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Vintage 2019

North Willamette Valley

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Summary:

A relatively mild early winter in 2018 was followed by a cold and wet second half of winter in 2019 and then a wet, but warm spring. The growing season saw a few mild frosts during late April, but started off warmer than average, moderating through mid-vintage with fewer than average heat spikes. Near-record precipitation amounts during late June and early July brought increased disease pressure to the region. The vintage will be remembered for the early rains in September and rapid cool down into October which challenged harvesting decisions. Degree-day totals for 2019 ended up similar to 2012 and 2018, marked by the lowest heat accumulation experienced in September and October since 2007. Phenological timing and interval lengths were similar to observations in 2018 averaging April 16th for bud break, June 8th for bloom, August 14th for véraison, and September 27th for harvest. The cool vintage came largely from substantially lower maximum temperatures while minimum temperatures were near average to slightly above average. This was largely the result of higher humidity levels, which also brought greater disease pressure.

Background:

This vintage summary is derived from weather and phenological observations from eleven locations across the north Willamette Valley. The locations include one in the Chehalem Mountains AVA, two in the Dundee Hills AVA, four in the Eola-Amity Hills AVA, two in the Yamhill-Carlton AVA, and two in the Willamette Valley AVA. The locations average 529 ft. in elevation, ranging from 205 ft. to 841 ft. Additional comparisons are made with the long-term McMinnville weather station located at the McMinnville Municipal Airport (157 ft.), and other stations in other growing regions in Oregon.

Climate:

Dormant Season

During the winter of 2018-2019, the PNW and Oregon experienced a moderately cool winter with temperatures in the region 0.5 to 2.0°F below the 1981-2020 climate normal period. The coldest area in the region was eastern Washington and eastern Oregon. The McMinnville weather station had a November 2018 through March of 2019 that was 0.4°F below normal. The first three months of the winter were quite mild with November through January averaging 1.6°F above average. February and March were colder than average (Figure 1), with February and early March seeing the coldest temperatures of the winter with an absolute minimum of 23.0°F observed on February 10th.

The eleven reference vineyards in the North Willamette Valley averaged 42.0°F during the winter of 2018-2019 (Table 1). Average minimum temperatures ranged from 35.9 to 38.4°F over the sites with an absolute minimum of 23.4°F observed on February 10th. On average, the sites observed a total of 32 days below freezing during the winter.

