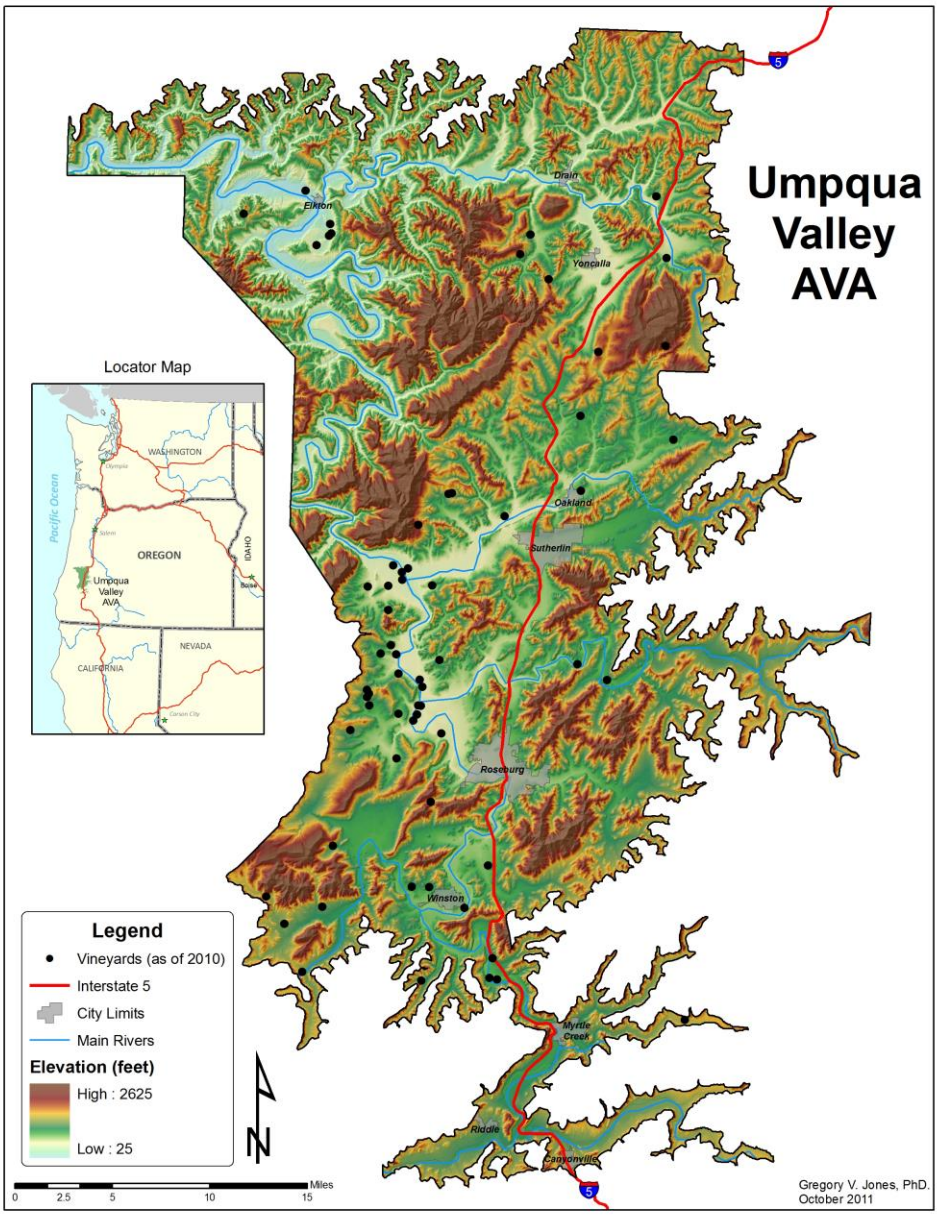
Vintage 2020
Umpqua Valley Reference Vineyard Report



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Summary:
A mild and dry winter in 2019-20 was followed by a dry growing season continuing the ongoing drought concerns for Oregon and the majority of the western US. The spring was relatively cool in the Umpqua Valley with mild frosts into mid-April, then followed by wide swings between early season heat then cool, wet conditions leading up to and during flowering. The result was widespread issues with fruit set leading to generally high amounts of shatter, smaller berries and clusters for many in the region. Heat stress during the summer was moderate, leading into what looked like a decent September weatherwise until the Labor Day extreme wind event, which was followed by catastrophic fires and smoke for days. Growing degree-day totals for the Umpqua Valley in 2020 ended up moderately higher than the previous vintage and above the average of the last 15 years. Across sites and varieties in the region the phenological timing averaged April 14th for bud break, June 11th for bloom, August 18th for véraison, and October 2nd for harvest. Growers reported generally low disease pressure, relatively low pest pressure, variable bird pressure with greatest impact at higher elevation and for late picked varieties, and a harvest that presented very good quality fruit at moderate to substantially lower yields due to bloom to fruit set weather conditions.

Project Overview:
This work is a continuation of the 2004-2010 reference vineyard project which established a suite of reference vineyards in the Umpqua Valley AVA 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 2011 vintage, the project has been scaled back to cover only temperature, phenology, and harvest composition from eight sites (no fruit sampling as in prior years). At each of the eight 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 Roseburg NWS station and the Roseburg Agri-Met station. For phenological observations, the sites submit dates for the four main events of bud break, bloom, véraison, and harvest for a range 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 sites and are then summarized for the region.

