Wolkovich Phenology Monitoring Protocol
Dark Horse Vineyard

Contents

1   The short version

Here we want a short bulleted list .... that covers: *Read the whole document before you first go out, or if you have questions. But here we provide short version to review more regularly.*

- Try to visit each flagged vine at least once a week.
- Supplies: datasheets, clipboard, pencil, Plant ID information
- 24 plants per block, 3 buds/clusters per plant
- Plants should be labeled with their Plant ID number
- Buds are numbered 1 to 3. Bud 1 is always the most southern or eastern bud.
- Budburst and leaf-out: Record Eichorn-Lorenz stages
- Flowering: Record percent flowering
- Veraison: Record percent veraison
- Check – did you record data on 96 plants (288 buds/clusters)?
- Back in the office: scan datasheet, label photos. Send to Mira Garner.

2 Objectives

We aim to characterize the phenology of a large number of winegrape varieties planted in vineyards around the Okanagan Valley in BC. Our primary goal is to improve grower models of phenological timing with relation to climate. To this end, we aim to monitor a diversity of varieties that capture differences in phenology. We will record the timing of phenological events for selected vines for 2-3 growing seasons from budburst through the summer to veraison. We will also take Brix measurements several times after veraison. Due to the limitations on travel and fieldwork during Corvid-19, we are not able to monitor the plants throughout the summer this year. Mike Watson has kindly agreed to some surveying through Arterra employees at the Dark Horse vineyard.

3 Sampling population at Dark Horse

We are monitoring vines in the following locations:
Block G - rows 4-5 south end, 10-11 middle
Block J - rows 7-8 south end and middle
Block E - rows 5-6 north end, 2-3 middle
Block 1 - rows 26-27 west end and middle

See Figure 1 for a map of the locations.

There are 6 plants on each row at each location so with the adjacent row, there will be groups of 12 flagged plants. More information about location and individual Plant ID numbers is in the spreadsheet called darkhorsePlantID.csv

4 Overview

1. Lizzie's team (Mira and Faith) flagged vines and started surveying phenology in early May. We were not out early enough for budburst.

2. We will aimed to monitor four phenological stages, but missed budburst:

   (a) Budburst (approximately mid April/early May). Until EL stage 9, record the EL stage of buds on three spurs. Once EL stage is at 9 you can stop recording until flowering starts (note that you may need to record higher than stage 9 at times in order to record whatever stage you see after 8, even if it is 12 or such if you have not yet recorded stage 9, more on this below).

   (b) Bloom (approximately May/early June)

   (c) Veraison (approximately mid July-mid August)

   (d) Ripening (Brix - approximately mid August-end September)