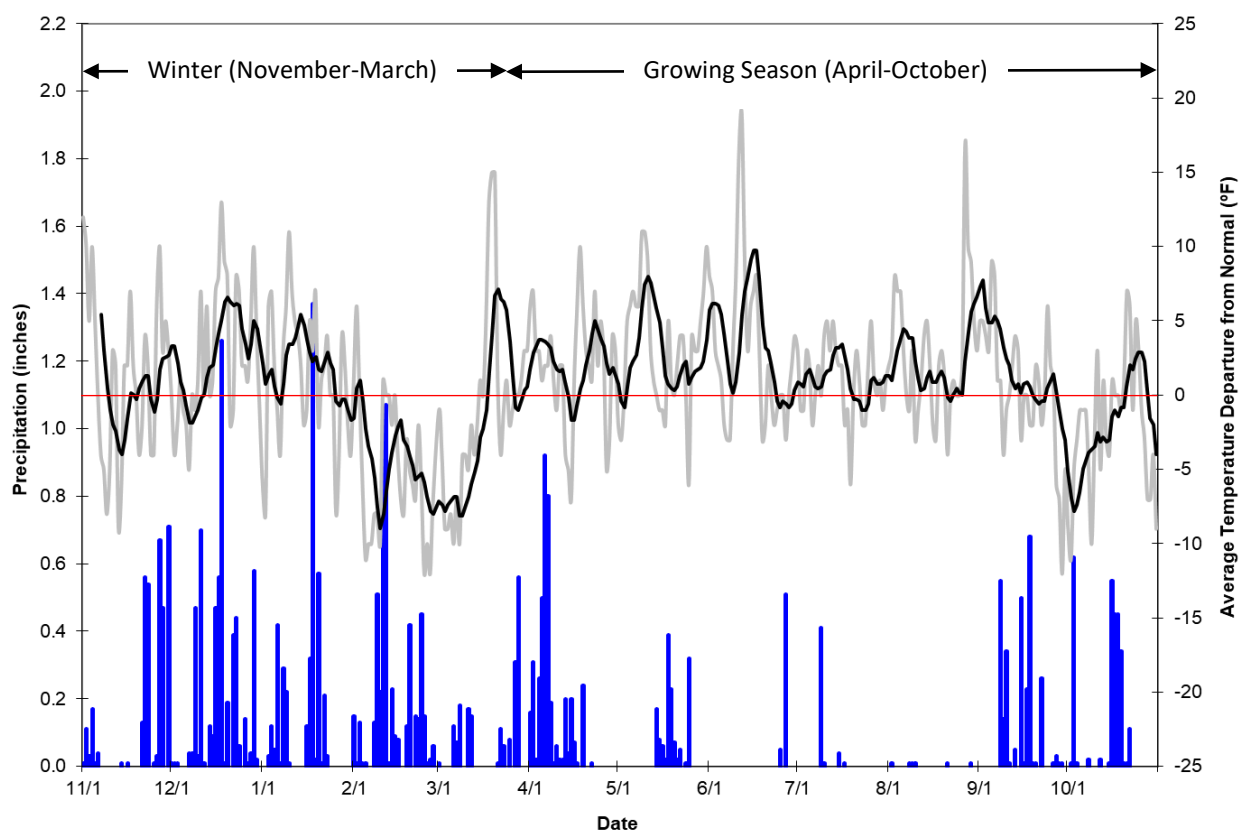


Figure 1 – Precipitation and temperature departure from normal for the McMinnville weather station from November 1, 2018 through October 31, 2019. The gray line represents the daily temperature departures from average, above and below the red line) and the black line represents the weekly moving average.

Precipitation during the dormant period was largely below normal (50-80%) in much of the PNW, with the driest areas being northwestern Oregon, western Washington, and northern Washington and Idaho. However, portions of eastern Oregon, eastern Washington, and southern Idaho experienced 115-130% of normal winter precipitation, while southern Oregon was near average. The McMinnville weather station experienced a winter with 19.45", which was 8.04" below the 1981-2010 climate normals (29% below) with only February seeing slightly above normal precipitation (Figure 1). The greatest one-day precipitation amount at the McMinnville weather station occurred on January 18th with 1.37".

For the winter the eleven reference vineyards averaged 19.03" of precipitation with the wettest period during the last three weeks of February, which can be seen in Figure 1 for the McMinnville weather station. Precipitation amounts ranged from 15.00" to 24.16" (Table 1) and the highest daily total experienced was 2.51" on December 18th. The number of days experiencing light rainfall (<0.25") averaged 67 across the sites, while heavier rainfall days (>0.25") averaged 25 across the sites. Dry days during the 2018-2019 winter averaged 58 days or roughly 38% of the winter.

Growing Season

The 2019 growing season from April through October across the PNW was relatively cool compared to the last five years, ending up 0.3°F above the long-term average. Oregon was slightly warmer than the PNW average at 0.5°F above average with the Willamette Valley +0.9°F, Southern Oregon +1.3°F, and the Columbia Gorge and Columbia Valley +0.5°F. The McMinnville weather station had a growing season that was 1.2°F above average with May, June, and August seeing the greatest warmer than average

departures (Figure 1). The growing season ended quite cool compared with recent years, with a rapid drop off in September, which was near average (+0.2°F), and October which was much colder than average (-2.5°F). The warmest day at the McMinnville station during the growing season was 99.3°F on August 27th with the location experiencing 8 days above 90°F and 3 days above 95°F, a significantly lower number than in 2018 (20 and 8 days, respectively).

