

Wolkovich Phenology Monitoring Protocol

Dark Horse Vineyard

Thank you for helping with phenological monitoring! We've provided a full set of detailed instructions for how to do the monitoring in this document. Check out the second page for a short overview and reminders of what to do and bring in the field each time.

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1 The short version

Here we provide short version to review more regularly. *(Read the whole document before you first go out, or if you have questions; check out this page more regularly.)*

Always bring: datasheets, clipboard, pencil, Plant ID information (and often you need a camera).

How often?: Try to visit each flagged vine at least once a week (twice is even better, if you have time).

In the vineyard:

- You should be visiting: 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.
- What to record? Depends on stage ...
 - Budburst and leafout: 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 Faith Jones.

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 plant development with relation to climate. To this end, we aim to monitor a diversity of varieties that capture differences in phenology. We will record the phenology 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 Covid-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. Thank you for your help!

3 Overview

1. Lizzie's team (Mira and Faith) flagged vines and started surveying phenology in early May.
2. We aim to monitor four phenological stages:
 - (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.
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.

4 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.

Dark Horse Vineyard

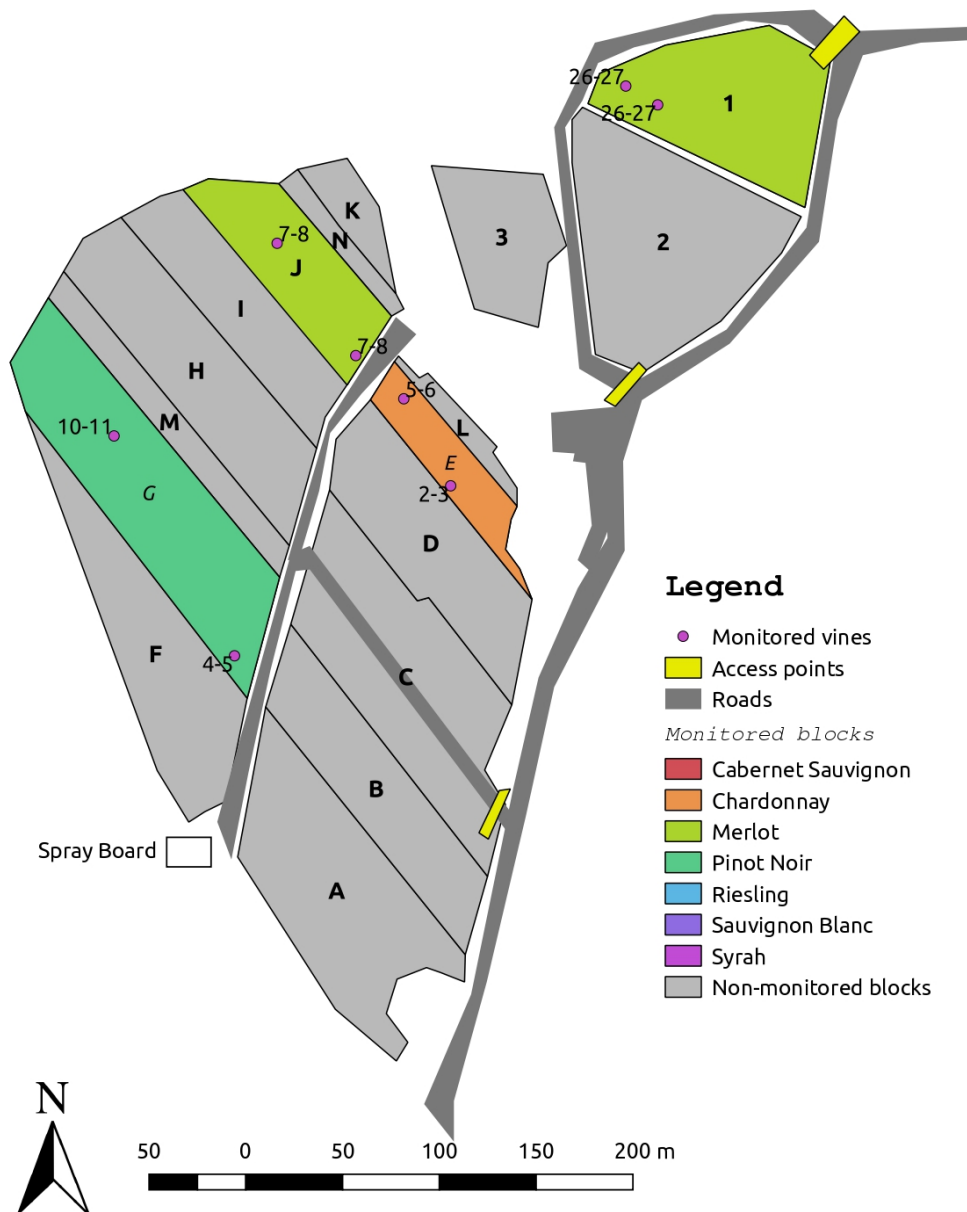


Figure 1: A map of the location of the vines we are sampling. Each point is a collection of 12 vines labeled with the row numbers of the vines.

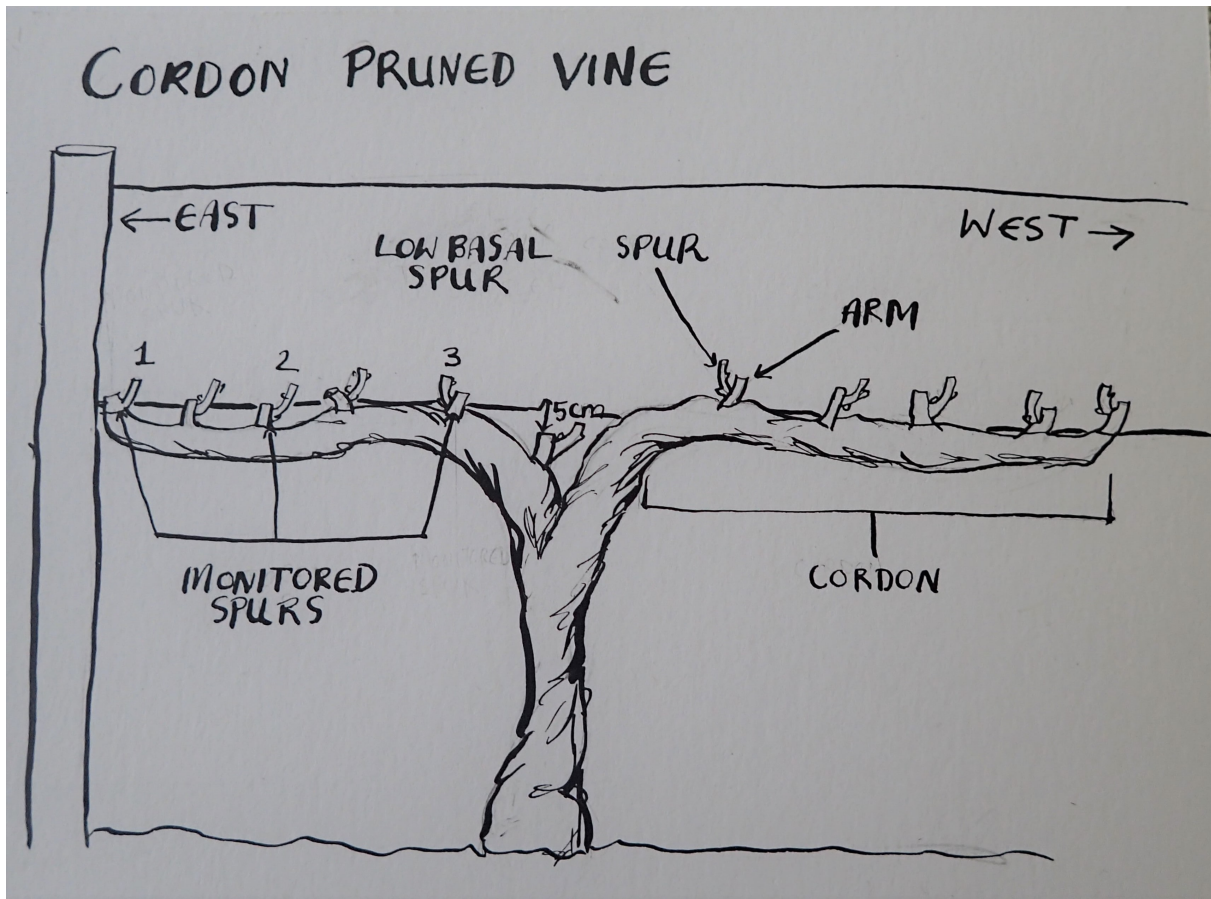


Figure 2: A diagram of a cordon pruned vine, showing which spurs we would monitor. Buds were numbered from east to west or south to north, and any spur that's base was more than 5cm below the wire the cordon was trained on was not sampled.