Climate:

Dormant Season

The PNW experienced a relatively warm winter during 2019-2020, with temperatures in the region 2.5°F above the 1981-2010 climate normal[1] period. In Oregon, the winter averaged 2.4°F warmer than normal, with maximum temperatures much higher than minimum temperatures compared to averages. Spatially the winter ranged from 1.3°F above along the coastal climate division to 3.0°F above in the north central climate division. The Roseburg weather station had a November 2019 through March of 2020 that was 1.0°F above normal. The first three months of the winter in Roseburg were quite mild with November through January averaging 2.1°F above average. The remainder of the winter was cooler than average with temperatures in February and March 0.7°F below average. The last week of November, the last week of December, and the first and second week of February saw the coldest temperatures of the winter with an absolute minimum of 26.0°F observed on November 30th at the Roseburg weather station. The dormant period had no record cold temperatures but had three record

[1] Climate normals are 30-year periods used by the global weather and climate services community for summarizing numerous weather variables. All references to 'normal' and 'average' for the Roseburg weather station in this report are with the 1981-2010 period, which will be replaced by the 1991-2020 period sometime during 2021.

warm temperatures of 64°F occurring on December 22nd, 61°F on January 3rd, and 65°F on February 20th.

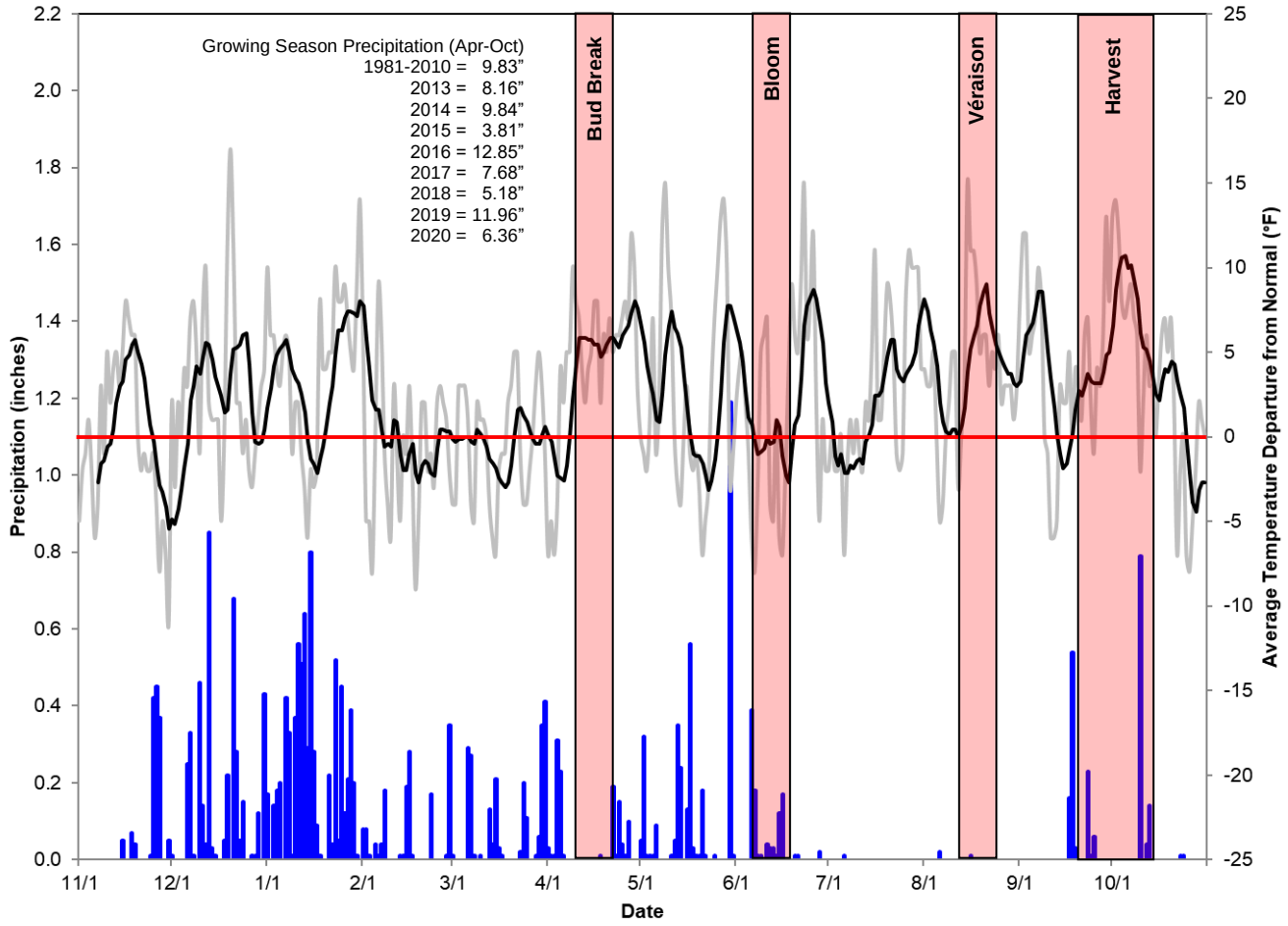

Figure 1 – Daily average temperature departures from normal and precipitation for November 1, 2019 to October 31, 2020 from the Roseburg weather station. The gray line is the day to day temperature departures from normal, the black line is the weekly average departures, and the blue bars are daily precipitation. 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 more details).

The eight reference vineyards in the Umpqua Valley averaged 43.7°F during the winter of 2019-2020 (Table 1). Average minimum temperatures ranged from 35.3 to 38.4°F over the eight sites with an absolute minimum of 23.4°F observed on November 1st and lows down to the mid 20’s during early and late November, mid-January, and the third week of February. On average, the sites observed a total of 32 days below freezing during the winter with a range from 19 days (Elkton area site) to 45 days (central AVA site).