Table 1 – Weather and climate characteristics from eleven vineyard locations in North Willamette Valley for the dormant season (November 1, 2018-March 31, 2019) and growing season (April 1-October 31, 2019). Growing degree-days are calculated with a base of 50°F with no upper cut-off.

Dormant Season (Nov 1 – Mar 31)	Average	Standard Deviation	Maximum	Minimum	Range
Average Temperature (°F)	42.0	0.6	42.8	41.0	1.8
Average Maximum Temperature (°F)	48.4	1.1	49.9	46.5	3.4
Average Minimum Temperature (°F)	36.8	0.8	38.4	35.9	2.5
Absolute Minimum Temperature (°F)	23.4	1.0	24.6	21.9	2.7
# of Days < 32°F	32	6	42	22	20
Total Precipitation (inches)	19.03	3.44	24.16	15.00	9.16
Highest Daily Total (inches)	1.48	0.48	2.51	0.95	1.56
Number of Days Without Precipitation (days)	58	4	64	50	14
Number of Days with Precipitation < 0.25" (days)	67	8	78	56	19
Number of Days with Precipitation > 0.25" (days)	25	5	32	19	13
Growing Season (Apr 1 – Oct 31)	Average-Median	Standard Deviation	Maximum	Minimum	Range
Growing Degree-Days	2101	120	2253	1910	343
Growing Season Average Temperature (°F)	59.3	0.6	60.1	58.3	1.8
Average Maximum Temperature (°F)	70.3	0.7	71.2	69.4	1.8
Absolute Maximum Temperature (°F)	96.8	1.6	100.8	95.1	5.7
# of Days > 95°F	2	0.8	3	1	2
Average Minimum Temperature (°F)	50.2	1.2	51.7	47.7	4.0
Absolute Minimum Temperature (°F)	30.0	2.7	33.4	25.6	7.8
# of Days < 32°F	1	1.3	4	0	4
Median Last Spring Frost (date or days)	3/11	2 days	3/15	3/11	4 days
Median First Fall Frost (date or days)	10/29	2 days	10/31	10/27	4 days
Median Frost-Free Period (days)	232	3 days	234	227	7
Total Precipitation (inches)	12.23	2.74	18.86	9.83	9.03
Highest Daily Total (inches)	0.96	0.13	1.14	0.77	0.37
Number of Days Without Precipitation (days)	150	5	158	139	19
Number of Days with Precipitation < 0.25" (days)	46	4	51	40	11
Number of Days with Precipitation > 0.25" (days)	18	5	26	13	13

Growing degree-days (GDD) over the PNW during 2019 started off near average but much lower than the very warm springs and summers of the last few years. Ultimately there was generally higher than average accumulation in the western valleys of both Oregon and Washington and near average to lower than average in portions of eastern Oregon, eastern Washington, and southern Idaho. For the McMinnville weather station 2019 GDD ended up at 2280, which was 2% below 2018, but 3% up from the 1981-2010 climate normal period. The vintage had similar GDD to that seen in 2004, 2005, 2012, and 2018 (+/- 2%). September and October 2019 saw the lowest amount of GDD since 2007, however, the amount accumulated during the last two months of the vintage was very common to what occurred during the 1960-1980 period.

The eleven reference vineyards averaged 2101 GDD during the 2019 growing season, down 271 GDD from 2018 (Table 1). The sites ranged from a low of 1910 GDD to a high of 2253 GDD for the vintage.

Figure 2 shows that the average GDD accumulation at the eleven sites (red line) was 179 GDD lower than the McMinnville airport location (black line), while last year they were more similar. Each of the sites and the McMinnville airport station show the steep drop off then minimal accumulation after mid-September, which is very unusual compared to the long-term average (Figure 2). Figure 3 shows the same degree-day data but, instead of cumulative as in Figure 2, it gives the daily accumulation values. As is common in most springs, 2019 saw wide swings in heat accumulation during April through June, with the warm mid-May and mid-June, and the cool departures in late June, the most evident early-season variations (Figure 3). The significant drop off in early to the middle of September is clearly evident, followed by the near absence of any additional accumulation in October.

