

SUMMARY OF THE 2021 'GROWING SEASON IN REVIEW' WORKSHOPS FOR ARIZONA WINE GRAPE GROWERS



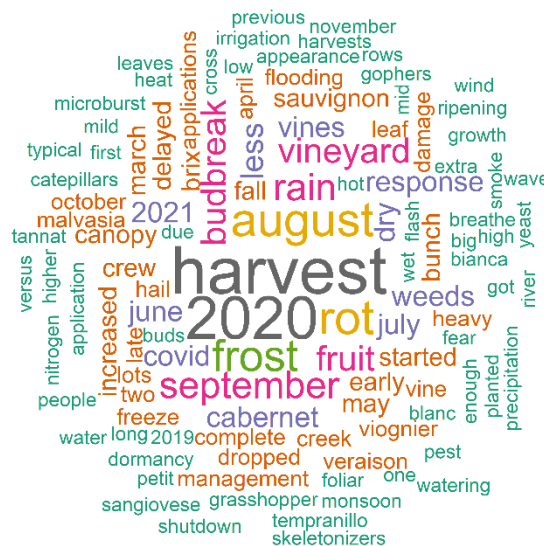
Verde Valley: November 9 at Yavapai College
Southeastern Arizona: November 16 at Buhl Memorial Vineyard

What were the topics on most minds at the 2021 'Growing Season in Review' workshops for Arizona wine grape growers?

In order to find out, we asked participants to post their observations on growth-stage timing, weather events, occurrences of pests or disease, and other issues along a monthly timeline. Posts not only gave shape to the 2021 growing season in terms of these topical categories, but also detailed both impacts and responses in vineyards, as well as varieties of note. And since we weren't able to gather for the 2020 editions of this workshop, posts also did more or less the same for the growing season that year.

The short answer to the above question is the word cloud to the right, in which the top terms are 'harvest', '2020', 'august', 'rot', and 'frost'. The long answer to the above question is in the following sections, where we take a closer look at these terms and some examples of them, along with a more general assessment of timeline posts.

Directly comparing the 2021 and 2020 growing seasons with workshop activities this year allowed participants to explore some uncharted territory. For during these two years, Arizona viticulture posted two new, more extreme endpoints in terms of conditions during the ripening and harvest periods. Many locations experienced near-record- to record-wet conditions in **July and August in 2021** and near-record- to record-hot-and-dry conditions during **those months in 2020**. Sure, wet or hot-and-dry summers



The more a specific term appeared on the timelines, the bigger and bolder it appears in this word cloud. Granted, not all terms from timeline posts show up here. We filtered out those with only one occurrence in order to keep the figure from becoming unruly. This isn't to say that the most frequently used terms are all that we are paying attention to. We'll be revisiting all participant posts in the coming months to help inform future issues of the [Climate Viticulture Newsletter](#).

have occurred before. But, heading into the workshops, we nonetheless wondered if the extra rain or additional heat and drought these past two years led to intensified impacts or posed any novel challenges. Regardless of the answer to this question, we believe that experience gained in 2021 and 2020 will be especially valuable to growers as they address the more variable and extreme summer climate that is **anticipated for the Southwest** in coming years.



Top Five Terms

'harvest' (timing and comparison)

Of the top five terms from the workshop timelines, the first four may provide some insight as far as how really wet or really hot-and-dry conditions during the ripening and harvest periods affect wine grape growing in Arizona.

One effect, at least regarding harvest, may be on timing. Despite [similar starting dates](#) to the growing season in 2021 and 2020, harvest dates look to have been later this past year. This is suggested, for instance, in the second and third posts to the right, which are from the same participant.

There is, however, a lot to untangle here. Harvest dates have myriad influences, whether related to growing conditions, vineyard management, or winery goals. In terms of the former, complexity can come from prior events like high temperatures that slow or shut down vine photosynthesis and [slow growth stage progress](#), or cloudy skies and cooler temperatures that also may delay vine phenology. Events coincident with harvest, like untimely rain and disease pressure, as pointed out by posts to the right, are other possible factors.

