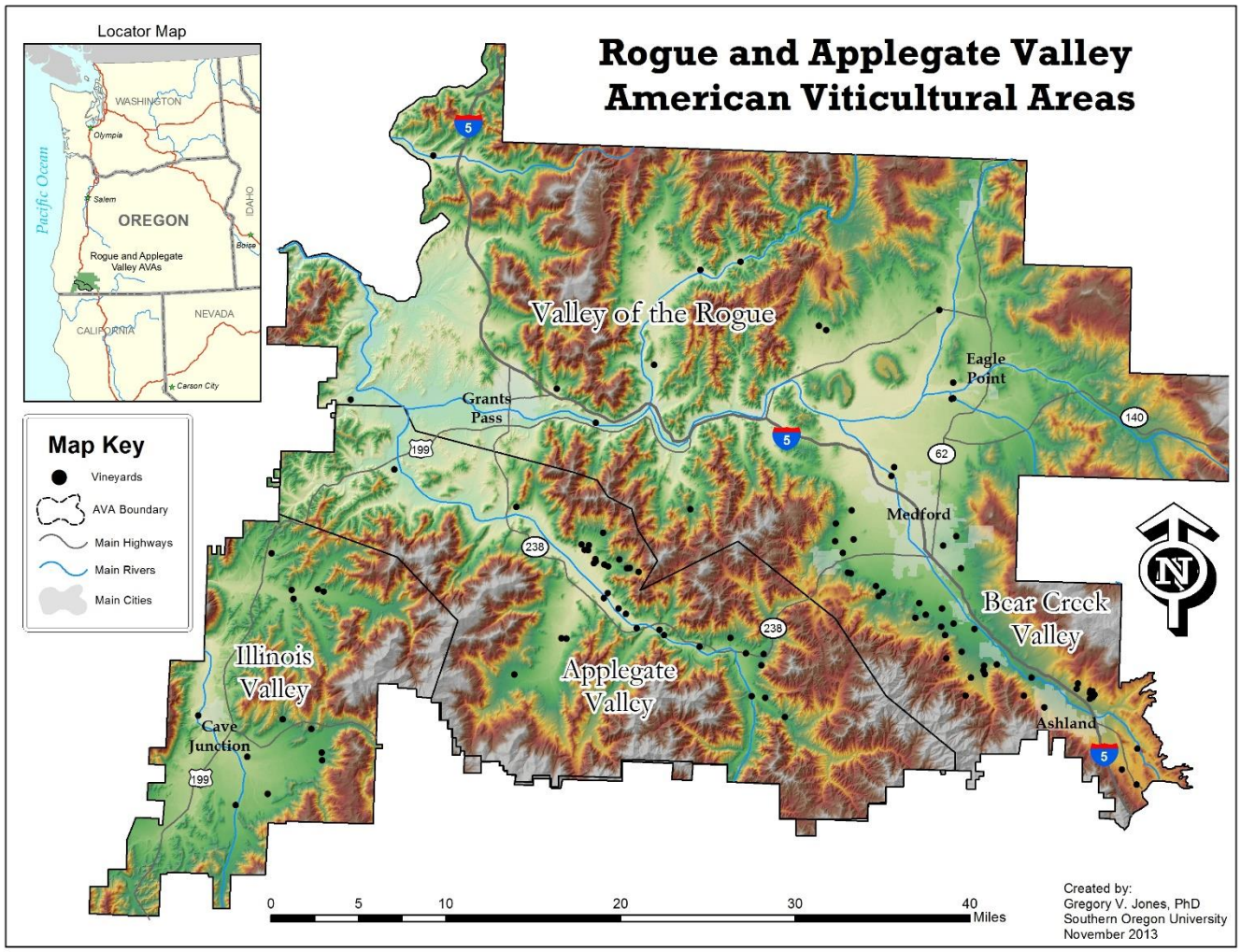
Vintage 2019
Rogue Valley Reference Vineyard Report



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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 overall warm spring. The growing season saw frosts during late April and early May, but started off warmer than average, moderating through mid-vintage with fewer than average heat spikes. Precipitation in late May brought increased disease pressure for many. The vintage will be remembered for the early rains in September and rapid cool down from September into October which challenged harvesting decisions. Degree-day totals for 2019 ended up similar to 2007 and 2008, 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 19th for bud break, June 6th for bloom, August 8th for véraison, and September 30th for harvest. Basic composition values from the reference vineyards indicate that the 2019 vintage had near average °Brix levels, acid levels that were significantly lower than average, pH values above average, and moderately lower than average yields due to numerous grower-reported issues of frost, shatter, and disease. The cool vintage came 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 both near bloom and during harvest.