Precipitation during the winter of 2019-2020 was below normal over the majority of the PNW, with the driest areas being southern and eastern Oregon, eastern Washington, and Idaho (50-80% of normal). Only portions of western Washington experienced normal winter precipitation (115-130%). While precipitation is not observed at the reference vineyards in the Umpqua Valley, values from the main climate stations in the Southern Oregon region indicate that November through March was significantly below average. The Roseburg weather station experienced a winter with 11.18”, which was 12.69” below the 1981-2010 climate normals (53% below) with January the only month with above normal

precipitation (Figure 1). The greatest one-day precipitation amount at the Roseburg weather station occurred on December 13th with 0.85" and there were no daily precipitation records during the winter for the station.

Table 1 – Umpqua Valley reference vineyard dormant season (November 1-March 31, 2019-20) and growing season (April 1-October 31, 2020) 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 2020 (base of 50°F with no upper cut-off).

Dormant Season (Nov 1 – Mar 31)	***Average***	***Standard Deviation***	***Maximum***	***Minimum***	***Range***
Average Temperature (°F)	43.7	0.6	44.7	43.0	1.7
Absolute Minimum Temperature (°F)	24.4	0.6	25.2	23.4	1.8
# of Days < 32°F	32	9.8	45	19	26
Growing Season (Apr 1 – Oct 31)	***Average***	***Standard Deviation***	***Maximum***	***Minimum***	***Range***
Growing Degree-Days	2796	280	3316	2367	956
Growing Season Average Temperature (°F)	62.7	1.3	65.3	60.7	4.6
Average Maximum Temperature (°F)	80.0	3.4	86.2	76.3	9.9
# of Days > 95°F	27	21	58	9	49
Average Minimum Temperature (°F)	48.9	1.4	50.8	46.4	4.4
# of Days < 32°F	4	2.6	8	1	7
Median Last Spring Frost (date or days)	Apr 8	6 days	Apr 17	Apr 3	14 days
Median First Fall Frost (date or days)	Oct 22	2 days	Oct 26	Oct 22	4
Median Frost-Free Period (days)	198	9 days	206	188	18 days

Growing Season

While the 2020 vintage will long be remembered for the Labor Day wind event, fires, and smoke, the first part of this section will describe the overall conditions with a separate section below on the specific aspects of this extreme event. The 2020 growing season from April through October across the PNW was relatively warm, ending up 2.0°F above the long-term average from 1981-2010. Oregon was moderately warmer than the PNW average at 2.4°F above average with the regions ranging from the Willamette Valley +2.1°F, the Columbia Gorge and Columbia Valley +2.3°F, and Southern Oregon +3.5°F. Overall the growing season average daily temperatures observed at the Roseburg weather station were 2.9°F warmer than the 1981-2010 climate normals (Figure 1). The warmest day at the Roseburg station during the growing season was 109.0°F on August 15th with the location experiencing 36 days above 90°F and 14 days above 95°F, a significantly higher number than in both 2018 and 2019, and compared to the long-term average. The growing season had nine temperature extreme records set in 2020, 90°F on May 8th, 93°F on May 28th, 97°F on June 23rd, 109°F on August 15th, 99°F on September 3rd, 96°F on September 29th, 93°F on October 2nd, 92°F on October 15th, and one minimum temperature record of 27°F on October 26th.

Heat accumulation in the PNW started off near average to slightly below average in eastern and northern Oregon and eastern Washington, while moderately above average for southern Oregon. Even with a relatively warm growing season, growing degree-days (GDD) continued to track closer to average for the northern and eastern wine regions while remaining above average in the southern regions. In the end, the 2020 vintage GDD amounts over most of California, Oregon, and Washington were up 5-20% above the 1981-2010 normals. Isolated areas in eastern Washington, eastern Oregon, and Idaho were closer to normal or as much as 5% down from average. Spring heat accumulation in the region for 2020 started off above average and continued through the end of the vintage (Figure 2). From April through

mid-June heat accumulation tracked above 2015, the warmest vintage so far in the region, then tracked above the average of the 2001-2019 vintages the rest of the vintage.