'2020' (heat and a pandemic)

If not high enough to slow or shut down vine photosynthesis and [slow growth stage progress](#), relatively warmer temperatures may instead be shortening the time between growth stages during the growing season, including the time it takes for grapes to ripen. It matters where temperatures are relative to growth thresholds and development rates.

*"2020 **harvest** dates earlier"*

*"august 2020 **harvest** started 7 ended 29"*

*"september last **harvest**"*

*"2020 quick **harvest** higher pH clean fruit"*

*"delayed **harvest** rain multiple vineyards"*

*"bunch rot fungus rots couldn't **harvest** fast enough"*

*"rot prompted early **harvests** not ideal"*

*"record **harvest**"*

*"**harvest** was completed before most other local **harvests**"*

Descriptions of how timelines and posts came to be are in Appendix 1: Workshop Activities, below. What themes do you pull from the posts with 'harvest', here, and others in Appendix 2: Timeline Posts, below?

"2020 hot dry early canopy shutdown"

"2020 compressed ripening season"

"2020 harvest dates earlier"

Like harvest dates, the length of the ripening and harvest periods is a function of several variables related to growing conditions, vineyard management, or winery goals. One aspect of the former, perhaps surprising, could stem from earlier in the growing season. If early varieties – those that reach growth stages earlier than others – were slowed down, and late varieties – those that reach growth stages later than others – were not, harvest of the early varieties may be delayed and moved closer to that of the late varieties. Logistically, this can turn into a [vineyard traffic jam](#).

‘august’ (monsoon and fruit quality)

Perhaps it is not surprising that ‘august’ is one of the top terms. After all, it is when the ripening and harvest periods at many locations lined up with what was in 2021 a near-record- to record-wet [monsoon](#).

The coincidence of a monsoon with the ripening and harvest periods is a unique feature of Arizona *terroir*, different from the Mediterranean climate (cool, wet winters and warm, dry summers) that many wine grape-growing areas around the world have. Although we keep a list of pros and cons when it comes to wet or dry monsoons, we still haven’t figured out if there’s a sweet spot for conditions at this time of year. Maybe the extremeness of the past two years has made this assessment harder.

Posts for ‘august’ also note that it’s not just when you harvest, but what you harvest. We’ll be looking at the effects of Arizona climate on wine grape composition as part of [our new specialty crop grant](#) from the [Arizona Department of Agriculture](#).

“2020 quick harvest higher pH clean fruit”

“2020 soil acidification fertilization petiole analysis 2021 more canopy better fruit more canopy management”

“2020 covid-19 mask in vineyard less crew”

Descriptions of how timelines and posts came to be are in Appendix 1: Workshop Activities, below. What themes do you pull from the posts with ‘2020’, here, and others in Appendix 2: Timeline Posts, below?

“august wet”

“august precipitation hampered sampling”

“august rot had started”

“august september bunch rot much more prevalent”

“tannat 23 brix august 18”

“cabernet sauvignon 22 brix august 25”

Descriptions of how timelines and posts came to be are in Appendix 1: Workshop Activities, below. What themes do you pull from the posts with ‘august’, here, and others in Appendix 2: Timeline Posts, below?

'rot' (impacts of a wet monsoon)

Posts here hint at the cascade of effects from a wet monsoon, from those related to vineyard management to others tied to harvest. Plainly, the top terms from these workshops are not always independent from one another.

As noted in [the newsletter](#), how ripening lines up with monsoon activity, and the temperature and precipitation conditions therein, may make an impression on [fruit quality](#) for a given vintage. Having [early and late varieties](#) in the vineyard, which can be a function of both scion and rootstock, can help hedge any negative effects of when harvest isn't optimally lined up with the weather. Seeing varieties listed to the right, we wonder if growing wine grapes of varying cluster tightness is another way to hedge such bets.

The numerous posts with 'rot' point to that perhaps being an intensified impact from the near-record- to record-wet conditions in [July and August in 2021](#). Although not appearing in the timelines, we also wonder if berry shrivel became more common under the opposing extreme during [those months in 2020](#). With the increasing frequency of hot-and-dry conditions, this latter issue is getting [more attention](#) in other wine grape-growing areas, as its impacts include reduced yield and effects on berry composition.