3. We hope to bring someone back at least for Brix sampling, so we mostly need help with flowering and veraison monitoring.
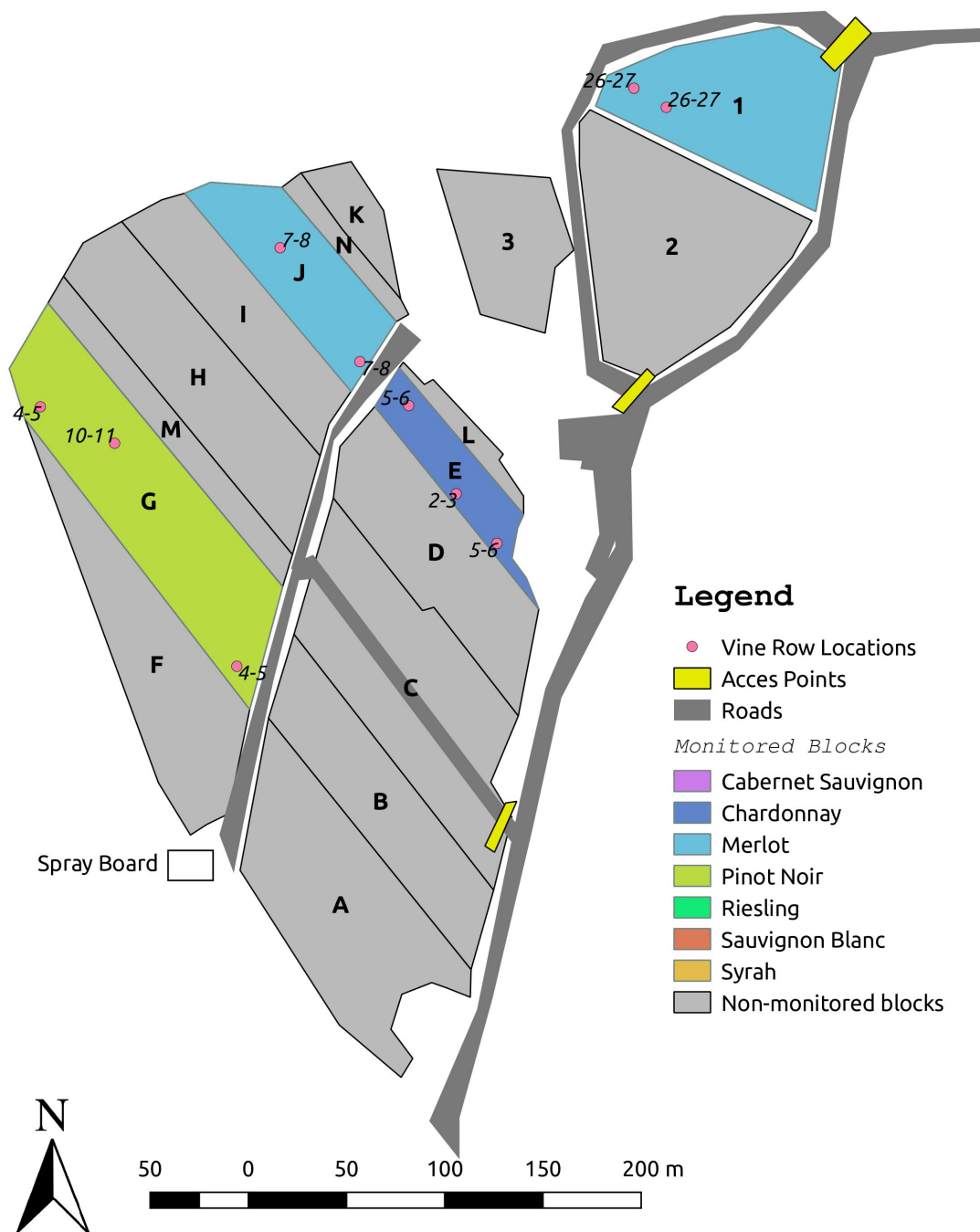
Dark Horse Vineyard