Project Overview:
This project is a continuation of the 2003-2009 reference vineyard project which established a suite of reference vineyards in the Rogue and Applegate Valley AVAs with a purpose of providing an in depth look at spatial variations in important characteristics of temperature, phenology, composition, and yields in the region. Starting with the 2010 vintage, the project was scaled back to cover only temperature, phenology, and harvest composition from six sites (one in the Illinois Valley, two in the Applegate Valley, two in the Bear Creek Valley, and one in the Valley of the Rogue). At each of the six sites temperature devices record at 15-minute intervals during both the dormant season (Nov 1-Mar 31) and the growing season (Apr 1-Oct 31). The observations are then aggregated to hourly and daily average, maximum, and minimum values and summarized over the entire region. Additional summaries are done for the Medford NWS station at the airport and the Agri-Met station at SOREC. For phenological observations, the six sites submit dates for the four main events of bud break, bloom, véraison, and harvest for a mix of varieties planted at each site. The phenological data are then summarized by average dates and intervals between dates for the entire region. Finally, harvest composition values for °Brix, titratable acidity, and pH, along with yields are submitted by the six sites and are then summarized for the region.

Climate:

Dormant Season

During the winter of 2018-2019, Oregon and the PNW experienced a moderately cool winter with temperatures in the region 0.5 to 2.0°F below the 1981-2020 climate normal period[1]. The coldest area in the region was eastern Washington and eastern Oregon. The Medford airport weather station had a November 2018 through March of 2019 that was 0.6°F below normal. The first three months of the winter were quite mild with November through January averaging 1.9°F above average. The remainder of the winter was cooler than average with temperatures in February and March 6.1°F and 0.9°F below average, respectively. The first week of February through the second week in March saw the coldest temperatures of the winter with an absolute minimum of 23.0°F observed on February 19th at the Medford airport station. The dormant period was largely free of record temperature extremes with only two maximum temperature records occurring (62°F December 16 and 65°F January 12).

[1] Note that all references to normal or averages in this report are to the 1981-2010 climate normal for each weather/climate parameter unless stated otherwise.