'frost' (spring and fall)

Although not tied to the two new, more extreme endpoints of conditions during the ripening and harvest periods, some of the posts with 'frost' did reference what had been an uncommon event.

"rot mold from monsoons"

"crop loss from rot slower pick times"

"weeds explosion in rows dropped fruit from rot"

"dropped fruit from rot brings wasps and bees"

"more rain more rot more vegetative growth more canopy management"

"bunch rot picpoul blanc tannat"

"rot prompted early harvests not ideal"

"bunch rot fungus rots couldn't harvest fast enough"

[Recent research](#) from Australia is developing tools to improve detection and measurement of bunch rot. Descriptions of how timelines and posts came to be are in Appendix 1: Workshop Activities, below. What themes do you pull from the posts with 'rot', here, and others in Appendix 2: Timeline Posts, below?

"2019 fall frost detrimental to 2020 fruit yield"

At many vineyard locations in 2021, there was a gradual progression of vines into dormancy. In the previous two growing seasons, however, October brought about the **first fall hard freeze**. Depending on vine phenology and vineyard location, the timing could have been prior to plants reaching **cold-hardiness** levels – through, for example, tissue dehydration – needed to withstand such temperatures. Resulting damages to vascular tissue look to have been the **likely reason** why vines showed **no or slow growth** during the following springs. Some of the surprise from these events may stem from the fact that it had been **about 10 years** since such a relatively early first fall hard freeze had last occurred in some locations.

“frost may 23”

“fall frost threat in 2020”

“fall frost 2020 november 11”

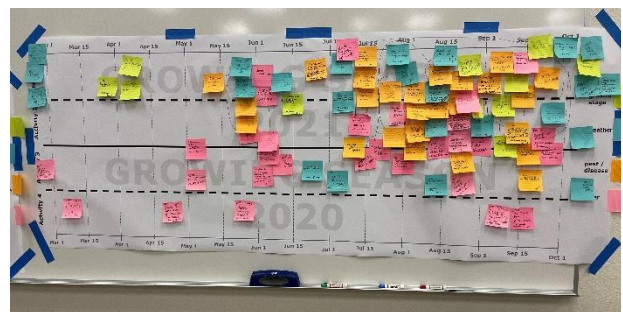
“late frost lost primary buds”

Descriptions of how timelines and posts came to be are in Appendix 1: Workshop Activities, below. What themes do you pull from the posts with ‘frost’, here, and others in Appendix 2: Timeline Posts, below?

Growing Season Shape

Taking a few steps back from the timelines, we see in the pictures to the right that much of the attention paid by participants on the past two growing seasons was focused on the ripening and harvest periods. This isn’t surprising, as three of the top five terms from the combination of the Verde Valley (top photo) and Southeastern Arizona (bottom photo) timelines are ‘harvest’, ‘august’, and ‘rot’.

What did surprise us from this viewpoint, however, was an apparent contrast between timelines from 2021 and 2019, the previous time this workshop took place, of when during the growing season a greater number of posts were made (below table). Plainly, posts were most often placed during the ripening and harvest periods for both of these years. But, there was a second cluster of comments during the early part of the



Verde Valley workshop posts on the topical category of growth stage are lime green, weather are blue, pest and disease occurrence are orange, and other are pink. A breakdown of timeline posts by month and by topical category is in the table, below. Photo by Jeremy Weiss

growing season in 2019 that reflected a relatively late budbreak and **cool May** that year.

We suspect that some of the attention on the relatively late start to the 2019 growing season was due to chill and heat accumulation that year **being different** from the previous two. Perhaps since chill and heat accumulation leading up to budbreak in 2021 **was instead similar** to that of the previous two years, the relatively late start to the 2021 growing season didn't stick out as much in participant minds.