Figure 1: A may of the location of the vines we are sampling. Each point is a collection of 12 vines labeled with the row numbers of the vines
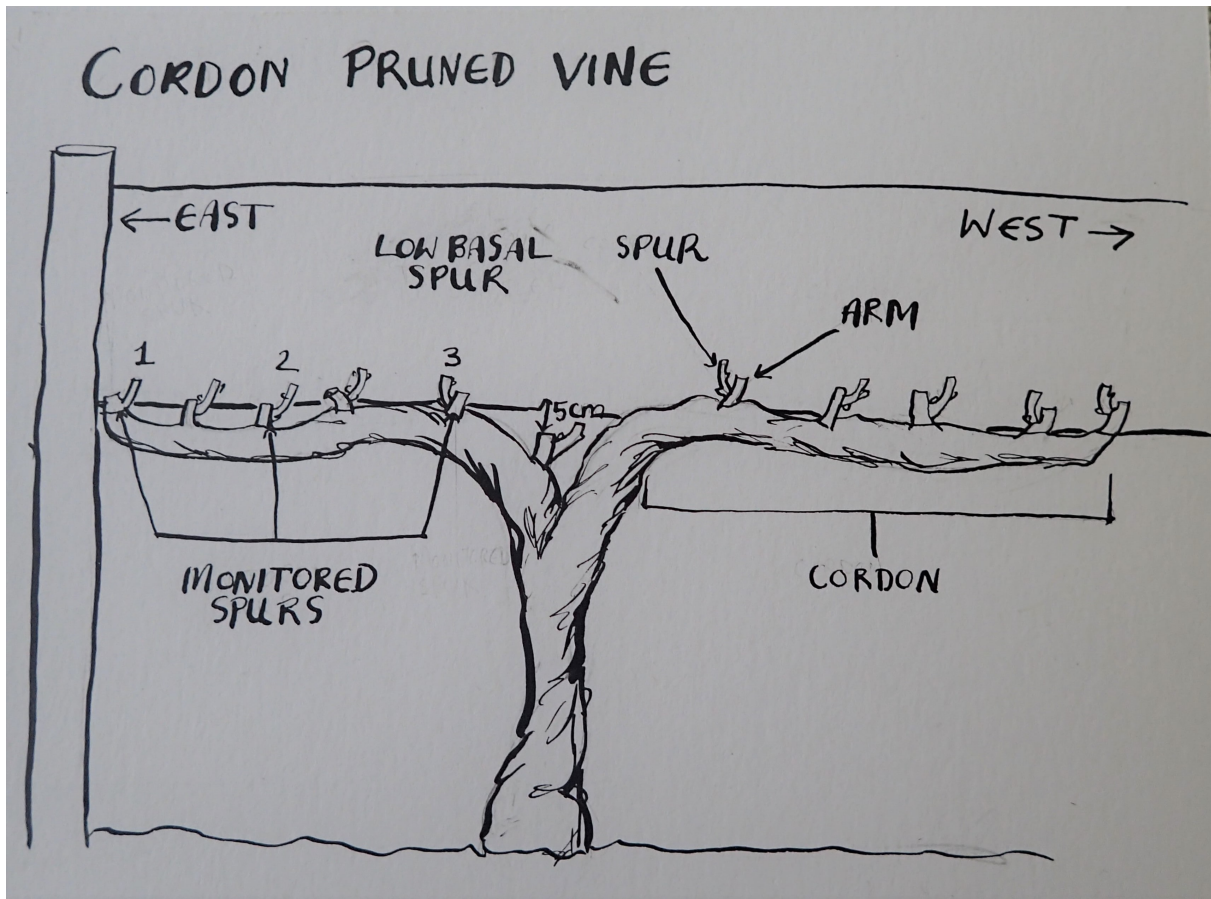
Figure 2: A diagram of a cordon pruned vine, showing which spurs we would monitor. Buds were numbered from east to west or south to north, and any spur that's base was more than 5cm below the wire the cordon was trained on was not sampled.

4. We aim to sample at least once a week. If you have more time, especially if it has been a warm week, then twice a week would be even better.