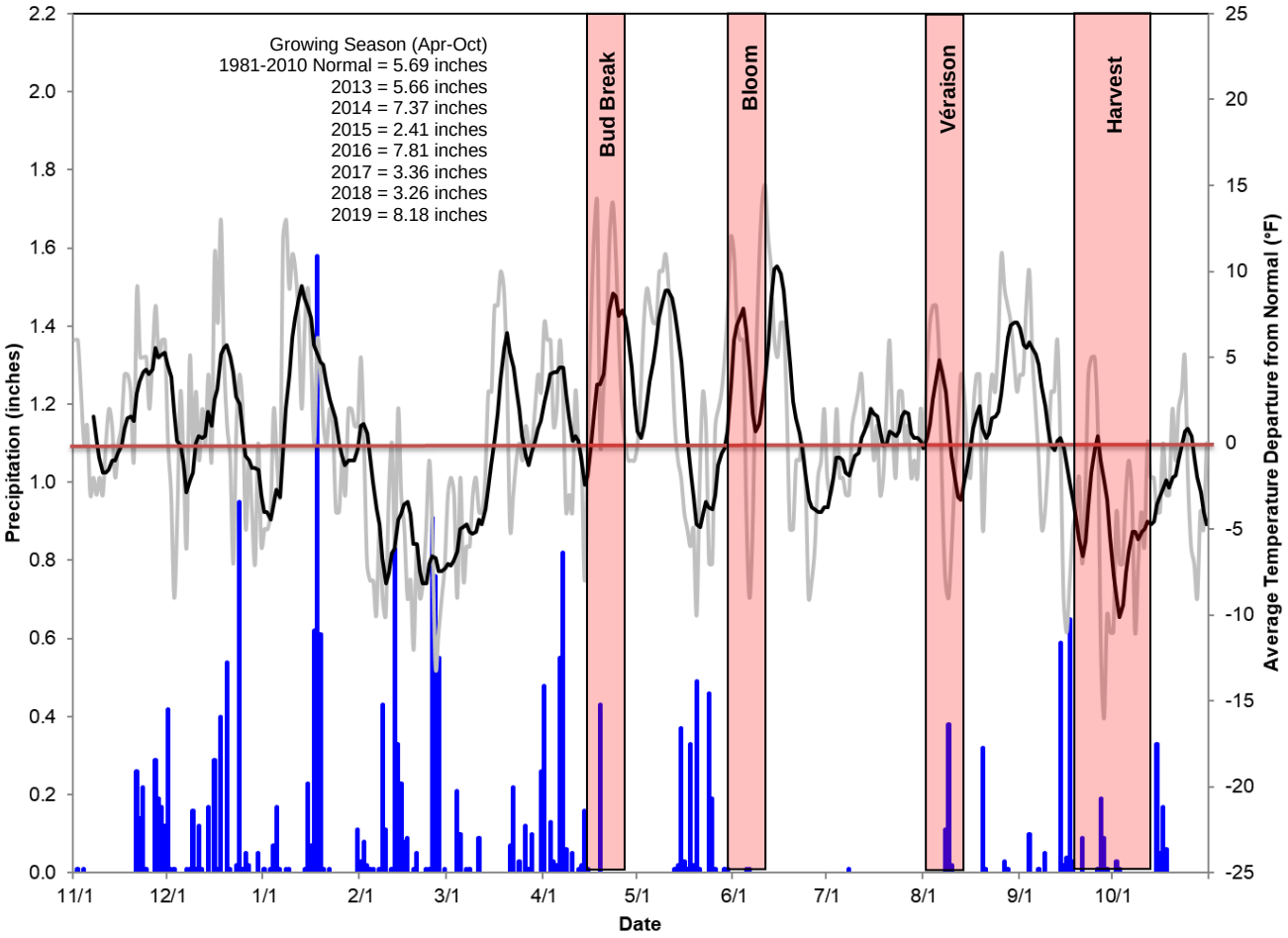

Figure 1 – Daily average temperature departures from normal and precipitation for November 1, 2018 to October 31, 2019 from the Medford Airport weather station. The gray line is the day to day temperature departures from normal, the black line is the weekly average departures, and the blue bars are daily precipitation. The long-term average is derived from the 1981-2010 climate normals. The vertical red bars represent the variation in region-wide average phenology (see text for details).

The six reference vineyards in the region averaged 40.6°F during the winter of 2018-2019 (Table 1). Average minimum temperatures ranged from 30.1 to 34.0°F over the six sites with an absolute minimum of 17.5°F observed on November 9th and lows down to roughly 20°F during early to mid-February. On average, the sites observed a total of 85 days below freezing during the winter with a range from 59 days (Bear Creek Valley site) to 102 days (Applegate Valley site).

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 precipitation is not observed at the reference vineyards, values from the main climate stations in the Southern Oregon region indicate that November through March was near average to above average. The Medford airport weather station experienced a winter with 16.18”, which was 3.52” above the 1981-2010 climate normals (28% above) with January and February the only months with above normal precipitation (Figure 1). The greatest one-day precipitation amount at the Medford weather station occurred on January 19th with 1.58”, which was a record for that date. The other precipitation records for the winter were a 2” snowfall for February 10th and a 4.1” snowfall on February 26th.

Table 1 – Rogue Valley reference vineyard dormant season (November 1-March 31, 2018-19) and growing season (April 1-October 31, 2019) climate characteristics. Note that the dormant season minimum temperature value is the average absolute low temperature experienced. Growing degree-days are calculated from April-October 2019 (base of 50°F with no upper cut-off).

Dormant Season (Nov 1 – Mar 31)	***Average***	***Standard Deviation***	***Maximum***	***Minimum***	***Range***
Average Temperature (°F)	40.6	1.1	42.4	39.5	2.9
Absolute Minimum Temperature (°F)	19.4	1.6	22.1	17.5	4.6
# of Days < 32°F	85	17	102	59	43
Growing Season (Apr 1 – Oct 31)	***Average***	***Standard Deviation***	***Maximum***	***Minimum***	***Range***
Growing Degree-Days	2668	223	3080	2432	649
Growing Season Average Temperature (°F)	62.1	1.1	64.1	61.0	3.1
Average Maximum Temperature (°F)	80.8	1.8	83.0	77.8	5.2
# of Days > 95°F	27	8	36	17	19
Average Minimum Temperature (°F)	45.3	2.4	49.1	42.8	6.3
# of Days < 32°F	14	6	21	7	14
Median Last Spring Frost (date or days)	5/1	23 days	5/3	3/15	49 days
Median First Fall Frost (date or days)	10/3	4 days	10/9	10/1	8 days
Median Frost-Free Period (days)	156	26 days	208	152	56

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 all four main wine growing regions in the state warmer than normal, ranging from 0.5 to 1.6°F above average during April-October. Overall the growing season average daily temperatures observed at the Medford weather station were cooler than the warm 2014-2017 vintages, ending up 0.5°F warmer than the 1981-2010 climate normals (Figure 1). The warmest day at the Medford airport station during the growing season was 105.1°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) and compared to the long-term average. The growing season only had one temperature extreme record set, a 99°F day on June 12th.

The big story for the 2019 growing season across the PNW was its ending, which was quite cool compared with recent years, with a rapid drop off in September (+0.2°F) and October, which was much colder than average (-2.5°F). The Medford airport weather station experienced a warmer than average April, May, and June followed by a cool July, warm August then a 1.5°F below average September and a 4.0°F below average October.

The wet late dormant period (January through March), continued into the growing season for the Rogue Valley with 8.34” at the Medford station, 47% (2.65”) above average for the location in 2019 (Figure 1). The majority of the rainfall came during the first three weeks of April, the middle of May, scattered events in early to mid-August, and mid-September (Figure 1). The station had four daily precipitation records during the 2019 growing season with 0.82” on April 8th, 0.11” on August 10th, 0.59” on September 16th, and 0.65” on September 19th.