Color codes for topical categories of posts at the Southeastern Arizona workshop are described in the photo caption, above. A breakdown of timeline posts by month and by topical category is in the table, below. Photo by Jeremy Weiss

YEAR	CATEGORY	MONTH									TOTAL
		MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT		
2021	growth stage	3	4	0	1	2	4	8	1	23	
	weather	6	1	3	4	6	15	3	6	44	
	pest/disease	0	0	4	1	7	13	9	0	34	
	other	1	1	3	6	1	10	7	0	29	
	TOTAL	10	6	10	12	16	42	27	7	130	
2019	growth stage	3	8	8	2	10	10	14	3	58	
	weather	8	5	6	7	10	11	14	2	63	
	pest/disease	0	4	3	7	7	9	6	0	36	
	other	2	4	0	3	5	10	2	1	27	
	TOTAL	13	21	17	19	32	40	36	6	184	

The table includes data from both the Verde Valley and Southeastern Arizona workshop editions. Month abbreviations are the first three letters of an individual month name. As workshop timelines represented the growing season only from March 1 through October 1, some entries posted at the beginning of March refer to previous months and some at the beginning of October refer to following months. More details on this are in Appendix 2: Timeline Posts, below. A summary of the 2019 'Growing Season in Review' workshops is [available online](#).

See you again next year?

The reason for these workshops is to fill a need identified by several wine grape growers to meet after harvest and discuss conditions of the growing season, share what went well and what didn't, and describe how

Our thanks to participants, workshop hosts, and event sponsors!

they dealt with challenges or took advantage of opportunities. We're glad to help put together and facilitate the events. Please feel free to give us **feedback** on the workshops this past year, suggestions on what topics to include more or less often, and ideas for new activities.

WRITTEN BY:

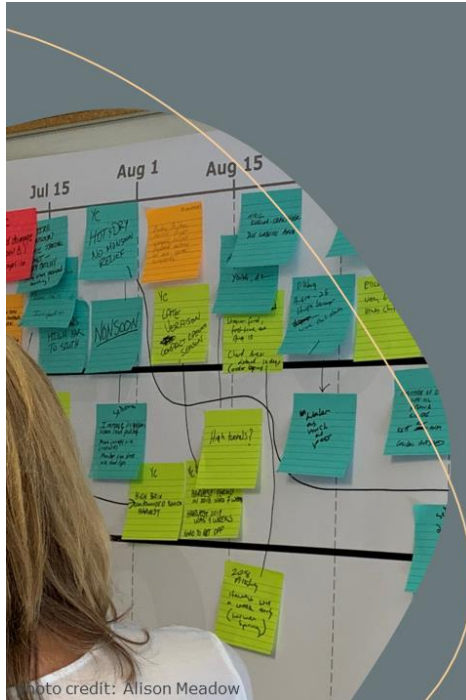
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WITH COOPERATION AND SUPPORT FROM:



Appendix 1: Workshop Activities

Details for the five participant activities at both of the 2021 workshop editions are below.



Activity 1
Shape the 2021 growing season.

INSTRUCTIONS
Recall timing of growth stages, weather events, occurrence of pests or disease, and other issues that occurred this year.

Use corresponding sticky notes to mark such events and issues on the growing season timeline.

Also write your name/affiliation on sticky notes.

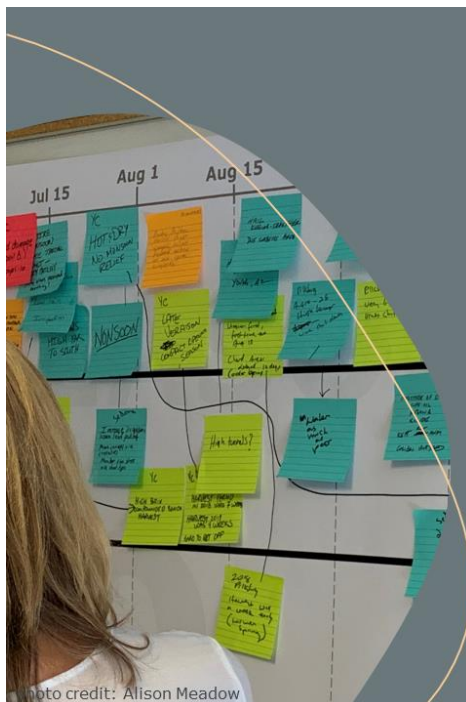
THINGS TO THINK ABOUT
What was timing of vine phenology like this past growing season?