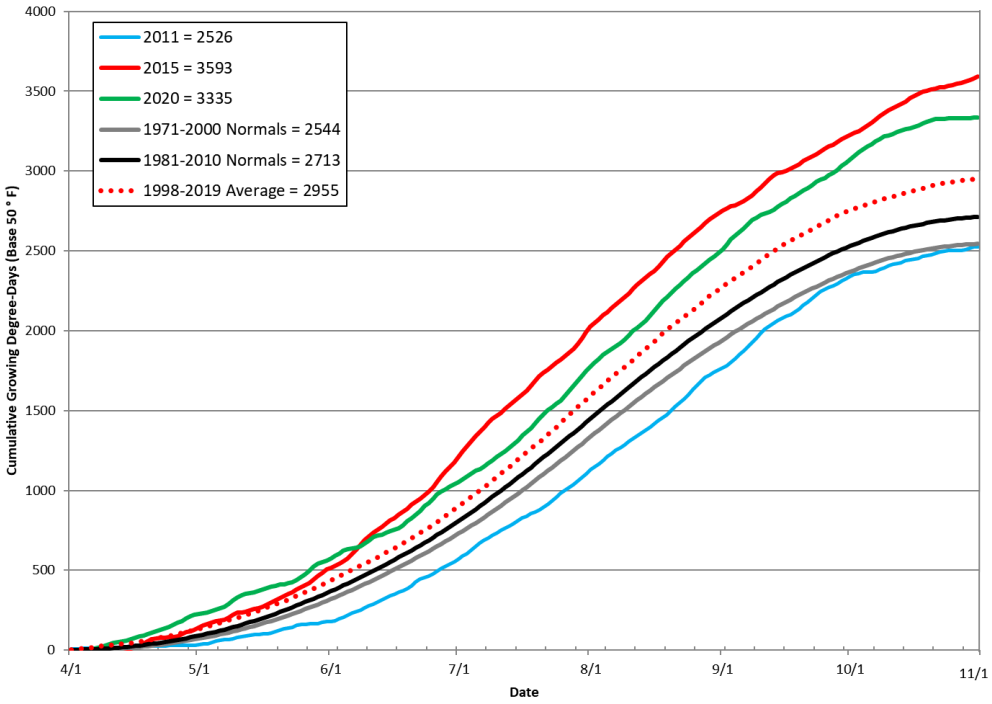

Figure 2 – Growing degree-day accumulation during April-October 2020 from the Roseburg weather station (green line). The long-term averages shown are for the 1971-2000 climate normals (gray line), 1981-2010 climate normals (black line), the 1998-2019 period average (red dotted line), 2015 the warmest 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 2001-2019 averages for the Roseburg station. As is common in most springs, 2020 saw wide swings in heat accumulation during April through June. Greater accumulation than average occurred during the warm April through early May period, followed by wide swings between much lower than average accumulation during the wet/cool period in the middle of May, then wide swings between very warm and cool periods in late May and June (Figure 3). The rest of the growing season saw mostly average daily accumulation, except for low accumulation periods in early July and August, then the significant drop off in September due the smoke (Figure 3).

GDD accumulation for 2020 ended up 3335 for the Roseburg weather station compared to 2637 at the Roseburg Agri-Met station and 2938 at the Medford Agri-Met station at SOREC. The 3335 GDD is 9% higher than the 2019 vintage, just below the warmest vintages of 2014 (3547) and 2015 (3593), 23% higher than the 1981-2010 normals (2713) and 11% higher compared to the 2001-2019 average (2993) (Figure 2). The year ended up being between the 2014/2015 and 2016/2017 vintages. Compared to other locations statewide, Roseburg ended up with the second highest heat accumulation compared to state's four main wine producing region's weather stations (McMinnville 2414, Milton-Freewater 3213, and Medford 3718).

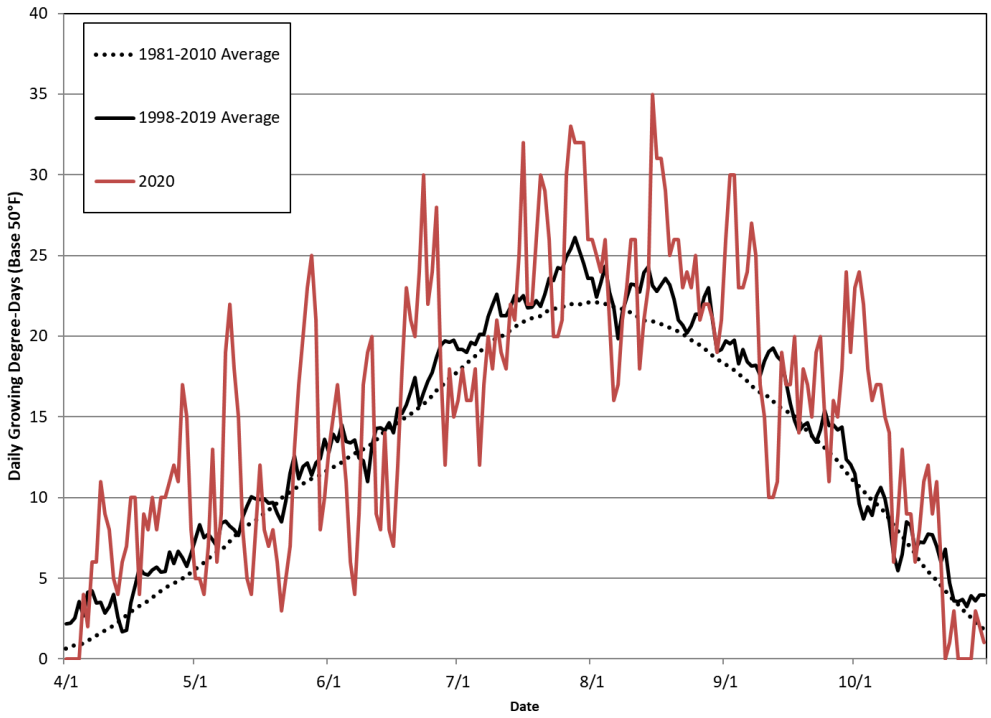

Figure 3 – Same data as in Figure 2 but shown as daily growing degree-day values during April-October 2020 from the Roseburg weather station (base 50°F). The long-term averages are derived from the 1981-2010 climate normals and the average from the 1998-2019 period of record.

For the 2020 vintage, site temperature data from the eight reference vineyards showed that the average GDD accumulation was 2796 with a standard deviation of 280 units (Table 1). Maximum accumulation was 3316 GDD (southern AVA site) while the minimum was 2367 GDD (Elkton area 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 9 days to a high of 58 days (Table 1). During 2020 there were 1 to 28 days over 100°F for the sites, with the hottest days of the year occurring during the last week of May, the last week of June, then mid-July through the first week of September with Roseburg and most sites being over 90°F nearly every day. The highest reference vineyard average maximum of 110.5°F and absolute maximum of 117.7°F was observed on August 15th.

