number of lower mountain sites seeing the snow depleted. Most locations saw the melt out occur about a month ahead of normal. ❖



Fire Weather Operations
Weather Balloons

By Mary Wister, Meteorologist / Incident Meteorologist

Releasing weather balloons, also known as radiosondes, is not uncommon in the National Weather Service. Upper air observations associated with radiosondes have been available since the late 1930s. Presently, there are 92 stations that routinely take upper air observations twice a day. Although radiosondes are not released at the NWS Pendleton office, upper air data can be viewed from surrounding NWS sites. The upper air data are necessary inputs into the equations that generate model data as well as upper air charts used for aviation, and the collected data can be displayed in a vertical sounding to show the current state of the upper atmosphere. The vertical distribution of temperature, dewpoint (to observe depth of moisture or dryness of the atmosphere), wind and pressure is provided on a sounding.

Over the past several years, the sampling of the upper atmosphere from radiosondes has been expanded to include similar instruments used by incident meteorologists (IMETs) during their deployment at wildfires. Thanks to GPS technology and innovative engineers, the program is relatively simple and the equipment (with the exception of helium tanks) can be easily stored in government vehicles or even taken on a plane. After the balloon is released, the program will show automatic readings every few seconds. Monitoring weather at a wildfire--not only at the surface but also the upper atmosphere--can help fire behavior analysts predict fire behavior and can help meteorologists determine the stability of the atmosphere and the strength of the winds aloft. Firefighter safety is paramount. Because weather is variable over space and time and can have a huge impact on fire spread and intensity, taking a balloon sounding will assist in fire weather operations and therefore help with firefighter safety.

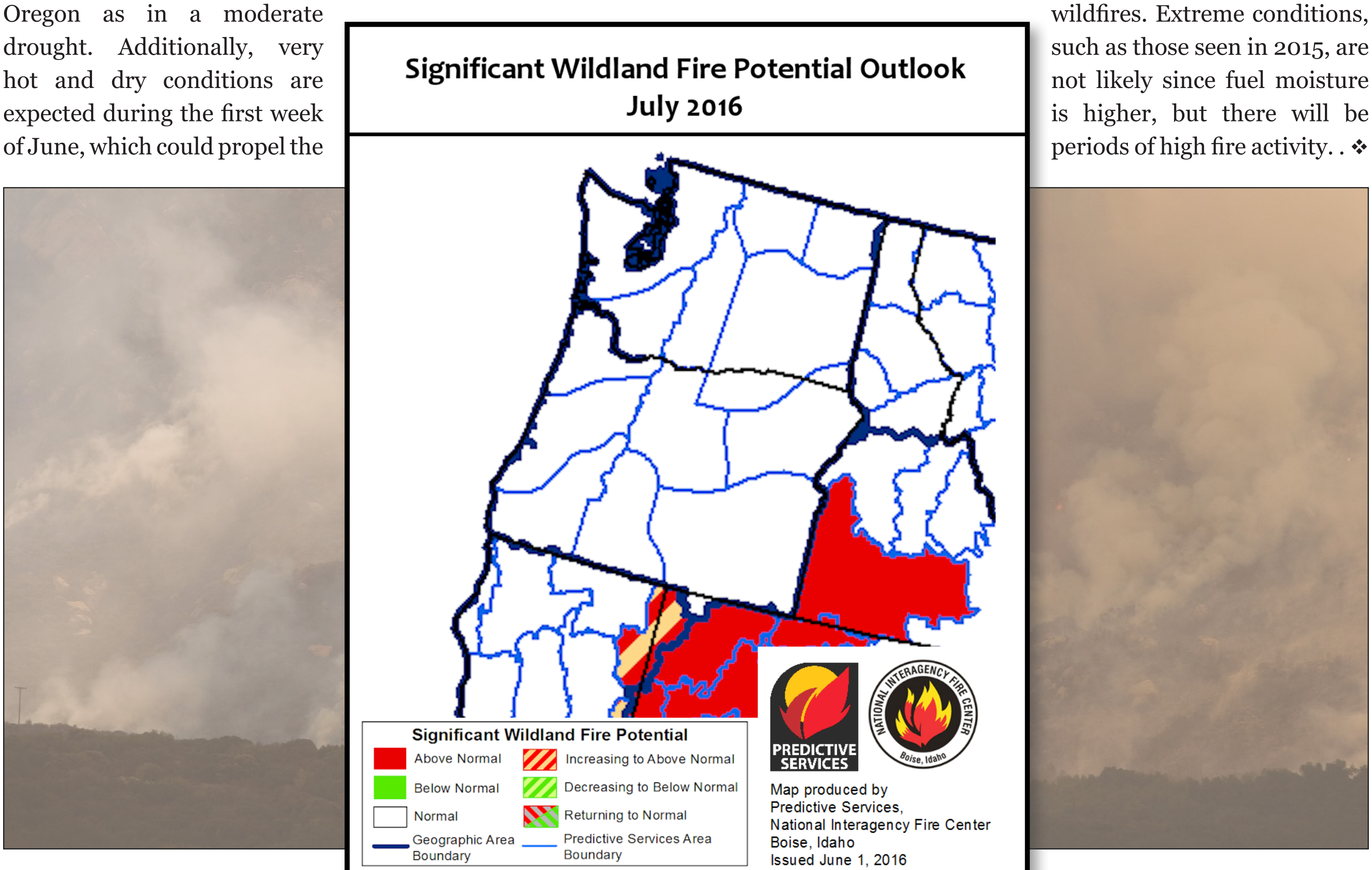
Due to the cost of each radiosonde (~$300), the balloons are often released once a day and only when there is a question about the stability of the atmosphere or when anticipating an approach of a migrating weather system. IMETs can send upper air data to surrounding NWS offices via email, and the data will soon be used as additional input into model equations. In other words, all meteorologists are excited about having additional upper air data to assist in forecasting the weather. ❖