Growing season average temperatures at the reference vineyards were 59.3°F during 2019, which was 1.4°F cooler than 2018. The cooler season came largely from maximum temperatures which were 2.8°F lower than 2018, while minimum temperatures were the same as 2018. The warmest periods of the growing season occurred in mid-June and late August (Figure 1) with an absolute maximum site temperature of 100.8°F observed on August 28th. During the season the reference vineyards experienced only 2 days over 95°F on average (Table 1), 4 days fewer than in 2018. The coldest periods during the growing season came during late April with site temperatures dropping to 33-38°F and late October when the absolute minimum of 25.6°F was observed. The number of days below freezing during the growing season ranged from none to 4 across the sites, which was similar to what was experienced in 2018. The median last spring frost date across the sites in 2019 was March 11th, which was over ten days earlier than 2018. The median first fall frost date across the sites occurred on October 29th (Table 1), eleven days sooner than in 2018. The overall frost-free period in 2019 averaged 232 days across the sites which was similar to what was observed in 2018.

Growing season precipitation was near average to moderately above average over most of the western US, with the PNW running approximately 20% above average for the April through October months. Statewide Oregon was also about 20% above average, however, there was moderate variation statewide with the McMinnville and Milton-Freewater locations being 3% and 10% below average, respectively, while Roseburg and Medford were 11% and 47% above average. The McMinnville station ended the growing season 0.41" below average with the wettest periods coming during the first three weeks of April, the third week in May, the middle two weeks in September, and the middle of October (Figure 1). The highest single day event for McMinnville during the growing season was 0.68" on September 18th. The western valleys of Oregon saw ~125-325% of normal precipitation in September with locations around the North Willamette receiving from 1.6" to 4.8" (own data). Compared to previous years at the best stations in the region, September 2019 precipitation amounts appear to be 1/3 to 1/2 of what was seen in September of 2013 (the typhoon year) and was similar to what was experienced in Septembers in 2004, 1997, 1986, 1982, 1981, 1978, 1977, 1973, 1972, and 1971.

For the eleven reference vineyards, precipitation during April through October averaged 12.23", ranging from a low of 9.83" to a high of 18.86" (Figure 1 Table 1). The 2019 vintage experienced over three inches more than the same sites did in 2018. The highest single amount received at any one site was 1.14" which occurred on September 8th. The number of days without precipitation during the growing season was 150 during 2019, 17 days fewer than experienced in 2018. The number of days with precipitation amounts less than 0.25" was 46, while the number of days with greater than 0.25" was 18, both higher than experienced in 2018 (35 and 12, respectively).