From a growing degree-day (GDD) standpoint spring heat accumulation in 2019 started off above average and continued so until the rain and cooler conditions in the third week in May (Figure 2). From early to late June heat accumulation tracked close to 2015, the warmest vintage so far in the region.

From late June through mid-September heat accumulation tracked the average of the 2001-2018 vintages. From roughly the 25th of September through the rest of October heat accumulation stalled as seen in the flattening of the accumulation curve in Figure 2, resulting in the lowest September-October accumulation since 2007.

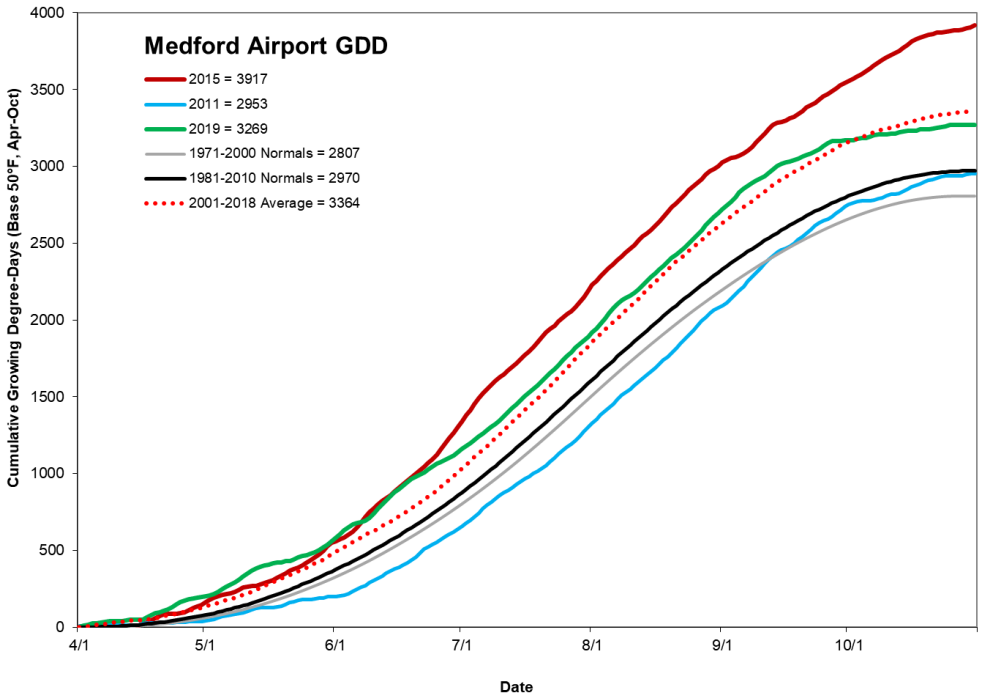

Figure 2 – Growing degree-day accumulation during April-October 2019 from the Medford Airport weather station (green line). The long-term averages shown are for the 1971-2000 climate normals (gray line), 1981-2010 climate normals (black line), the 2001-2018 period average (red dotted line), 2015 the previous warmest year since 1998 (red line), and 2011 the coolest year since 1998 (blue line). Data 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 shows the same degree-day data but, instead of cumulative as in Figure 2, it gives the daily accumulation relative to the 1981-2010 and 2001-2018 averages. As is common in most springs, 2019 saw wide swings in heat accumulation during April through June. Greater accumulation than average occurred during the warm mid-April through early May, followed by lower than average accumulation during the wet/cool period in late May, then wide swings between very warm and cool periods in June (Figure 3). The rest of the growing season saw mostly average daily accumulation, especially in mid-July, followed by some periods with high accumulation amounts in August, then the significant drop off in the middle to the end of September (Figure 3).

GDD accumulation for 2019 ended up 3269 for the Medford weather station compared to 2709 at the Roseburg Agri-Met station and 2734 at the Medford Agri-Met station at SOREC. The 3269 GDD is substantially lower than experienced in 2014 (3896) and 2015 (3917), but moderately higher than the 1981-2010 normals (2970) and slightly down compared to the 2001-2018 average (3364) (Figure 2). The year ended up being most similar to 2007 (3121) and 2008 (3255). Compared to other locations statewide, Medford ended up with the highest heat accumulation compared to state's four main wine producing region's weather stations (McMinnville 2280, Roseburg 3044 and Milton-Freewater 3197).