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

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/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 you find a flag is missing, figure out which bud position is missing and flag a bud in this position. Note the change on the datasheet.

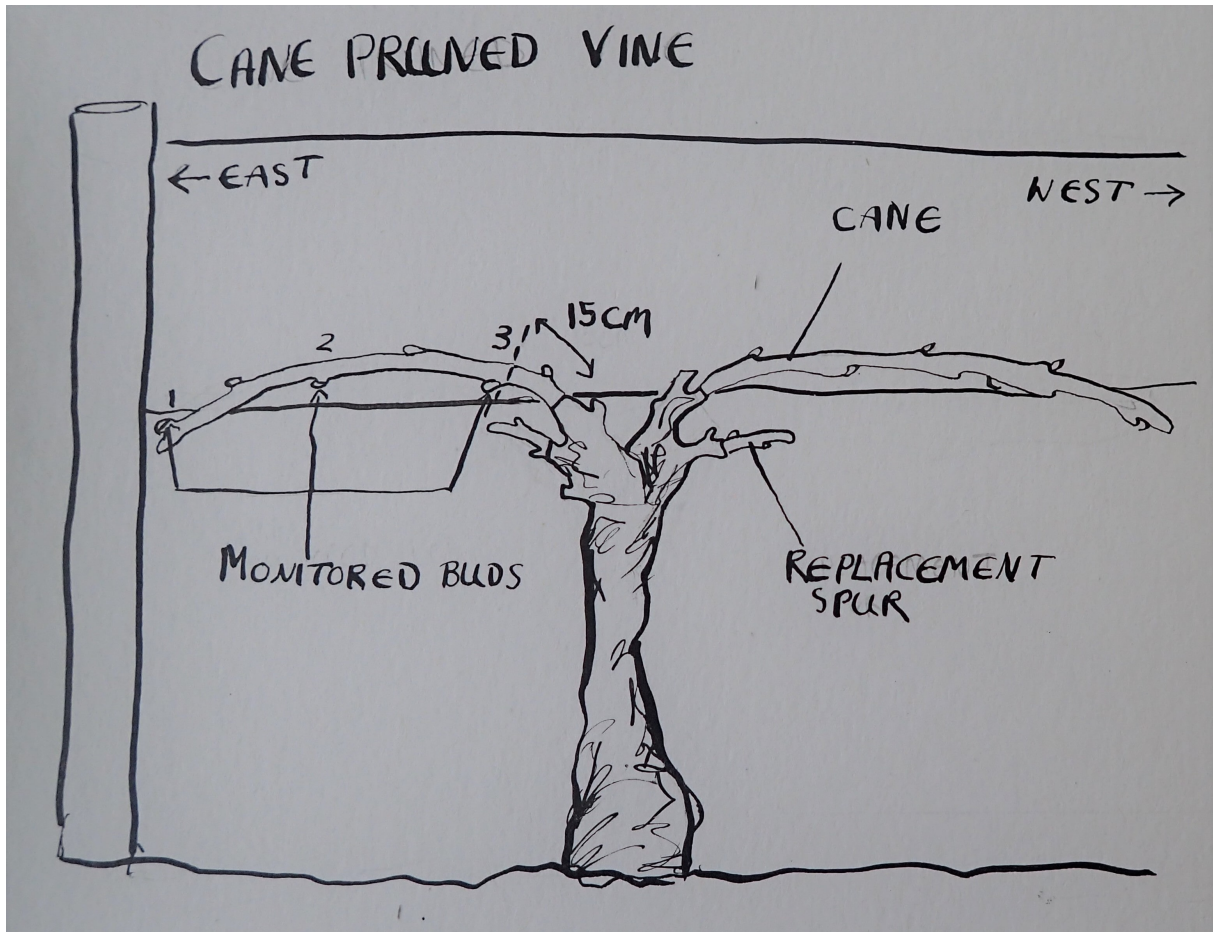


Figure 3: A diagram of a cane pruned vine, with the buds we would monitor and their numbering shown. Note that we do not sample buds too close to the head of the vine.