Were events and issues typical or novel?

Were events and issues positive or negative?

Photo credit: Alison Meadow

Activity 1 – Shape the 2021 growing season



Activity 2
Detail impacts and responses, note varieties.

INSTRUCTIONS
Recall actual or possible impacts and responses to events and issues that occurred this year, noting affected varieties if applicable.

Use corresponding sticky notes to mark impacts and responses on the timeline and connect them to related events and issues in Activity 1.

Also write your name/affiliation on sticky notes.

THINGS TO THINK ABOUT
Were impacts of and responses to events and issues typical or novel?

Were responses to events and issues proactive or reactive?

Were responses to events and issues successful or not?

Photo credit: Alison Meadow

Activity 2 – Detail impacts and responses during the 2021 growing season, noting varieties when relevant

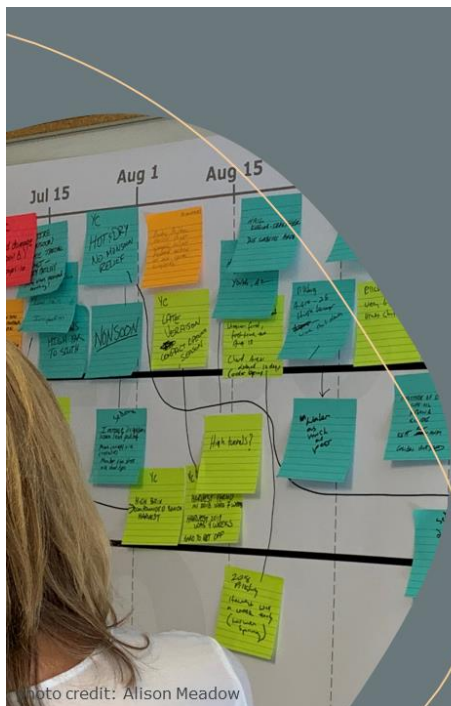


Photo credit: Alison Meadow

Activity 3

Compare the 2021 and 2020 growing seasons.

INSTRUCTIONS

Recall timing of events and issues that occurred in 2020, with particular attention to the ripening period.

Use sticky notes to mark events and issues on the timeline and connect them to related events and issues in Activities 1 and 2.

Also write your name/affiliation on sticky notes.

THINGS TO THINK ABOUT

What was timing of vine phenology like?

Were events and issues typical or novel?

Were events and issues positive or negative?

Activity 3 – Compare the 2021 and 2020 growing seasons

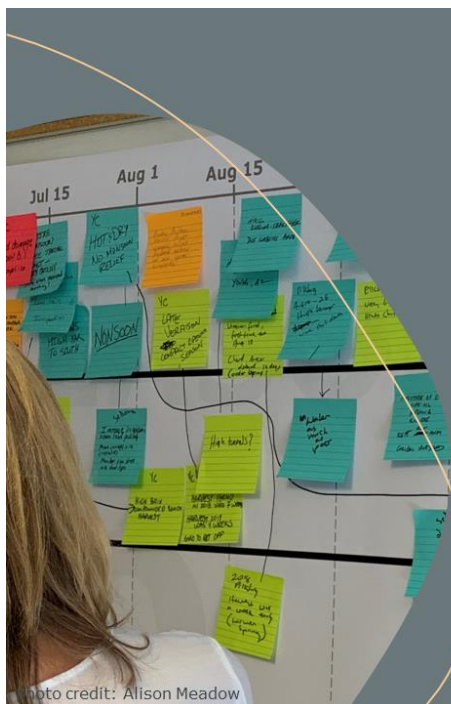


Photo credit: Alison Meadow

Activity 4

Compare 2021 and 2020 impacts, responses.

INSTRUCTIONS

Recall actual or possible impacts and responses to events and issues that occurred this year, noting affected varieties if applicable.