The 2020 growing season saw absolute minimum temperatures that were moderately cooler than average at the reference vineyards. The coldest nights during the growing season occurred during early to mid-April with temperatures dipping down to 26-33°F throughout the region and during the last week of October when sites saw temperatures dip into the mid-20s. During these periods in April and October the sites experienced from 1 to 8 days that dropped below 32°F. The median last frost in the spring occurred April 8th across the region but, like many years, there was a wide range from the earliest being April 3rd (Elkton area site) to as late as April 17th (central AVA site) (Table 1). The median first fall frost was October 22nd across the reference vineyard sites with a four day range from the earliest first frost on October 22nd to the latest on October 26th, the same day as the Roseburg weather station. The resulting frost-free period median was 198 days in 2020, ranging 18 days across the sites from 188 days (central AVA site) to 206 days (Elkton area site).

Growing season precipitation was near average to significantly below average over most of the western US in 2020, with drought conditions widespread and increasing over the year. The PNW ended the

season down by approximately 5-10% for the April through October months, however much of the higher-than-average amounts came from western Washington, the northern Cascades, and Bitterroot Range in northern Idaho. Statewide Oregon saw between 20-35% below average precipitation, with areas to the north seeing lower deficits and areas to the south seeing higher deficits. For the Roseburg area, the dry winter continued into the growing season with only May and September wetter than average for the region. The May precipitation came mostly in one event with 1.19" occurring on May 30th. The June precipitation came during bloom and fruit set, with 1.01" during June 6th to the 16th. The Roseburg weather station saw 6.36" during the 2020 growing season, 35% (3.47") below average for the location (Figure 1). The highest single day event for Roseburg during the growing season was the 1.19" on May 30th, which was a record amount for that date.

Comparisons with Previous Years

Compared to past dormant periods at the reference vineyards (starting in 2004-05), the 2019-20 winter was slightly warmer than average for the period (Table 2). This past winter had both a lower number of cold nights compared to average (32 vs 35) and experienced moderately warmer than average absolute minimum temperatures. During the growing season, the 2020 vintage temperatures across the reference vineyards ended up near average to 1.2°F warmer than average over the entire period. Average maximum temperatures were significantly higher than average (2.5°F) while average minimum temperatures were slightly warmer (0.1°F) compared to the long-term average. In terms of heat accumulation, the 2020 growing season GDD average of 2796 at the reference vineyards was 270 heat units greater than 2019, 11% more than the 2004-2019 average (2506), 400-600 heat units warmer than 2010 and 2011, and just over 200 heat units lower than 2015, the warmest vintage to date in the Umpqua Valley and the majority of the western US (Table 2).

During the growing season, absolute maximum temperatures were moderately higher than average, and the sites experienced a higher number of days over 95°F during 2020. The absolute minimum temperatures observed at the reference vineyards during the growing season were significantly below the period average (although they came in late October after the majority of the harvest was done), while the average number of days below 32°F was only one more than typical for the region. The last spring frost date was three days later than the time period average, and five days later than the 2018 vintage. The first fall frost date was eight days earlier than the time period average, but over ten days shorter than the 2019 vintage. The average frost-free period in 2020 was 198 days, 11 days shorter than the time period average but ten days longer than the 2019 vintage (Table 2).

Labor Day Wind Event, Fires, and Smoke:

In late August and the first couple of days of September, the forecast was pointing to a heat extreme event for the coming week with some concern for plant stress and fruit dehydration. However, as the very large high-pressure area responsible for the heat event grew, stretching from the desert SW to Alaska, the forecast started calling for an extreme east wind event. This was largely due to the size of the high-pressure area and that it was pushing the jet stream into northern Canada and forcing the cold air southward into the Rockies and the central US; with Denver forecast for snow. By September 7th temperatures in NE Oregon and SW Oregon were 50-70 degrees apart creating the gradient that would enhance the strong winds (30-60 mph) from the east. As the east wind developed further it moved over numerous mountainous areas, warming, drying, and increasing in wind speed. The result was a dramatic drop in dew points (as much as 30 degrees in an hour) and lowering relative humidity to desert-like conditions even to the coast (to 8-15%). This same event brought very cold air to the Rockies with

temperatures dropping 60 degrees or more in one day and significant snow to the mountains and the Front Range.

This wind event was extremely rare, with only a couple of similar events in our data record. Others have noted that this was the strongest 2-day easterly wind event during fire season since at least September of 1950, but that event came during a cooler period and after some significant precipitation earlier in the month. Another somewhat similar event occurred during the initial Tillamook Burn fire in 1933, but prior to that there is no evidence of events of this magnitude in the 1800s.

In addition, the Labor Day weather event arrived at the worst possible time; woody material (fuels) west of the Cascades and Sierra Nevada mountains were ready to burn and burn quickly. Up and down the western US fires that had been smoldering from a lightening event in mid-August exploded while new fires erupted around them from numerous trees and power lines being toppled. Unrivaled destruction spread while the winds continued to whip the fires out of control. From the fires came smoke, and a lot of it, which the east winds pushed over 1000 miles out over the Pacific. Then the circulation in the atmosphere shifted with high-pressure building in from the east, first pulling the smoke from the Pacific back over the western US, then dropping the wind speeds, which provided a modicum of advantage to firefighters. However, the declining wind speeds, stable air from the high pressure, and lower solar radiation reaching the surface brought mid to high-level smoke down to the surface in many regions. The smoke lowered daytime temperatures significantly (5-25°F or more) from what would have been seen under clear skies, and over a few days, the lack of solar radiation hitting the surface caused nighttime temperatures to drop significantly (5-10°F or more). The high pressure and smoke together created a strong inversion holding smoke near the surface until changes in airflow and rain events during September 16-18 (varied tremendously from north to south in the state) brought some reprieve 11-13 days after the wind event started.