5   Finding the buds

We flagged three buds/shoots on each of the vines in our monitoring program. We randomly chose one of the canes or cordons on each plant, and flagged three arms or spurs on the chosen cordon (Figure 2) or three buds/shoots on the chosen cane (Figure 3). We flagged a bud close to the trunk, a middle bud, and the bud at the end of the cordon/cane. We flagged as close to the bud as we could when we initially placed the flagging tape, and later flagged some of the shoots once they were big enough. For the cordon pruned vines, we monitor the lowest bud/shoot of the highest spur of the arm (Figure 4). If any of the flags are missing, figure out which bud position is missing and flag a bud in this position. Note the change on the datasheet.
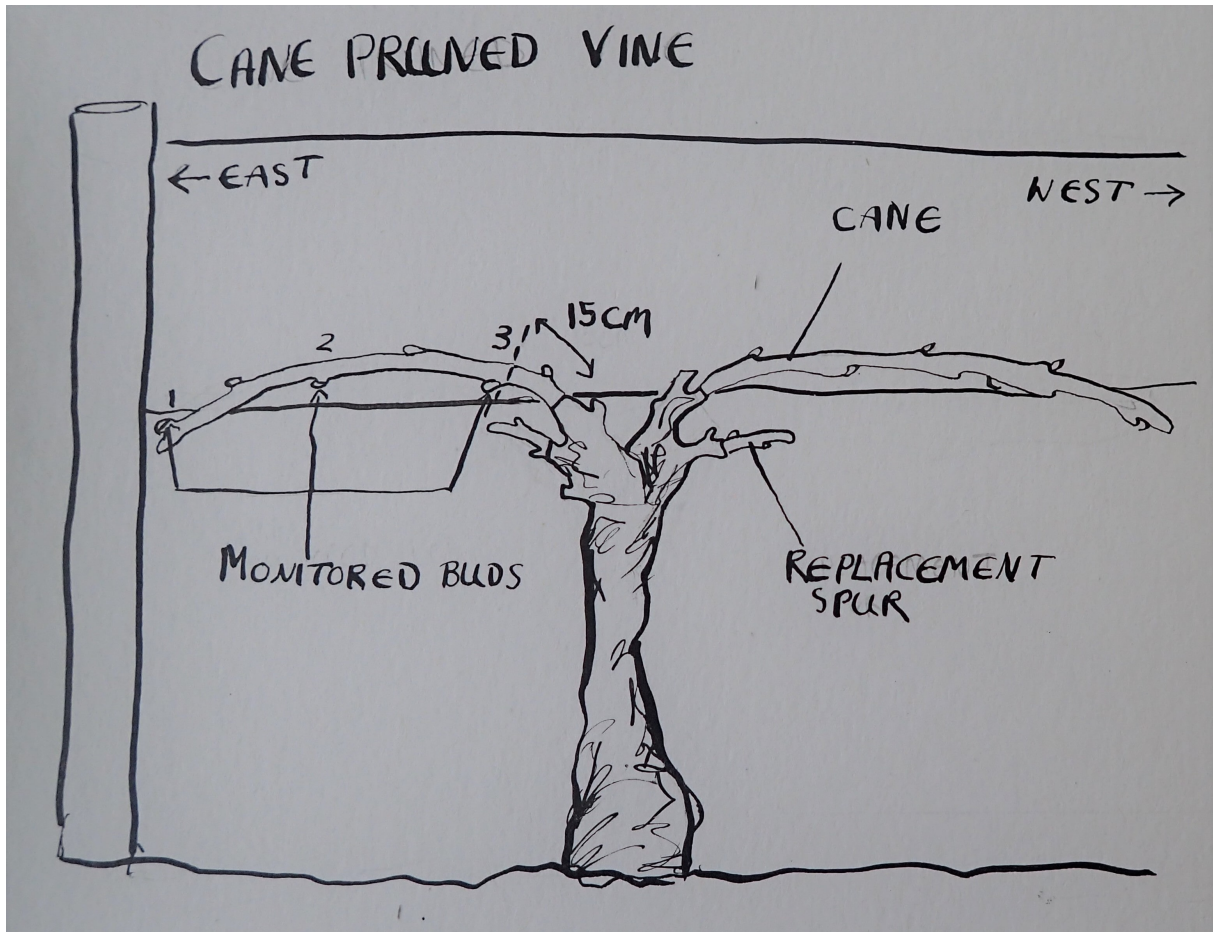
Figure 3: A diagram of a cane pruned vine, with the buds we would monitor and their numbering shown. Note that we do not sample buds too close to the head of the vine.
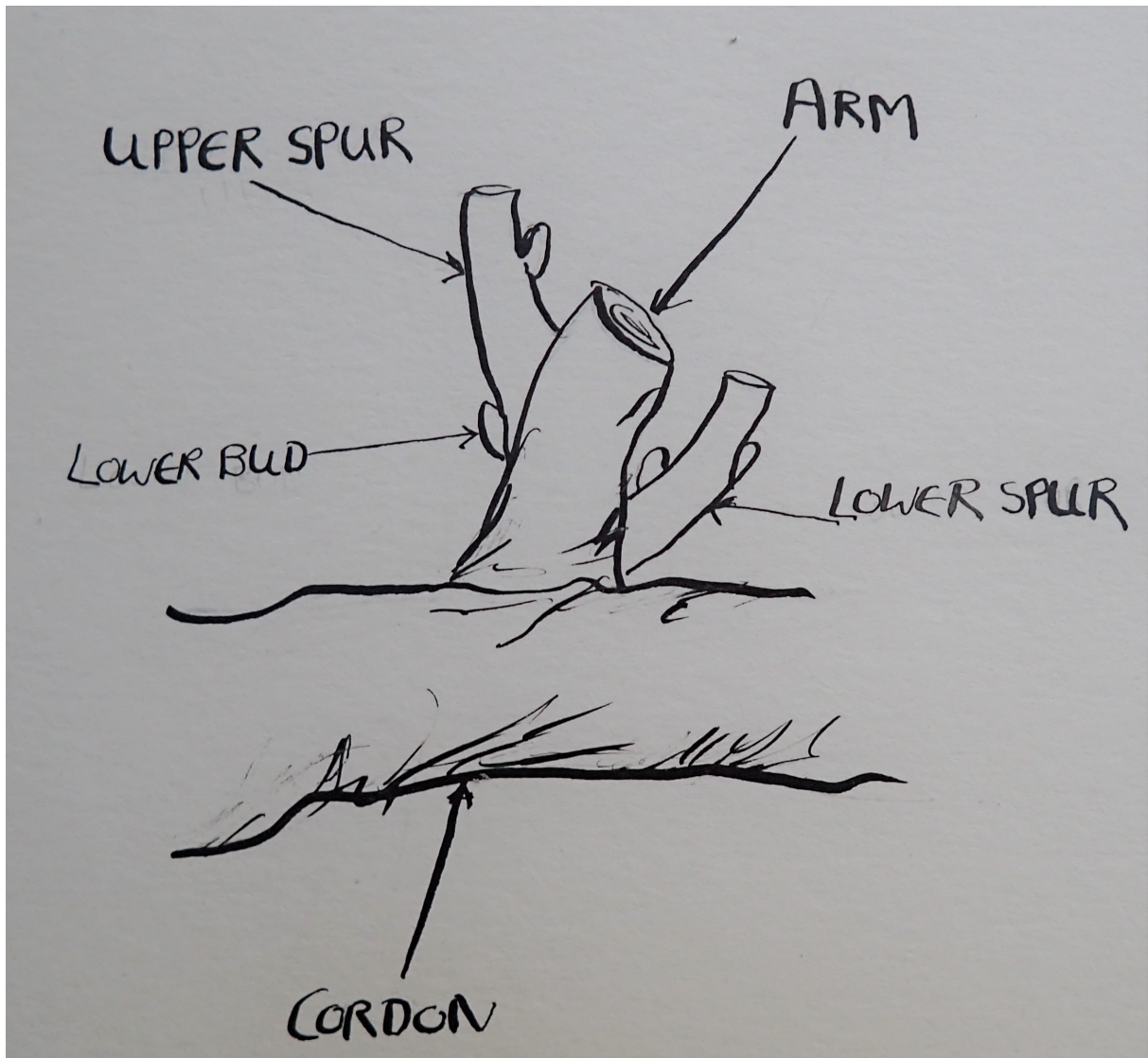
Figure 4: A diagram of an arm of a cordon that had two spurs on it. In this case we chose to focus on the lower bud of the higher of the two spurs for monitoring.