Use sticky notes to mark impacts and responses on the timeline and connect them to related events and issues in Activities 1, 2, and 3.

Also write your name/affiliation on sticky notes.

THINGS TO THINK ABOUT

Were impacts and responses of events and issues typical or novel?

Were responses to events and issues proactive or reactive?

Were responses to events and issues successful or not?

Activity 4 – Compare impacts and responses between the 2021 and 2020 growing seasons, noting varieties when relevant



photo credit: Michael Pierce

Wrap-up

Things to bring to the 2022 vintage.

THINGS TO THINK ABOUT

What was different from previous wet ripening periods?

What was different from previous hot and dry ripening periods?

What range of responses and varieties is needed to handle our now wider, more extreme range of ripening period conditions?

EXTRA TAKE-AWAYS

A 'double-dip' La Niña event is here.

A new economic study of Arizona's wine industry is out.

An ag-centric listserv with NWS-Flagstaff is starting.

All this and more in the Climate Viticulture Newsletter.

Activity 5 – Wrap up the workshop and discuss things to bring to the 2022 vintage

Appendix 2: Timeline Posts

A list of all timeline posts and corresponding details is below.

	POST	EDITION	ACTIVITY	CATEGORY	MONTH	LINKS
1	windy	SEAZ	1	weather	Mar	
2	very dry through July	VV	1	weather	Mar	
3	dry previous year	VV	1	weather	Mar	
4	fall frost threat in 2020	VV	1	weather	Mar	
5	late october freeze low 20s	VV	1	weather	Mar	
6	2019 fall frost detrimental to 2020 fruit yield	VV	3	weather	Mar	
7	covid-19	VV	4	other	Mar	
8	budbreak mid march 14 march 29	SEAZ	3	growth stage	Mar	
9	bud break viognier march 29	SEAZ	1	growth stage	Mar	
10	budbreak viognier march 31	VV	1	growth stage	Mar	
11	budbreak tempranillo petit syrah petit verdot cabernet sauvignon april 5	SEAZ	1	growth stage	Apr	
12	viognier budbreak april 8	VV	1	growth stage	Apr	
13	budbreak	VV	1	growth stage	Apr	
14	no precipitation increased irrigation	SEAZ	1	weather	Apr	
15	budbreak cabernet sauvignon april 2	SEAZ	3	growth stage	Apr	
16	2020 covid-19 people quit less crew online classes masks fear	VV	4	other	Apr	
17	lots of deer in may on property and eating shrubs trees	SEAZ	1	other	May	
18	spray zinc boron nitrogen pest management	VV	2	pest/disease	May	
19	2020 hot dry early canopy shutdown	VV	3	weather	May	
20	big fat caterpillars	VV	1	pest/disease	May	
21	swallowtail cocoon may 24	VV	1	pest/disease	May	
22	late frost lost primary buds	VV	1	weather	May	
23	frost may 23	VV	1	weather	May	
24	dropped all fruit flowers young vines	VV	2	other	May	
25	response to appearance of cocoons neem oil application may 24	VV	2	pest/disease	May	21
26	2020 covid-19 mask in vineyard less crew	VV	4	other	May	
27	planted vidal blanc	VV	1	other	Jun	
28	fires smoke june to july	VV	1	other	Jun	
29	heat wave	SEAZ	1	weather	Jun	
30	response reaction to wildfire increased watering cycles in duration	VV	2	other	Jun	28
31	vineyard crew was sent home smoke affected care of vines in that way not sure of long term	VV	2	other	Jun	28
32	heat wave increased irrigation	SEAZ	3	weather	Jun	
33	mid june veraison typical	VV	1	growth stage	Jun	
34	cornville fire june 13	VV	1	weather	Jun	
35	more water bigger berries than 2020 june 13	VV	2	other	Jun	
36	planted malvasia bianca out of 150 vines only 1 survived too hot june 11	VV	3	other	Jun	