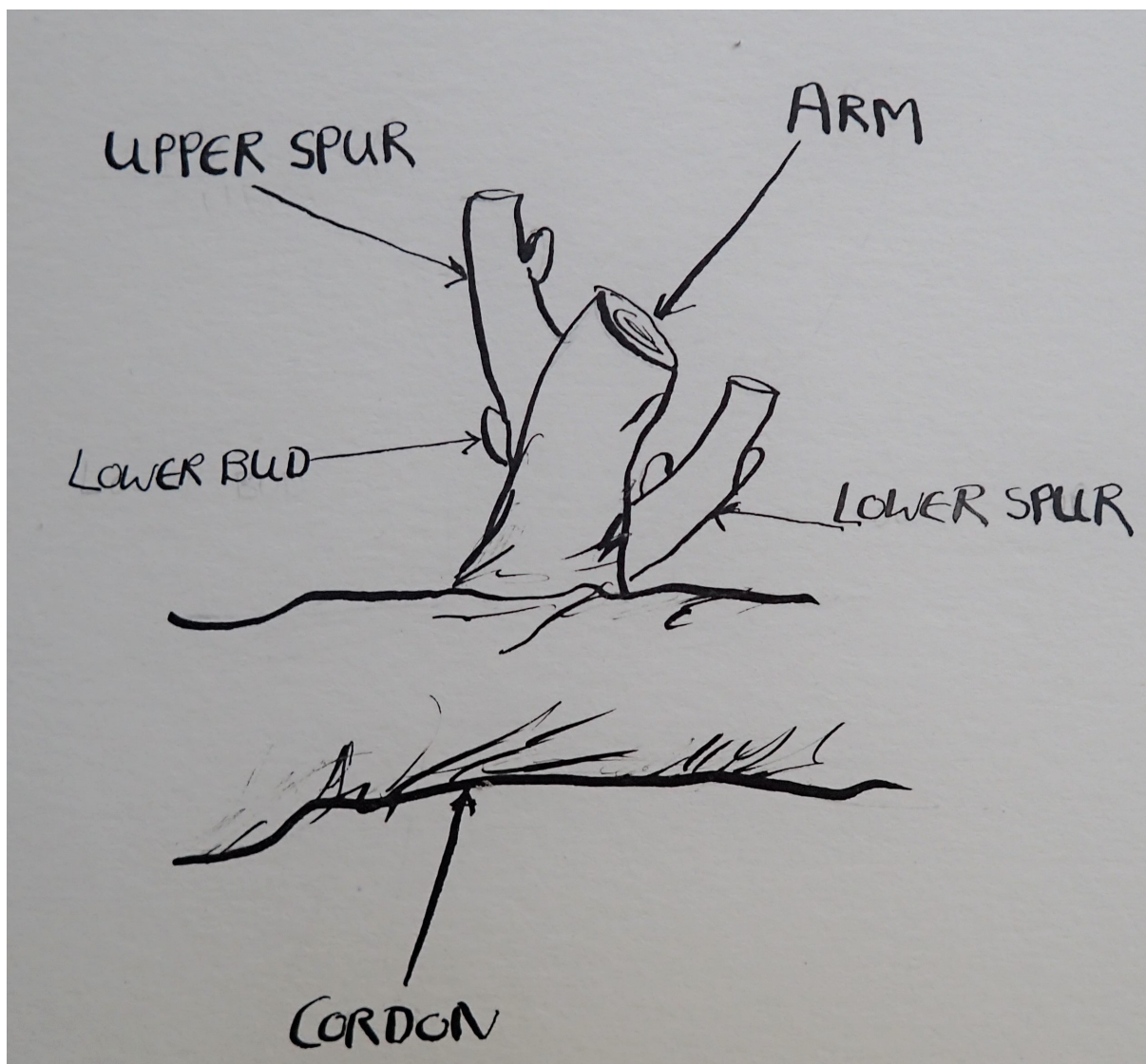


Figure 4: A diagram of an arm of a cordon that had two spurs on it. In this case we chose to focus on the lower bud of the higher of the two spurs for monitoring.

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 just before you start 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 winegrapes: (1) budburst, (2) flowering, (3) veraison, and (4) ripening and harvest. For the first stage, budburst, we will use the stage numbers from the Modified Eichorn-Lorenz system (see Figure 5). For flowering and veraison, 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.