While September 2020 will long be remembered for the east wind event, catastrophic fires, and days of suffocating smoke, it also ended up being one of the top 5 warmest Septembers on record for most of the west (4.0-6.0°F warmer than average). From looking at upper air data and other regional weather station data from outside the smoke areas, I believe that without the smoke it would have likely been the warmest September on record over most of the west. Using the reference vineyard stations as an example, for the seven days prior to the event (September 1-7) the maximum temperatures averaged 93.1°F, 19-25 degrees higher than the days during the main smoke period (September 10-18) with an average of 74.1°F, and I firmly believe the macro-scale conditions would have likely held to clear skies, warm, and dry conditions through mid-month at the minimum, without the smoke.

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.

Season/Variable	*Year or Period*																	
Dormant Season (Nov 1 – Mar 31)	***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***	***19-20***	***Average***
Average Temperature (°F)	NA	43.7	42.3	42.7	40.9	42.2	43.6	43.9	41.9	43.4	42.9	47.1	45.3	43.3	43.4	42.5	43.7	43.3
Abs. Minimum Temperature (°F)	NA	23.3	16.0	15.9	16.4	14.1	8.8	18.5	22.0	20.6	5.6	17.3	17.5	25.3	19.2	21.0	24.4	17.9
# of Days < 32°F	NA	34	32	52	52	40	26	30	42	35	40	21	15	33	29	40	32	35
Growing Season (Apr 1 – Oct 31)	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***2020***	***Average***
Growing Degree-Days	2636	2302	2458	2144	2243	2384	2039	2120	2380	2522	2971	3011	2760	2662	2655	2526	2796	2506
Abs. Maximum Temperature (°F)	107.7	106.7	110.2	103.7	107.2	113.7	109.6	101.9	106.7	105.9	108.3	111.1	113.1	115.2	112.9	111.4	110.5	109.2
# of Days > 95°F	17	10	24	11	19	23	13	14	20	20	31	31	23	30	25	23	27	21
Abs. Minimum Temperature (°F)	33.9	30.1	23.3	28.5	24.2	28.1	27.6	27.3	29.4	29.2	30.8	30.8	33.2	28.6	24.7	23.7	19.6	27.8
# of Days < 32°F	0	2	4	2	7	5	2	6	2	2	0	1	0	3	3	4	4	3
Median Last Spring Frost	Apr-1*	Apr-13	Mar27	Apr-2	Apr-20	Apr-16	Apr-24	Apr-25	Mar31	Apr-14	Mar27	Apr-9	Feb 23	Mar22	Apr 3	Apr 8	Apr 8	Apr 5
Median First Fall Frost	Nov-5	Nov-4	Oct-26	Oct-27	Oct-11	Oct-12	Oct-19	Oct-26	Nov-9	Oct-29	Nov30	Nov24	Dec-7	Oct 31	Oct 18	Oct 10	Oct 22	Oct 30
Median Frost-Free Period	218	205	213	208	174	179	178	184	223	202	247	230	288	213	198	188	198	209

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. Note that the last spring frost in 2004 is from the Roseburg KQEN station observation, which correlates reasonably well with the reference vineyard sites in other years.

Phenology:

Summarizing the phenological observations over the reference vineyards and across all varieties shows a median bud break of April 14th (Table 3). During the spring of 2020 bud break was observed over a relatively long period of just over three weeks across all varieties and sites, reported as early as April 7th and as late as April 30th. The median date of flowering was June 11th with over a month between the earliest (May 30th) and latest (July 8th, high elevation site) sites across the region and over all varieties. Véraison and the start of the ripening phase during 2020 occurred over a 24-day period during early to late August (median August 18th). The earliest véraison was observed on August 1st while the latest was observed on August 25th. Harvest ranged over a 37-day period from September 4th to October 11th across varieties and sites with a median date of October 22nd (Table 3).

Average intervals between phenological events (an important measure of vine and berry development timing) shows that bud break to flowering during 2020 had a median of 56 days; that flowering to véraison was 68 days on average; and that véraison to harvest was 46 days on average (Table 3). These intervals had 7 to 10-day standard deviations across sites and varieties, but a very wide range between the shortest and longest intervals due to site elevation differences. For 2020, the length of the bud break to harvest period averaged 171 days with 36 days between the shortest and longest by site and variety.

Table 3 –Phenological date and interval characteristics for the 2020 vintage averaged over sites and varieties.

Event/Interval	*Median*	*Standard Deviation*	*Latest or Longest*	*Earliest or Shortest*
Bud Break	April 14	4 days	April 30	April 7
Flowering	June 11	9 days	July 8	May 30
Véraison	August 18	7 days	August 25	August 1
Harvest	October 2	10 days	October 11	September 4
Bud Break to Flowering	56 days	9 days	83 days	49 days
Flowering to Véraison	68 days	10 days	74 days	41 days
Véraison to Harvest	46 days	7 days	57 days	34 days
Bud Break to Harvest	171 days	8 days	182 days	146 days

Comparisons with Previous Years

The main phenological events for the 2020 vintage were near the averages when compared to the previous sixteen vintages (Table 4). The median bud break was one day later than average but a few days earlier than the last few vintages. Bloom was three days earlier than the period average, over three weeks earlier than the cool 2011 vintage but 10 days later than the warm 2015 and 2016 vintages. Median véraison dates during 2020 averaged three days later than average, varying by +/- 7 days over sites and varieties, and occurring over two weeks later than in the 2019 vintage. The median harvest date was two days earlier than average, over three weeks earlier than the cool 2010 and 2011 vintages, but moderately later than the 2013-2016 vintages.