	POST	EDITION	ACTIVITY	CATEGORY	MONTH	LINKS
37	less hornworms in vineyard later appearance of skeletonizer damage	VV	1	pest/disease	Jun	
38	2020 compressed ripening season	VV	3	weather	Jun	
39	veraison started late	SEAZ	1	growth stage	July	
40	very few gophers	SEAZ	1	pest/disease	Jul	
41	microburst wind	VV	1	weather	Jul	
42	heavy rain	VV	1	weather	Jul	
43	vineyard damage due to storm microburst july 13	VV	1	weather	Jul	
44	veraison july 2020	SEAZ	3	growth stage	Jul	
45	bone dry previous two years	VV	3	weather	Jul	
46	noticeable increase in butterfly and grasshopper populations	VV	1	pest/disease	Jul	
47	grasshopper invasion	VV	1	pest/disease	Jul	
48	perce's disease	VV	1	pest/disease	Jul	
49	light rains low weeds nice summer	SEAZ	1	weather	Jul	
50	extra food for birds leaves got munched	VV	2	other	Jul	47
51	scheduled pest foliar applications	VV	2	pest/disease	Jul	
52	leaf curl in two vines removal	VV	1	pest/disease	Jul	
53	more normal monsoon slightly delayed	VV	1	weather	Jul	
54	pruned back to two buds and treated with systemic insecticide vine rebudded but leaves only got about one-quarter inch then curled up and fell off now I think the vine is just dead	VV	2	pest/disease	Jul	48
55	weeds extra vegetation	SEAZ	1	pest/disease	Aug	
56	rain continues	VV	1	weather	Aug	
57	july august increased mushroom growth	VV	2	other	Aug	
58	leaf discoloring cabernet variety hillside add nitrogen 10 45 10	VV	2	other	Aug	
59	flash flooding	SEAZ	1	weather	Aug	
60	high wind gusts	SEAZ	1	weather	Aug	
61	august 2020 harvest started 7 ended 29	SEAZ	3	growth stage	Aug	
62	first harvest august 20	SEAZ	1	growth stage	Aug	
63	rot mold from monsoons	VV	1	pest/disease	Aug	
64	skeletonizers little leaf cutter weevils	VV	1	pest/disease	Aug	
65	skeletonizers	VV	1	pest/disease	Aug	69
66	heavy rain creek flooding august 14 23 creek ok to cross after this date	SEAZ	1	weather	Aug	
67	hail	SEAZ	1	weather	Aug	
68	august rot had started	SEAZ	1	weather	Aug	
69	lots of rain	VV	1	weather	Aug	
70	higher cluster weights	VV	2	other	Aug	63
71	more grass and weeds to mow	VV	2	other	Aug	63
72	crop loss from rot slower pick times	VV	2	other	Aug	56
73	weeds explosion in rows dropped fruit from rot	VV	2	other	Aug	69
74	bacillus thuringiensis effective for one week	VV	2	pest/disease	Aug	64