6   Selecting clusters to monitor flowering/veraison

1. Once the shoot we are monitoring becomes well-developed (12 leaves and developed inflorescence), move the flagging to a specific inflorescence (cluster). This is probably best done as you move to monitoring % flowering.

2. We will sample one cluster per shoot. Select the dominant cluster (usually the most basal cluster of the monitored cane/shoot); if during the season your cluster dies or is removed for some reason, select a nearby dominant cluster and make a note.

7   Observing Phenology

We are using the Eichorn-Lorenz system for monitoring phenology until flowering described in this PDF:

Our goal is to have standardized observations of phenological stages for analysis. There are four main widely observed stages for grapevine: (1) budburst, (2) flowering or bloom, (3) veraison, and (4) ripening and harvest. For the first stage, budburst, we will use the stage numbers from the Modified Eichorn-Lorenz system (a stage number between 1-17, with 4 meaning budburst; see Figure 5 below).For stages 2 and 3, we will estimate the percent occurrence of the stage (proportion of berries on a selected cluster have gone through the stage of bloom or color change, respectively). We will measure ripening quantitatively, using a refractometer to measure Brix (sugar) accumulation.
For each vine:

1. Stand facing the vine. Double-check Plant ID (labeled with a sharpie on one of the flags), block, and row number before recording in correct place on data sheet that we will provide. We don't keep information on the varieties within each block on the field data recording sheets.