For each vine:

1. Stand facing the vine. Double-check Plant ID (labeled on one of the flags), block, and row number before recording in correct place on data sheet that we will provide. You do not need to write information about the varieties on the datasheets.
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 flowering (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.
5. Take photos of representative illustrations for different varieties of target % at stage (e.g., clusters at 5%, 25%, 50%, 75%, 95% flowering) for different varieties. aim for 3-5 photos of

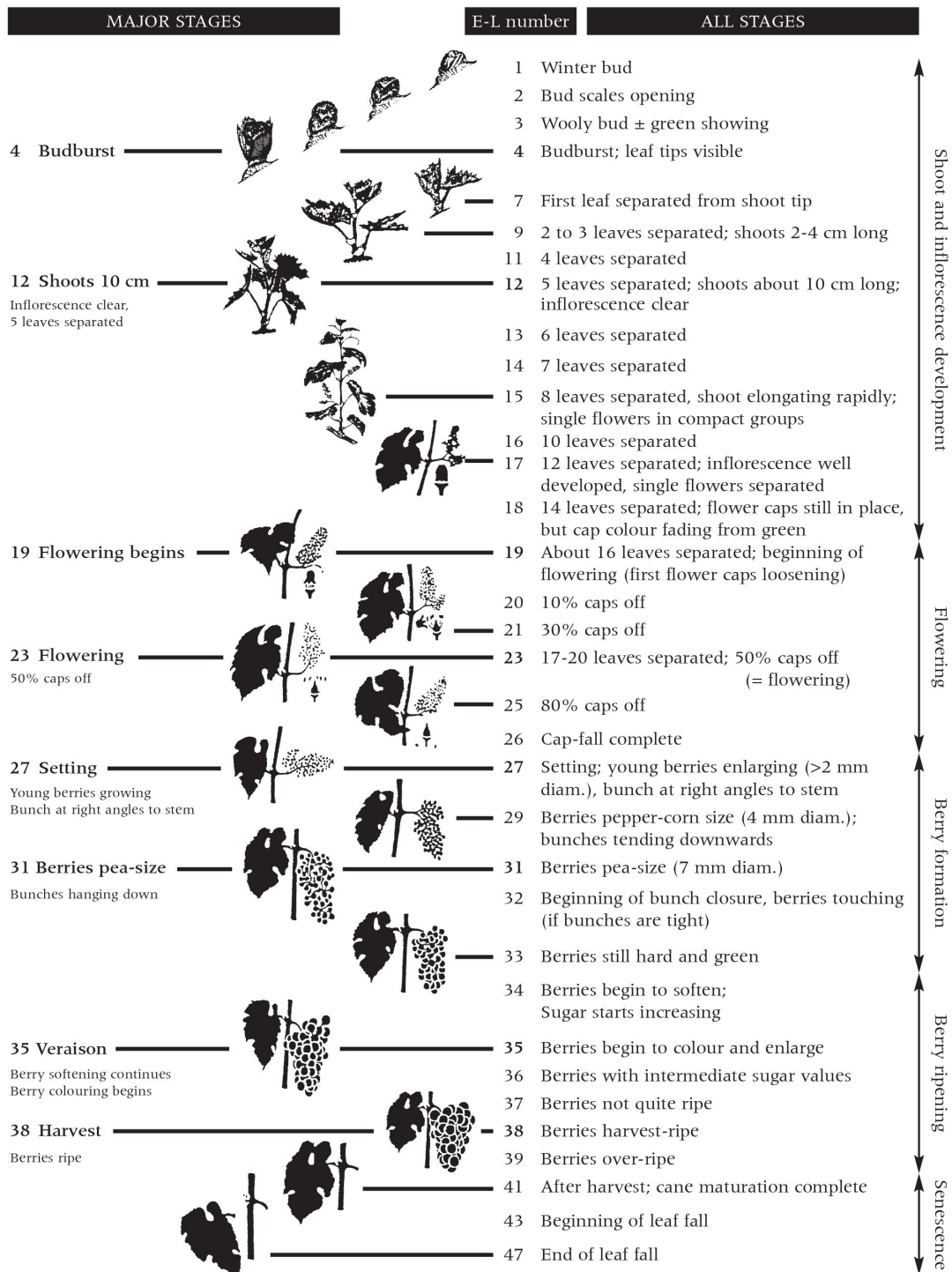


Figure 7.3 Modified E-L system for identifying major and intermediate grapevine growth stages (revised from Coombe 1995). Note that not all varieties show a woolly bud or a green tip stage (May 2000) hence the five budburst stages in the modified original 1995 system have been changed slightly by removing 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)

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

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 Faith. 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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