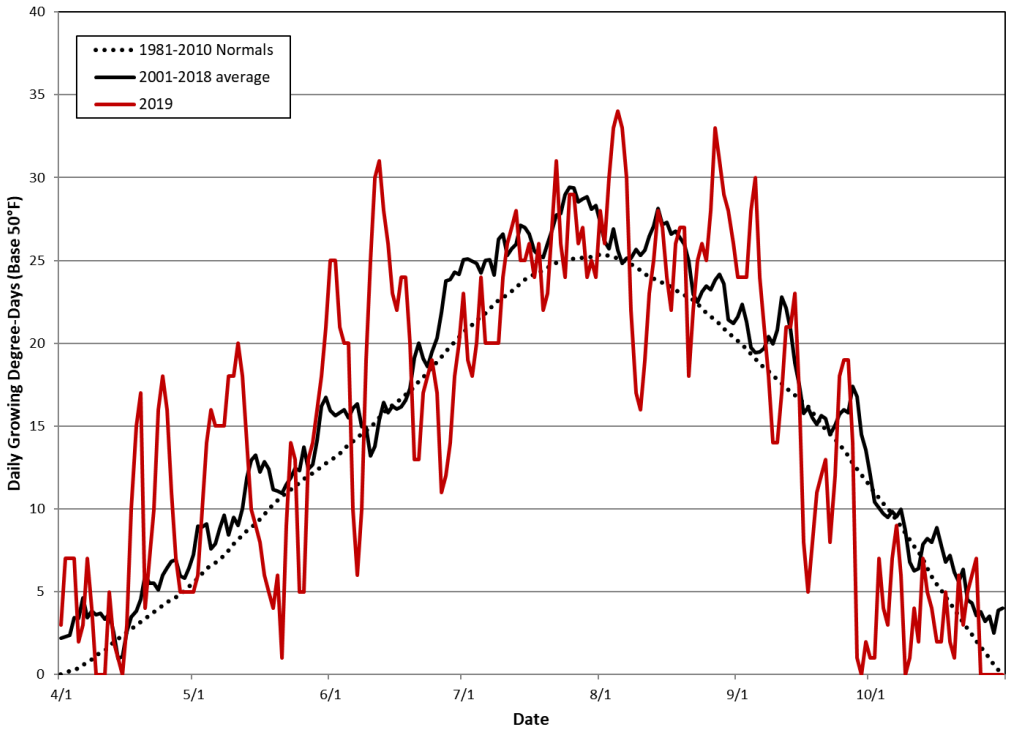

Figure 3 – Same data as in Figure 2 but shown as daily growing degree-day values during April-October 2019 from the Medford Airport weather station (base 50°F). The long-term averages are derived from the 1981-2010 climate normals and the average from the 2001-2018 period of record.

For the 2019 vintage, site temperature data from the six reference vineyards showed that the average GDD accumulation was 2668 with a standard deviation of 223 units (Table 1). Maximum accumulation was 3080 GDD (Bear Creek Valley site) while the minimum was 2432 GDD (Illinois Valley site). In terms of heat extremes there were 27 days on average with temperatures over 95°F across the region, ranging from a low of 17 days to a high of 36 days (Table 1). During 2019 there were only a few days over 100°F for the region (5 to 13 across the sites), with the hottest days of the year occurring during the second week of June, the first week of August, and the last week of August with Medford and most sites being over 98°F nearly every day. The highest reference vineyard average maximum of 105.3°F and absolute maximum of 107.7°F was observed on August 27th.

The 2019 growing season saw absolute minimum temperatures that were slightly warmer than average at the reference vineyards. The coldest nights during the growing season occurred during April 28 through May 3 with temperatures dipping down to 28-30°F throughout the region. During the last week in October sites in the Illinois Valley, Applegate Valley, and Sam's Valley saw temperatures dip into the mid-20s, while the Bear Creek Valley sites remained in the upper 20s to lower 30s. The sites experienced from 7 to 21 days during April through October that dropped below 32°F in 2019 with the majority occurring during mid to late April and late October. The median last frost in the spring occurred May 1st across the region but, like most years, there was a wide range from the earliest being March 15th (Bear Creek Valley site) to as late as May 3rd (Applegate and Illinois Valley site)(Table 1). The median first fall frost was October 3rd across the reference vineyard sites with a relatively narrow range from the earliest first frost on October 1st to the latest on October 9th, the same as the Medford weather station. The resulting frost-free period median was 156 days in 2019, ranging 56 days across the sites from 152 days (Illinois Valley site) to 208 days (Bear Creek Valley site).

Comparisons with Previous Years

Compared to past dormant periods at the reference vineyards (starting in 2003-04), the 2018-19 winter was slightly cooler than average for the period (Table 2). While this past winter had a higher number of cold nights compared to average (85 vs 75), the region experienced moderately warmer than average absolute minimum temperatures with lower winter freeze impacts than in recent years. During the growing season, the 2019 vintage temperatures across the reference vineyards ended up near average to 0.5°F cooler than average over the entire period. Average maximum temperatures were significantly lower than average while average minimum temperatures were moderately warmer compared to the long-term average. In terms of heat accumulation, the 2019 growing season GDD average of 2668 at the reference vineyards was nearly 100 heat units less than 2018, right at the 2003-2018 average (2669), 300-500 heat units warmer than 2010 and 2011, and nearly 400 heat units lower than 2015, the warmest vintage to date in the Rogue Valley and the majority of the western US (Table 2).