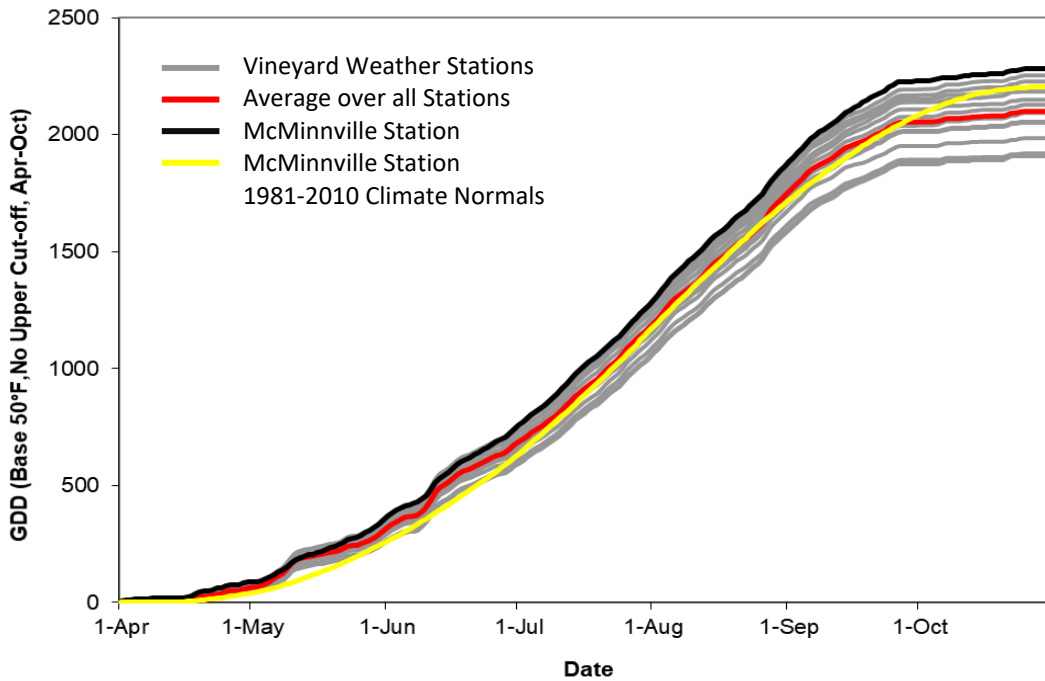


Figure 2 – Growing degree-day accumulation during April-October 2019 from each of the vineyard weather stations (grey lines), the average over all vineyard weather stations (red line), and the McMinnville Airport weather station (black line). The long-term average (yellow line) is from the 1981-2010 climate normals for the McMinnville weather station. Calculated from daily Tmax and Tmin observations for April 1st through October 31st using a base of 50°F with no upper cut-off.