Incident Meteorologists Phil Manuel and Scott Weishaar prepare to launch a weather balloon on the Stouts Creek Fire near Canyonville, OR. (Photo: NOAA)

2016 Projected Fire Season

By Rachel Cobb, Incident Meteorologist / Fire Weather Program Leader

The fire season is greatly influenced by weather conditions in the preceding winter and spring. Temperatures remained above normal since the beginning of 2016, and while most of Washington received above normal precipitation this winter, most of eastern Oregon did not. Portions of Crook, Baker and Malheur counties received less than 50 percent of normal precipitation since January 1st. Regional mountains received average to above average snow during the early months of winter, but a very warm spring, with record breaking temperatures in April, caused the snow to melt early. By May 1st, some areas had less than 25 percent of normal snowpack, and there have already been a few small lightning-caused wildfires in the forests. The U.S. Drought Monitor continues to designate central and northeast Oregon as abnormally dry, and southeast Oregon as in a moderate drought. Additionally, very hot and dry conditions are expected during the first week of June, which could propel the area into fire season earlier than usual. On average, fire season in northeast Oregon does not begin until July 1st, but it may be declared by mid-June this year. The Climate Prediction Center is calling for temperatures to remain above normal through the spring and summer, but the precipitation outlook is, as usual, still uncertain. However, La Nina is expected to develop by the end of summer, which could bring above normal precipitation beginning in September, thus potentially ending the season early. The average end date for a fire season in northeast Oregon is October 17th. In summary, the 2016 fire season in the Pacific Northwest is expected to be normally active as compared to previous fire seasons. Typical summer heat and dryness, coupled with drought and earlier exposure of higher elevation fuels during lightning events, could lead to a few large, costly wildfires. Extreme conditions, such as those seen in 2015, are not likely since fuel moisture is higher, but there will be periods of high fire activity. . ❖



For more information about fire weather and wildland fire management please visit the Pacific Northwest Coordination Center's website at http://gacc.nifc.gov/nwcc

NWS Pendleton Open House

By Michael Vescio, Meteorologist In Charge

The National Weather Forecast Office in Pendleton, Oregon, will hold an Open House on Thursday, October 13th as part of its continuing effort to build a Weather-Ready Nation and encourage the public to prepare for hazardous weather. Residents are invited to tour the operations center, meet meteorologists and learn how forecasters track storms and issue warnings. The event will be free and open to the public. ❖

WHAT: Open House at National Weather Service Forecast Office, Pendleton

WHEN: Thursday, October 13, 2016 from 10 a.m. to 3 p.m., rain or shine

WHERE: 2001 NW 56th Drive
Pendleton, Oregon 97801

ACTIVITIES WILL INCLUDE:

- Demonstrations of dual-polarized Doppler radar
- Learn how warnings and forecasts are made
- Learn about amateur radio, hydrology, and climate
- Kid-friendly weather experiments
- Learn how to be weather-ready
- Programs about severe weather and the instruments that meteorologists use

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