During the growing season, absolute maximum temperatures were moderately lower than average, and the sites experienced fewer days over 95°F during 2019. The absolute minimum temperatures observed at the reference vineyards during the growing season were slightly below the period average, while the number of days below 32°F were three more than average. The last spring frost date was three days later than the time period average, and twelve days later than the 2018 vintage. The first fall frost date was twelve days earlier than the time period average, but similar to the two previous vintages. The result was a shorter than average frost-free period of 156 days in 2019, but not as short as seen in 2017 (153 days) (Table 2).

Table 2 – Reference vineyard climate comparisons across the dormant (November 1 – March 31) and growing seasons (April 1 – October 31) for each year of the project. *Note that for the 2012-2019 vintages the data come from fewer sites than the 2003-2010 period (see text for details).

Season/Variable	***Year***																	
Dormant Season (Nov 1 – Mar 31)	***02-03***	***03-04***	***04-05***	***05-06***	***06-07***	***07-08***	***08-09***	***09-10***	***10-11***	***11-12***	***12-13***	***13-14***	***14-15***	***15-16***	***16-17***	***17-18***	***18-19***	***Average***
Average Temperature (°F)	NA	42.8	41.1	40.3	40.8	39.2	39.9	41.1	40.5	39.6	40.5	40.3	45.0	42.8	41.2	41.4	40.6	41.1
Absolute Minimum Temperature (°F)	NA	18.4	18.1	16.0	9.8	15.0	12.4	8.4	15.3	16.3	15.2	-7.2	15.0	11.3	4.3	16.9	17.5	12.7
# of Days < 32°F	NA	51	84	77	77	96	85	65	72	101	82	86	45	51	64	76	85	75
Growing Season (Apr 1 – Oct 31)	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***Average***
Growing Degree-Days	2903	2737	2463	2699	2510	2535	2680	2300	2223	2559	2638	3042	3049	2778	2819	2765	2668	2669
Absolute Maximum Temperature (°F)	113.1	111.9	108.9	114.6	110.2	111.5	115.6	111.3	105.1	106.2	108.8	109.0	113.0	113.8	116.6	107.1	107.7	110.8
# of Days > 95°F	47	42	37	40	25	36	36	29	24	30	37	48	40	34	39	29	27	35
Absolute Minimum Temperature (°F)	20.9	30.1	26.4	23.3	21.6	19.7	21.6	21.5	23.3	30.0	25.9	25.6	27.6	29.3	21.4	22.3	23.3	24.3
# of Days < 32°F	10	5	10	17	10	22	16	13	15	5	17	3	7	1	14	12	14	11
Median Last Spring Frost (date)	5/1	4/2	4/19	5/8	4/27	5/5	4/30	5/6	5/6	5/10	5/1	4/28	4/9	4/26	5/3	4/19	5/1	4/28
Median First Fall Frost (date)	10/10	10/25	9/25	10/11	9/24	10/9	10/2	10/23	10/25	10/21	10/3	11/11	11/1	12/5	10/3	10/2	10/3	10/15
Median Frost-Free Period (days)	162	206	159	156	150	157	155	170	172	164	154	197	206	223	153	167	156	171

The maximum and minimum temperatures are the absolute values recorded for the entire region for that year and season. Frost dates and the frost-free period are the median observed over the entire region for that year.

Phenology:

Summarizing the phenological observations over the reference vineyards and across all varieties shows a median bud break of April 19th (Table 3). During the spring of 2019 bud break was observed over a relatively long period of just over three weeks across all varieties and sites, reported as early as April 6th and as late as April 28th. The median date of flowering was June 6th with roughly a month between the earliest (May 15th) and latest (June 15th) sites across the region and over all varieties. Véraison and the start of the ripening phase during 2019 occurred over a 15-day period during early to mid-August (median August 8th). The earliest véraison was observed on August 1st while the latest was observed on August 16th. Harvest ranged over a 40-day period from September 12th to October 20th across varieties and sites with a median date of September 30th (Table 3).

Average intervals between phenological events (an important measure of vine and berry development timing) shows that bud break to flowering during 2019 had a median of 48 days; that flowering to véraison was 64 days on average; and that véraison to harvest was 54 days on average (Table 3). These intervals had 8 to 12-day standard deviations across sites and varieties, but a very wide range between the shortest and longest intervals due to site differences. For 2019, the length of the bud break to harvest period averaged 165 days with 40 days between the shortest and longest vineyard sites.

Table 3 –Phenological date and interval characteristics for the 2019 vintage averaged over sites and varieties. Note that for the 2010-2019 vintages the data come from fewer sites (see text for details).