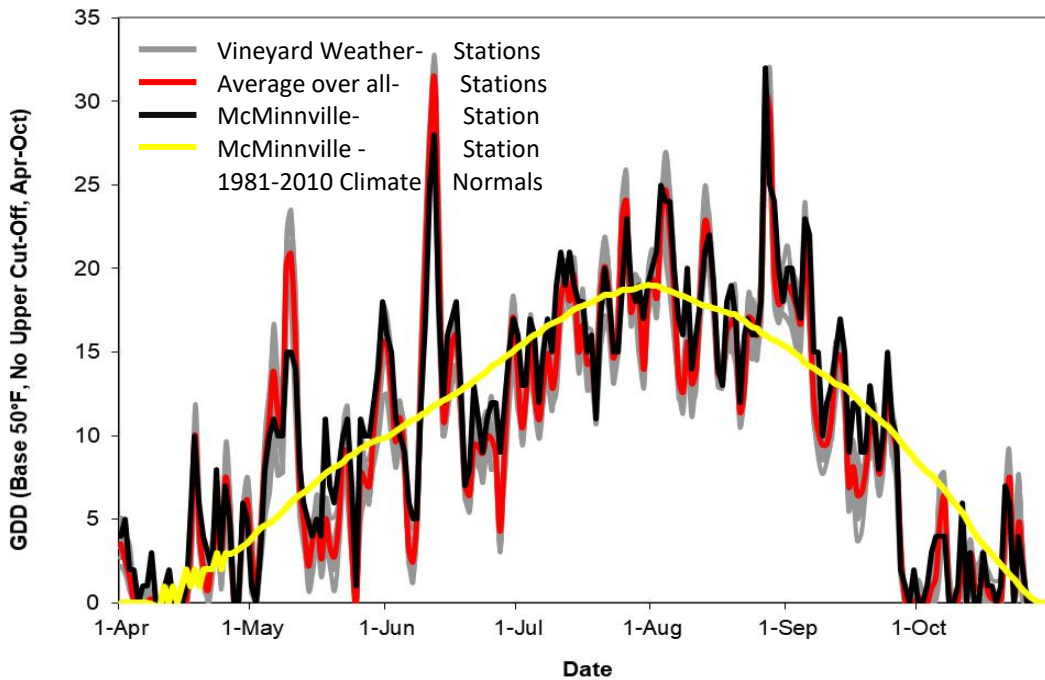


Figure 3 – Same data as in Figure 2, but shown as daily growing degree-day values during April-October 2019 from each of the vineyard weather stations (grey lines), the average over all vineyard weather stations (red line), and the McMinnville Airport weather station (black line). The long-term average (yellow line) is from the 1981-2010 climate normals for the McMinnville weather station. Calculated from daily Tmax and Tmin observations for April 1st through October 31st using a base of 50°F with no upper cut-off.

The McMinnville weather station experienced ten record events in the period from November 1, 2018 through October 31, 2019. These included record maximum temperatures on March 19 (75°F), May 10 (86°F), and June 11 and 12 (95 and 96°F, respectively). Record events also occurred in minimum temperatures with 25°F on November 9 and in record-high nighttime minimums of 55°F on November 1, 49°F on March 20, and 60°F on June 12. Only one record precipitation event occurred at the McMinnville weather station with 0.41" of rain on July 9, on the same day which many of the reference vineyards had greater than 0.25" of rain.

Phenology:

Phenology was observed at each of the locations with bud break, bloom, and véraison record at 25% occurrence and harvest as the date that picking started for each location. Summarizing the phenological observations for the locations and averaged across all varieties for 2019 shows an average bud break of April 16th (Table 2), which is one day earlier on average than observed in 2018. The sites also show a similar range with ten-days across sites, reported as early as April 11th and as late as April 21st. The average date of flowering was June 8th which was four days earlier than flowering in 2018. The range across sites in flowering during 2019 was one week shorter than observed in 2018, with the earliest being (June 5th) and latest (June 12th). Véraison and the start of the ripening phase during 2019 occurred over a 12-day period from early to mid-August, averaging August 14th across the sites, which was similar to what was observed during the 2018 vintage. The earliest véraison in 2019 was observed on August 9th while the latest was observed on August 21st. In 2019 harvest ranged over a 16-day period from September 21st to October 7th across the sites with an average date of September 27th (Table 2). Across these sites, harvest dates were similar in the 2018 and 2019 vintages.

Average intervals between phenological events show that bud break to flowering during 2019 had an average interval across these sites of 53 days; that flowering to véraison was 67 days on average; and that véraison to harvest was 45 days on average (Table 2). These intervals had 3 to 5-day standard deviations across sites, but a wide range between the shortest and longest intervals due to site elevation/temperature differences. For 2019, the length of flowering to harvest averaged 111 days while the length of the bud break to harvest period averaged 164 days with 17 days between vineyard sites with the shortest and longest intervals. Both the average intervals and site variations in intervals were very similar during 2019 as compared to 2018.

Table 2 –Phenological date (25% occurrence) and interval characteristics for the 2018 vintage averaged over all sites and varieties.

<i>Event/Interval</i>	<i>Average</i>	<i>Standard Deviation</i>	<i>Latest or Longest</i>	<i>Earliest or Shortest</i>
Bud Break	April 16	3 days	April 21	April 11
Flowering	June 8	2 days	June 12	June 5
Véraison	August 14	4 days	August 21	August 9
Harvest	September 27	5 days	October 7	September 21
Bud Break to Flowering	53 days	3 days	58 days	48 days
Flowering to Véraison	67 days	3 days	73 days	63 days
Véraison to Harvest	45 days	5 days	53 days	36 days
Flowering to Harvest	111 days	5 days	120 days	103 days
Bud Break to Harvest	164 days	5 days	174 days	157 days

Impacts and Influences:

Weather-related impacts on the 2019 vintage include; 1) a mild winter followed by a hard cold snap in February that potentially caused irregular bud growth in the spring, 2) frosts in April that likely caused some bud damage depending on the site, 3) moderately cool conditions, higher humidity, and rain that brought greater powdery mildew pressure pre- and post-flowering, 4) a rapid cool down with significant precipitation in September that initiated botrytis infections and some sour rot, and 5) greater bird pressure than has been seen in recent years due to both locally cool temperatures driving bird numbers but also regional temperature patterns in western Canada driving migratory birds into Oregon right as most of the fruit was being timed for picking.