2. Bud numbers are not written on the flags but are numbered 1 to 3 with Bud 1 being the most southern or eastern bud. (Not the easiest system but we're stuck with it for this summer)

3. For pre-bloom, record the appropriate E-L stage of the shoot that was flagged, or the shoot closest to the flagging that matches our selection criteria laid out in the section above. Record its EL stage (number from "1": still dormant, to "17": twelve leaves separated- see 5) until EL stage 9. Once EL stage is at 9 you can stop recording until flowering starts (note that you may need to record higher than stage 9 at times in order to record whatever stage you see after 8, even if it is 12 or such if you have not yet recorded stage 9, more on this below).

4. For bloom (EL 23) and veraison (EL 35), look at each cluster (#1, #2, #3) and estimate the percent (from 0-100%) of berries on the sample cluster that have achieved that stage.

MAJOR STAGES	E-L number	ALL STAGES

	1	Winter bud
	2	Bud scales opening
	3	Wooly bud ± green showing
4 Budburst	4	Budburst; leaf tips visible
	7	First leaf separated from shoot tip
	9	2 to 3 leaves separated; shoots 2-4 cm long
	11	4 leaves separated
12 Shoots 10 cm Inflorescence clear, 5 leaves separated	12	5 leaves separated; shoots about 10 cm long; inflorescence clear
	13	6 leaves separated
	14	7 leaves separated
	15	8 leaves separated, shoot elongating rapidly; single flowers in compact groups
	16	10 leaves separated
	17	12 leaves separated; inflorescence well developed, single flowers separated
	18	14 leaves separated; flower caps still in place, but cap colour fading from green
19 Flowering begins	19	About 16 leaves separated; beginning of flowering (first flower caps loosening)
	20	10% caps off
	21	30% caps off
23 Flowering 50% caps off	23	17-20 leaves separated; 50% caps off (= flowering)
	25	80% caps off
	26	Cap-fall complete
27 Setting Young berries growing Bunch at right angles to stem	27	Setting; young berries enlarging (>2 mm diam.), bunch at right angles to stem
	29	Berries pepper-corn size (4 mm diam.); bunches tending downwards
31 Berries pea-size Bunches hanging down	31	Berries pea-size (7 mm diam.)
	32	Beginning of bunch closure, berries touching (if bunches are tight)
	33	Berries still hard and green
	34	Berries begin to soften; Sugar starts increasing
35 Veraison Berry softening continues Berry colouring begins	35	Berries begin to colour and enlarge
	36	Berries with intermediate sugar values
	37	Berries not quite ripe
38 Harvest Berries ripe	38	Berries harvest-ripe
	39	Berries over-ripe
	41	After harvest; cane maturation complete
	43	Beginning of leaf fall
	47	End of leaf fall