Event/Interval	*Median*	*Standard Deviation*	*Latest or Longest*	*Earliest or Shortest*
Bud Break	April 19	6 days	April 28	April 6
Flowering	June 6	9 days	June 15	May 15
Véraison	August 8	5 days	August 16	August 1
Harvest	September 30	12 days	October 20	September 12
Bud Break to Flowering	48 days	12 days	65 days	35 days
Flowering to Véraison	64 days	8 days	71 days	55 days
Véraison to Harvest	54 days	11 days	79 days	38 days
Bud Break to Harvest	165 days	12 days	180 days	140 days

Comparisons with Previous Years

The main phenological events for the 2019 vintage were later than average for bud break but earlier than average for other events when compared to the previous sixteen vintages (Table 4). The median bud break was two days later than average but a couple of days earlier than the 2018 vintage. Bloom was five days earlier than the period average, over three weeks earlier than the cool 2011 vintage but five to eight days later than the warm 2015 and 2016 vintages. Median véraison dates during 2019 were eight days earlier than average, varying by +/- 5 days over sites and varieties, and occurring over three weeks ahead of the cool 2011 vintage but a few days behind the warm 2015 and 2016 vintages. The median harvest date was six days earlier than average, over three weeks earlier than the cool 2010 and 2011 vintages, similar to the 2017 and 2018 vintages, but later than the 2012-2015 vintages.

For the 2019 vintage, the period between bud break and bloom of 48 days was shorter than the period average by a week (Table 4). The bloom to véraison period in 2019 was 2 days shorter than the period

Table 4 – Reference vineyard average phenology comparisons for the 2003 to 2019 vintages. *Note that the 2010-2019 vintage numbers come from fewer sites and varieties than the previous years (see text for details). Note that 'd' stands for days.

Stage or Interval	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*Average*
Bud Break																		
Median	4/18	4/2	4/15	4/25	4/19	4/30	4/23	4/20	5/2	4/24	4/15	4/11	4/1	4/4	4/15	4/21	4/19	4/17
Std. Deviation	10 d	8 d	10 d	9 d	10 d	9 d	10 d	9 d	10 d	4 d	4 d	7 d	7 d	4 d	8 d	8 d	6 d	8 days
Flowering																		
Median	6/11	6/4	6/19	6/12	6/10	6/22	6/15	6/27	7/1	6/16	6/8	6/5	6/2	5/31	6/5	6/7	6/6	6/11
Std. Deviation	10 d	6 d	7 d	6 d	7 d	8 d	8 d	8 d	6 d	5 d	6 d	9 d	6 d	4 d	8 d	5 d	9 d	7 days
Véraison																		
Median	8/20	8/11	8/22	8/16	8/16	8/24	8/20	8/31	9/3	8/22	8/11	8/11	8/5	8/5	8/10	8/12	8/8	8/16
Std. Deviation	7 d	6 d	9 d	6 d	6 d	7 d	8 d	7 d	9 d	8 d	6 d	4 d	8 d	7 d	7 d	4 d	5 d	7 days
Harvest																		
Median	10/7	10/1	10/19	10/9	10/9	10/14	10/7	10/26	10/26	10/7	9/26	9/24	9/16	9/21	9/29	10/1	9/30	10/5
Std. Deviation	12 d	10 d	10 d	12 d	12 d	9 d	13 d	12 d	6 d	12 d	14 d	13 d	13 d	10 d	10 d	12 d	12 d	11 days
Bud Break to Flowering																		
Median	52 d	64 d	65 d	48 d	52 d	51 d	52 d	66 d	57 d	53 d	55 d	56 d	61 d	57 d	52 d	53 d	48 d	55 days
Std. Deviation	10 d	7 d	10 d	9 d	10 d	7 d	8 d	9 d	11 d	6 d	6 d	10 d	10 d	4 d	6 d	10 d	12 d	9 days
Flowering to Véraison																		
Median	69 d	68 d	64 d	67 d	68 d	65 d	64 d	66 d	66 d	63 d	66 d	64 d	64 d	69 d	66 d	63 d	64 d	66 days
Std. Deviation	9 d	9 d	9 d	6 d	8 d	9 d	8 d	10 d	6 d	6 d	6 d	9 d	6 d	6 d	6 d	3 d	8 d	7 days
Véraison to Harvest																		
Median	48 d	50 d	59 d	52 d	54 d	52 d	47 d	57 d	50 d	43 d	50 d	45 d	45 d	44 d	53 d	51 d	54 d	50 days
Std. Deviation	8 d	10 d	11 d	11 d	11 d	9 d	12 d	14 d	9 d	10 d	14 d	14 d	13 d	11 d	12 d	11 d	11 d	11 days
Bud Break to Harvest																		
Median	172 d	186 d	189 d	168 d	174 d	166 d	163 d	188 d	175 d	168 d	165 d	165 d	165 d	172 d	167 d	163 d	165 d	171 days
Std. Deviation	15 d	12 d	14 d	14 d	14 d	11 d	16 d	15 d	9 d	13 d	14 d	14 d	16 d	10 d	15 d	18 d	12 d	14 days

average (66 days), responding to the warmth early in the season. The average length of time between véraison and harvest was 54 days, four days longer than the period average. The average bud break to harvest interval of 165 days in 2019 was shorter than average by six days, but roughly similar to the last six vintages. Even though the individual dates of phenological events vary quite a lot from year to year, the long-term data for these intervals between events continues to converge toward very consistent lengths for each growth interval for the region.