For the 2020 vintage, the period between bud break and bloom of 56 days was shorter than the period average by six days (Table 4). The bloom to véraison period was five days longer than the period

Table 4 – Reference vineyard average phenology comparisons for each year of the project. Note that the 2011-2020 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	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*Average*
Bud Break																		
Median	4/1	4/2	4/22	4/9	4/22	4/21	4/16	5/1	4/22	4/11	4/4	3/27	3/30	4/18	4/20	4/18	4/14	4/13
Std. Deviation	7 d	11 d	4 d	7 d	8 d	5 d	7 d	7 d	4 d	7 d	7 d	8 d	6 d	7 d	5 d	4 d	4 d	6 days
Flowering																		
Median	6/5	6/13	6/14	6/9	6/23	6/16	7/2	7/3	6/21	6/9	6/10	6/1	6/1	6/17	6/15	6/12	6/11	6/14
Std. Deviation	5 d	7 d	5 d	7 d	6 d	6 d	6 d	5 d	5 d	4 d	6 d	7 d	5 d	5 d	4 d	6 d	9 d	6 days
Véraison																		
Median	8/13	8/14	8/14	8/12	8/19	8/19	8/30	9/9	8/26	8/12	8/9	7/31	8/6	8/14	8/15	8/2	8/18	8/15
Std. Deviation	7 d	10 d	9 d	9 d	9 d	7 d	11 d	8 d	7 d	6 d	7 d	9 d	7 d	9 d	9 d	8 d	7 d	8 days
Harvest																		
Median	10/5	10/10	10/8	10/7	10/15	10/8	10/19	10/26	10/3	9/27	9/22	9/23	9/18	10/6	10/4	9/29	10/2	10/4
Std. Deviation	9 d	12 d	9 d	10 d	9 d	8 d	6 d	6 d	8 d	9 d	11 d	13 d	11 d	9 d	12 d	9 d	10 d	9 days
Bud Break to Flowering																		
Median	65 d	76 d	54 d	61 d	64 d	56 d	75 d	63 d	59 d	57 d	65 d	63 d	64 d	62 d	56 d	54 d	56 d	62 days
Std. Deviation	7 d	14 d	6 d	8 d	6 d	7 d	6 d	7 d	4 d	5 d	8 d	9 d	6 d	5 d	3 d	4 d	9 d	7 days
Flowering to Véraison																		
Median	68 d	61 d	62 d	63 d	59 d	63 d	58 d	65 d	68 d	65 d	63 d	63 d	64 d	58 d	62 d	58 d	68 d	63 days
Std. Deviation	6 d	8 d	8 d	8 d	6 d	6 d	10 d	4 d	5 d	6 d	6 d	7 d	7 d	5 d	7 d	8 d	10 d	7 days
Véraison to Harvest																		
Median	55 d	51 d	51 d	56 d	55 d	51 d	46 d	49 d	41 d	44 d	44 d	48 d	45 d	51 d	48 d	58 d	46 d	49 days
Std. Deviation	11 d	15 d	10 d	11 d	10 d	9 d	10 d	8 d	7 d	8 d	11 d	9 d	12 d	10 d	12 d	8 d	6 d	10 days
Bud Break to Harvest																		
Median	185 d	194 d	168 d	175 d	174 d	171 d	185 d	177 d	164 d	166 d	173 d	172 d	170 d	170 d	169 d	170 d	171 d	174 days
Std. Deviation	13 d	13 d	8 d	13 d	11 d	9 d	8 d	9 d	7 d	11 d	10 d	14 d	13 d	10 d	13 d	7 d	8 d	10 days

average (63 days). The average length of time between véraison and harvest was 46 days, three days shorter than the period average, and twelve days shorter than the 2019 vintage. The average bud break to harvest interval of 171 days in 2020 was shorter than average by three days, but roughly similar to the last seven 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 2020 vintage, grower-submitted harvest composition values reflect a near average sugar accumulation showing a median 23.5 °Brix with a moderately wide range from 22.0 to 26.0 °Brix across sites and varieties (Table 5). Harvest titratable acidity averaged 6.8 g/L in 2020 with a reported minimum of 4.4 g/L to a maximum of 7.8 g/L while pH numbers averaged 3.42 with a range from 3.20 to 3.71 over all sites and varieties. Yields averaged 1.6 tons/acre across the sites and varieties, ranging 1.6 tons/acre from a low of 1.0 to a high of 2.6 tons/acre (Table 5).

Table 5 –Harvest composition characteristics for the 2020 vintage averaged over sites and varieties.