Stages grouped at right: Shoot and inflorescence development · Flowering · Berry formation · Berry ripening · Senescence
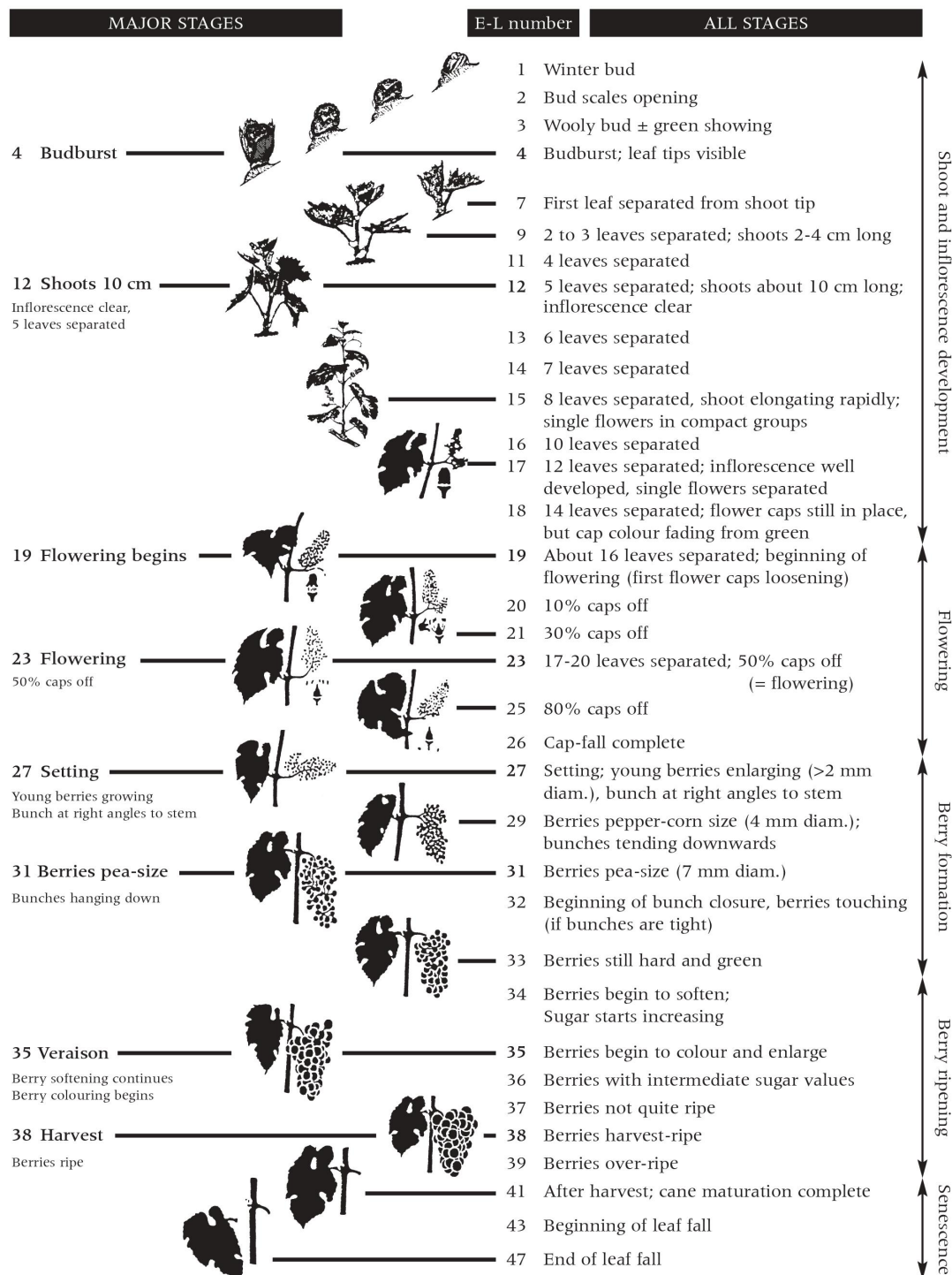
Figure 7.3 Modified E-L system for identifying major and intermediate grapevine growth stages (revised from Coombe 1995). Note that not all varieties show a woolly bud or a green tip stage (May 2000) hence the five budburst stages in the modified original 1995 system have been changed slightly by removing stage 4 and allocating the definition of budburst to what was formerly stage 5.
Revised version of "Grapevine growth stages – The modified E-L system" Viticulture 1 – Resources. 2nd edition 2004. Eds. Dry, P. and Coombe, B. (Winetitles) 153

Figure 5: Modified Eichorn-Lorenz (EL) scale that our lab uses for monitoring phenology until flowering

5. Take photos of representative illustrations for different varieties of target % at stage (e.g., clusters at 5%, 25%, 50%, 75%, 95% bloom) for different varieties. aim for 3-5 photos of each percentage taken across a diversity of varieties and across a couple different sampling dates, and make sure vine number and date are visible in photo for identification. **Label the filename with the percent.**

6. For ripening, our current plan is to send one of our team to collect berries so we can analyze Brix. We will aim to collect samples starting around 12-15 Brix until commercial harvest.

8   What to do with the data

After each round of monitoring, scan the datasheet and send to Mira. If you have taken photos, label them with the percent and the data then send them as well.

9   Contact details

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