Composition:

For the 2019 vintage, grower-submitted harvest composition values reflect a near average sugar accumulation showing a median 23.8 °Brix with a wider than normal range from 20.5 to 27.5 °Brix across sites and varieties (Table 5). Harvest titratable acidity averaged 4.5 g/L in 2019 with a reported minimum of 3.6 g/L to a maximum of 7.4 g/L while pH numbers averaged 3.60 with a range from 3.22 to 4.99 over all sites and varieties. Yields averaged 2.7 tons/acre across the sites and varieties, ranging 5.0 tons/acre from a low of 1.3 to a high of 6.3 tons/acre (Table 5).

Table 5 –Harvest composition characteristics for the 2019 vintage averaged over sites and varieties.

Region	°Brix	TA (g/L)	pH	Yield (T/acre)
Median	23.8	4.5	3.60	2.7
Standard Deviation	1.6	1.0	0.40	1.1
Maximum	27.5	7.4	4.99	6.3
Minimum	20.5	3.6	3.22	1.3

Comparisons with Previous Vintages

The 2019 vintage harvest composition values from the sites give a general comparison with the 2003 through 2018 vintages (Table 6). Average °Brix values of 23.8 were slightly lower than the period average but similar to many vintages over the last decade. Average titratable acidity of 4.5 g/L was significantly lower than the period average (5.9 g/L) and the lowest reported across the entire time period (2003-2019). Following from the low acid levels, the median pH values in 2019 were moderately higher than the long-term average and had higher than average site and variety variation. Yields reported from the sites show that the 2019 vintage was below the period average (-16%) and the lowest average yields since the 2012 vintage. The range of 5.0 tons/acre across sites and varieties in 2019 was the same as the 2018 and continues a trend of substantially more than past vintages (Table 5).

Table 6 – Reference vineyard average harvest composition comparisons for the 2003 to 2019 vintages. *Note that the 2010-2019 vintage numbers come from fewer sites and varieties than the previous years.

Parameter	*Harvest Numbers*																	
	2003	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*Average*
°Brix	24.4	24.5	23.4	24.1	23.6	23.9	23.5	23.2	23.8	24.0	24.2	24.5	24.4	24.1	23.8	24.3	23.8	24.0
TA (g/L)	6.1	5.8	6.3	5.9	6.3	6.2	5.9	7.1	7.0	5.5	6.3	5.4	5.4	5.0	5.7	5.8	4.5	5.9
pH	3.42	3.49	3.39	3.50	3.37	3.43	3.55	3.47	3.42	3.56	3.45	3.49	3.50	3.49	3.44	3.41	3.60	3.47
Yield[1]	2.9	2.6	2.8	3.1	3.2	3.0	2.9	2.2	3.9	2.9	3.6	3.8	4.2	3.3	3.4	3.8	2.7	3.2

[1] Tons per acre

Grower Comments:

Comments on the season submitted by growers point to a challenging vintage. Most stated that the spring started off fine, but that late frost in April and early May impacted some regions and blocks depending on frost protection measures. Many mentioned the warm early May moved things rapidly to flowering but a wet and cool period in late May brought some mildew pressure, which was followed by some very warm days which in combination likely affected fruit set. Comments about fruit set vary from very good to very poor, with some indicating more shatter than normal and others saying that lag phase cluster weights were down for some varieties and not others. In terms of bird pressure, growers noted average to very low bird pressure for earlier picking times, and higher pressure with later harvesting. Other pest pressure was also stated being variable with most indicating low impacts and others mentioning late season mite issues. Many mentioned that the cold snap in February appeared to lower some insect populations, especially yellow jackets. Comments concerning disease issues ranged widely from many indicating a relatively low-pressure year, but others indicating moderate powdery mildew near flowering, and botrytis and sour rot increasing tremendously after the cool down and wet weather in late September.

Impacts and Influences:

A summary of 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 late April and early May 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 toward the middle to end of the harvest period.

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 globally 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 (Atlanta was bearable in September!). At the same time, the normally dominant summer high-pressure area over the western US was smaller than usual and was shunted southwest. The result of the southeastern US blocking high and the changes in strength and position of the Pacific high was 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 had 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 offshore winds. 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.

Future Work

- The observation network will continue with the reduced number of sites (six) and focus on site temperatures, phenology, and harvest composition and yields for the foreseeable future.
- An overview presentation will be given at the annual meeting of the Rogue Valley Winegrowers Association which will be held on January 25, 2020 (see RVWA email newsletter and web site announcements for further details).

- The results will also be used to provide a Southern Oregon component to the Oregon Wine Symposium's "Vintage Overview" session during February 11-12, 2020 in Portland at the Oregon Convention Center.
- A synthesis report with further in-depth analyses of the study will be compiled and made available as more data are gathered and processed.

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