Region	°Brix	TA (g/L)	pH	Yield (T/acre)
Median	23.5	6.8	3.42	1.6
Standard Deviation	1.2	1.3	0.14	0.5
Maximum	26.0	7.8	3.71	2.6
Minimum	22.0	4.4	3.20	1.0
Range	4.0	3.5	0.51	1.6

Comparisons with Previous Vintages

The 2020 vintage harvest composition values from the sites give a general comparison with the 2004 through 2019 vintages (Table 6). Average °Brix values of 23.5 were right at the period average and consistent with many recent vintages. Average titratable acidity of 6.8 g/L was slightly higher than the period average (6.5 g/L) and similar to the 2004, 2005, and 2008 vintages. Median pH values in 2020 were slightly lower than the long-term average, similar to the last three vintages, and had lower than average site and variety variation. Yields reported from the sites show that the 2020 vintage were substantially below the period average (-33%) and the lowest reported since the 2004 vintage. The range of 1.6 tons/acre across sites and varieties in 2020 was similar to the 2018 and 2019 vintages (Table 5).

Table 6 - Comparison of the overall harvest composition values (all varieties) for each year of the project. *Note that the 2011-2020 vintage numbers come from fewer sites and varieties than the previous years (see text for details).

Parameter	*Harvest Numbers*																	
	2004	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*Average*
°Brix	24.1	24.0	24.4	23.5	23.7	23.5	22.5	21.5	23.6	23.5	23.4	24.1	24.0	23.4	23.8	23.0	23.5	23.5
TA (g/L)	6.6	6.9	6.5	7.1	6.8	6.4	7.6	7.8	6.3	5.6	5.9	5.9	5.8	6.2	6.4	6.4	6.8	6.5
pH	3.50	3.38	3.46	3.33	3.42	3.41	3.31	3.40	3.50	3.56	3.50	3.51	3.50	3.40	3.41	3.40	3.42	3.44
Yield[1]	1.7	2.4	2.8	2.8	2.5	2.4	2.0	2.9	1.9	2.6	2.7	2.7	2.9	2.7	2.4	2.6	1.6	2.4

[1] Tons per acre

Grower Comments and Overall Impacts:

Weather-related impacts (from above) combined with numerous grower comments provide a general summary for the 2020 vintage for the Umpqua Valley include: 1) even with a slightly late spring frost, very mild and no visible damage, 2) leading up to flowering there were major swings between abnormally high and low temperatures, followed by a bloom to fruit set period with overall higher cloud cover, showers, lower maximum temperatures, and higher humidity. These conditions likely played a role in fruit set being significantly down for many (smaller clusters, smaller berries, hens and chicks, and shatter prevalent), resulting in lower yields; 3) a relatively cool early July with slower than average heat accumulation and moderate summer heat stress; 4) Labor Day wind event and then smoke presented challenges for many (described above), slowed ripening, but many reported fruit quality was very good with balanced sugar, acid, and pH; 5) disease pressure average to significantly down across the region; and 6) interesting year for bird damage with everything from major impacts at higher elevations and later picking, to average to lower than average bird pressure at many locations.

Current Conditions:

Unfortunately, the prolonged dry conditions over the western US have continued, even in the PNW and Northern California where near seasonally average precipitation amounts in November and early December have not fully alleviated drought concerns. Nearly 90% of the western US is in some category of drought with over 60% in severe to exceptional drought conditions. The only areas not exhibiting drought are western Washington, a small area of coastal Southern California, and scattered small areas in the northern Rockies. The longer-term outlook for the US through February continues to show the forecasted dry conditions for much of the west with further development expected in Southern California, the southern Plains, Texas, and even the southeast. The PNW is expected to see some improvement in drought conditions with the winter precipitation forecast as detailed below. The Four Corners region continues to be the bullseye for the western drought, with the extreme drought conditions being the result of a weak monsoon season, record-high temperatures year to date, and now what looks like a dry winter.

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 has clearly strengthened further into La Niña conditions. The Climate Prediction Center (CPC) has reported that SSTs in the east-central Pacific are approximately 2-3°F below average, with patterns in all key atmospheric variables consistent with La Niña conditions. Most model forecasts point to the Tropics exceeding the threshold of La Niña SST conditions through winter and dissipating next spring. The official CPC/IRI outlook and other agency outlooks are consistent with these model forecasts, calling for an 95% chance of La Niña for winter. Therefore, a La Niña advisory is in effect. Now with meteorological winter in place and La Niña conditions, the forecast leads me to believe that we will likely see a pattern that is consistent with historical analogs where the PNW has a greater chance of being wetter than average (roughly 70%), while California and the southwest have a greater chance to remain dry. However, contrary to average La Niña conditions, which are typically much cooler than average over the entire west, the current forecast is calling for warmer than average to average conditions, except for the PNW and across the northern Rockies, which I think reflects more influence from the North Pacific (see below).

The North Pacific continues to show a large area of anomalously warm water running 2-5°F above average. Although there has been some surface cooling in the last few weeks and some coastal cooling along the California coast, the North Pacific remains much warmer than average. The North Pacific is currently closer to neutral or the warm phase of the Pacific Decadal Oscillation, which would put it out of phase with the Tropics, which is colder than average (see above). The effect here is that the current warmth in the North Pacific will likely mute the La Niña effect, making the magnitude of the impact lower. The result is that the PNW will likely be in for slightly warmer winter than expected with a normal La Niña but is likely to stay wet over the course of the winter, while California would likely be warm and dry.

Further updates will be provided in monthly Weather and Climate Summary and Forecasts on my webpage and regional presentations over the coming months.

Future Work

- The observation network will continue for the foreseeable future focusing on site temperatures, phenology, and harvest composition and yields.
- An overview presentation will be given either at or virtually during a late winter/early spring meeting of the Umpqua Valley Winegrowers Association (watch for email 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 "Climatology Report" session on Wednesday, February 17 at 1pm during the February 16-19 virtual symposium.
- 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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