The cool growing season along with a wet and abrupt drop off in temperatures in September and October was unexpected in the backdrop of the extreme warmth of the last five years in the western US. Even more so with the planet on track to be the 2nd or 3rd warmest year on record! However, numerous issues contributed to the conditions seen in Oregon and the PNW during 2019. First, for much of the year, the majority of the Arctic and Subarctic (including Alaska) was much warmer than average, even with greater departures from average than many mid-latitude locations. The Arctic warmth has displaced cooler air into the mid-latitudes with the most prominent area being western and central North America. In addition, a very large high-pressure area developed in the southeastern US in the middle summer and became 'stuck' in place for over two months. The result for the southeastern US was extreme warmth, prolonged drought, and lower humidity levels. At the same time, the normally dominant summer high-pressure area over the western US was shunted southwest and was smaller than usual. The result of the southeastern US blocking high and the changes in strength and position of the Pacific high resulted in sustained northwest to north flow over the PNW. This type of circulation typically starts in late October, not in early September. At the same time, the North Pacific was much warmer than average (+2 to 6°F), and the cooler airflow over the warmer ocean resulted in higher precipitation amounts in September than we have in many years. So it was, a perfect storm per se.

Current Conditions:

The slow start to the wet season in the west has drought conditions remaining in place throughout much of California, Oregon, and the Four Corners region. The first real series of winter storms is currently upon us and will help with Oregon's current drought status. The longer-term seasonal drought outlook hints at the western valleys of the PNW seeing some improvement or complete drought removal over the next three months.

While there are numerous factors that drive our regional weather and climate, the two broader influences that are very prominent are North Pacific and Tropical Pacific sea surface temperatures.

The tropical Pacific continues to wax and wane between neutral and El Niño conditions. The latest reports indicate SSTs in the east-central Pacific were near thresholds of weak El Niño levels during October and early November. However, patterns in most atmospheric variables generally maintained neutral conditions. The oceanic warming is attributed to intra-seasonal variability, and the overall diagnosis indicates ENSO-neutral conditions will likely persist. Most model forecasts favor ENSO-neutral through winter and spring, with slightly higher chances for El Niño than La Niña. The official outlooks for numerous forecasting agencies are consistent with these model forecasts. When ENSO is in a neutral phase, tropical Pacific SSTs are usually close to average. However, ENSO-neutral conditions do not mean

that regional weather conditions will necessarily be average, but that these types of winters tend to be the least predictable.

Overall the North Pacific and the Gulf of Alaska remain much warmer than average. However, the trend to cooler coastal waters along the west coast continues over the last couple of months due to greater coastal upwelling from more persistent winds over the last couple of months. The thought is that the current warmer than average North Pacific sea surface temperatures (SSTs) should influence both circulation and the amount of moisture in the atmosphere. The effect will likely bring a wetter than average western Canada but near average to lower than average winter precipitation the further south along the west coast. With the Tropical Pacific in a neutral phase, the North Pacific stands to have a greater impact on our winter precipitation pattern this year.

If the conditions in the tropics and north Pacific continue to hold, the weather across the western US will likely be cool to average in terms of temperatures and dry for the first part of winter and then average for precipitation and slightly warmer than average for the second part of winter. Of course, time will provide more insight as we cross the forecasting barriers for being able to have a better picture of what the spring of 2020 will bring to Oregon and the rest of the western US. Further updates will be provided in monthly Weather and Climate Summary and Forecasts and regional symposium presentations.

Acknowledgements

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