	POST	EDITION	ACTIVITY	CATEGORY	MONTH	LINKS
75	fungal issues constant applications	VV	2	pest/disease	Aug	
76	fungicide applications foliar started as reactive became proactive	VV	2	pest/disease	Aug	
77	dropped fruit from rot brings wasps and bees	VV	2	pest/disease	Aug	73
78	noticed more aphids leafminers in 2021	VV	2	pest/disease	Aug	
79	impact flash flooding erosion in rows response cover crops what type	SEAZ	2	weather	Aug	
80	hail response bird hail net	SEAZ	2	weather	Aug	
81	more rain more rot more vegetative growth more canopy management effect on vineyard	VV	2	weather	Aug	69
82	very wet lush vineyard less water mowing	VV	2	weather	Aug	
83	2020 harvest dates earlier	VV	3	weather	Aug	
84	delayed ripening after monsoon	VV	1	growth stage	Aug	
85	harvest sangiovese august 28	VV	1	growth stage	Aug	
86	tannat 23 brix august 18	VV	1	other	Aug	84
87	cabernet sauvignon 22 brix august 25	VV	1	other	Aug	84
88	bunch rot picpoul blanc tannat	VV	1	pest/disease	Aug	
89	august wet	SEAZ	1	weather	Aug	
90	august precipitation hampered sampling	SEAZ	1	weather	Aug	
91	2020 soil acidification fertilization petiole analysis 2021 more canopy better fruit more canopy management	VV	2	other	Aug	
92	weed pressure too high to control	SEAZ	2	pest/disease	Aug	
93	bunch rot fungus rots couldn't harvest fast enough	SEAZ	2	pest/disease	Aug	
94	rot prompted early harvests not ideal	SEAZ	2	pest/disease	Aug	
95	delayed harvest rain multiple vineyards	VV	2	weather	Aug	69
96	2020 quick harvest higher pH clean fruit	VV	3	other	Aug	
97	august september bunch rot much more prevalent	VV	1	pest/disease	Sep	84
98	more time on vine riper flavors	VV	2	other	Sep	97
99	worker shortage	SEAZ	3	other	Sep	
100	malvasia bianca early shutdown	VV	1	growth stage	Sep	
101	sangiovese 2.8 tons 25 brix september 8	VV	1	other	Sep	
102	less powdery mildew more bunch rot	VV	1	pest/disease	Sep	
103	heavy rain september 1 dry ground creek cross ok	SEAZ	1	weather	Sep	
104	resume more frequent watering	VV	2	growth stage	Sep	100
105	rattlesnakes september 3	VV	2	pest/disease	Sep	
106	september last harvest	SEAZ	1	growth stage	Sep	
107	harvest complete	SEAZ	1	growth stage	Sep	
108	record harvest	VV	1	growth stage	Sep	
109	harvest was completed before most other local harvests	VV	1	growth stage	Sep	
110	big caterpillars during harvest	SEAZ	1	pest/disease	Sep	
111	flies horrid	SEAZ	1	pest/disease	Sep	
112	lots of grasshoppers	VV	1	pest/disease	Sep	
113	gophers everywhere	VV	1	pest/disease	Sep	

	POST	EDITION	ACTIVITY	CATEGORY	MONTH	LINKS
114	september used commercial yeast for ferment of malvasia due to fruit quality down in 2021 versus 2020 when we were able to use wild yeast	VV	2	pest/disease	Sep	97
115	covid-19 harvest I can't breathe small crew	VV	3	other	Sep	
116	2021 less covid-19 fear I can breathe see people calmer	VV	3	other	Sep	115
117	2021 no wasp stings versus 2020 and 2019	VV	3	pest/disease	Sep	
118	harvest complete	SEAZ	1	growth stage	Sep	
119	harvest complete	SEAZ	1	growth stage	Sep	
120	first fall frost by the river	VV	1	weather	Sep	
121	rest of posts reinstall vineyard hardware	VV	2	other	Sep	41
122	harvest tempranillo graciano september 11 cabernet sauvignon september 25	VV	2	other	Sep	
123	frost by the river typical response stuffed bunny boxes with straw intended frost cloth but shipping delayed frost wasn't long enough to cause damage successful	VV	2	weather	Sep	120
124	november dormancy	VV	1	growth stage	Oct	
125	mild freeze	SEAZ	1	weather	Oct	
126	mild freeze	VV	1	weather	Oct	
127	moderate temperatures slow to dormancy	VV	1	weather	Oct	
128	weather chill harvest montepulciano early could have stayed on vines longer 22 Brix pH 3.4 october 2	VV	1	weather	Oct	
129	rain fertilizer application no frost yet october 5	VV	2	weather	Oct	
130	fall frost 2020 november 11	VV	3	weather	Oct	

We used these post text entries to generate the word cloud at the start of this summary document. Edition abbreviations are VV for Verde Valley and SEAZ for southeastern Arizona. Activity numbers correspond to the activity descriptions in Appendix 1: Workshop Activities. Month abbreviations are the first three letters of an individual month name. As workshop timelines represented the growing season only from March 1 through October 1, some entries posted at the beginning of March refer to previous months and some at the beginning of October refer to following months. Post text allows such interpretation, for example, "november dormancy" for entry 124. Links refer to connections drawn on the timeline by participants between related posts, and entries in this column correspond to post numbers in the first column.