



How to Measure Dormant Pruning Weight of Grapevines

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Figure 1. A vineyard worker removes the canes from the trellis while pruning grapevines and places the dormant canes in the alley. (Photo: Patricia A. Skinkis, © Oregon State University)

Pruning weights are one of the best and most practical measures for monitoring vine growth and changes in vine size due to vineyard management practices. Since pruning is necessary every year to maintain vine structure, size, and yield potential (Figure 1), it is easy to gather these data while conducting normal management practices. The amount of wood that is removed each dormant season is a reflection of the magnitude of growth in a vineyard, even when canopy management techniques have been implemented during the prior growing season. Pruning weights are not meant to be a measure of total biomass production by the vine; they are considered a relative measure of vine vigor. Even though canopy management practices such as hedging may be used in the prior season, grapevines continue to grow and compensate for the loss of shoot tips or leaves by growing more leaf area and lateral shoots, and canes may become thicker.

Pruning weights can be used to measure those differences. Research trials conducted in Oregon and elsewhere show that pruning weights are often one of the first growth parameters influenced by vineyard management practices.

Why pruning weights are important

Pruning weights are useful in determining baseline vigor levels and are one of the best ways to quantify areas of your vineyard that are not uniform. In addition, they can add quantitative measures

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to visual observations noted during the growing season. Weak or overly vigorous areas need to have different management practices implemented to bring them to a more uniform standard with the rest of the vineyard. Variable management of these areas is possible once you have a good idea of the vigor levels in your vineyard blocks. Pruning weights can also help you track changes in vine growth and productivity due to changes in vineyard management. They can help you determine if management practices are having the desired outcome or not. For example, a block may have high vigor, and implementation of a perennial grass cover crop can be used to reduce vigor over time. By collecting pruning weights from this block annually, you will be able to determine when the change in vigor is occurring and how much impact the cover cropping method is having on your vines.

There are several ways to use and analyze pruning weights, including pruning weight per vine and per linear foot of row, cane weights, and the yield-to-pruning-weight ratio (known as the Ravaz Index). All of these metrics can help you interpret vine size and vine balance, but each is used for different reasons and in different circumstances. The section “Step 5: How to use the data” explains each metric and how it can be used.

This protocol will provide you with a list of materials and describes how to measure pruning weights from your vineyard. This is also designed to help you learn how to use that data to determine vine

vigor status and monitor vine growth across seasons. A field data collection sheet is provided for your use in the vineyard.

Materials:

- vineyard map
- flagging tape
- weatherproof hanging scale
- twine or bungee cord
- pruning shears
- data sheets
- clipboard
- pencil or pen

Step 1: Identify reference vines for measurement

Before starting to prune your vineyard, identify vines from which you will measure pruning weight data. A minimum of 20 vines should be measured in a given vineyard block. This can be done by selecting three to five areas within the vineyard or a given block and flagging a section of five to 10 consecutive vines in each area. To find the vines for these measurements each year, it may be easier to flag vines between line posts, so the number of vines per area may vary between blocks. Be sure to make note of the vine rows and sections to be measured in your notes and on your vineyard map. It is best to flag the trunk of the reference vines using plastic flagging tape for easy identification in the block (Figure 2). It is important to know areas of concern when outlining



Figure 2. Flagging trunks of reference vines with plastic flagging tape helps in identifying these vines for later measurements. (Photo: Patricia A. Skinkis, © Oregon State University)

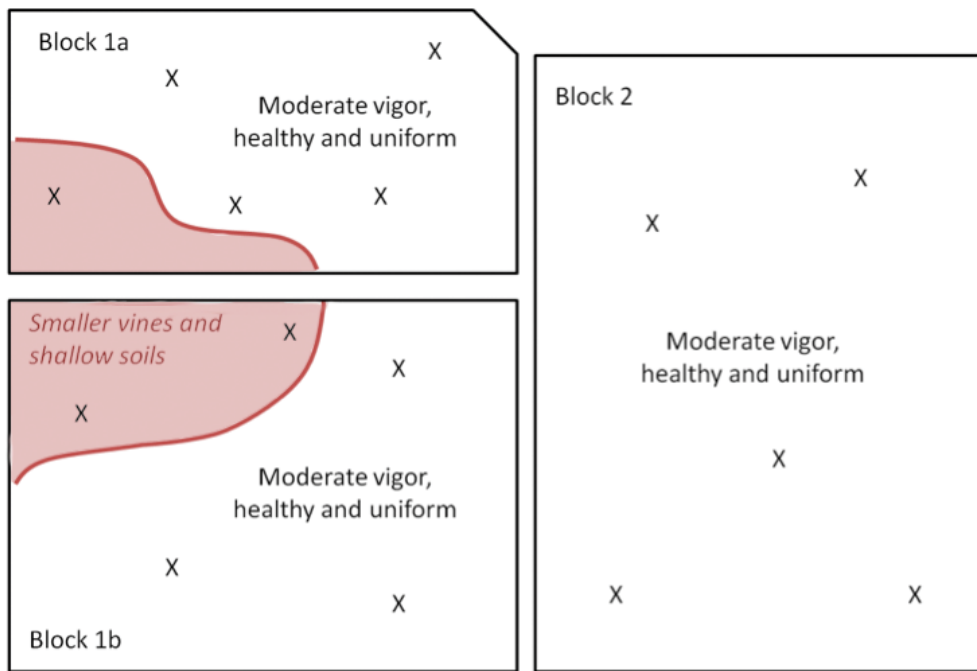


Figure 3. An example of a vineyard map where reference-vine sections are identified with an X. This map represents large vineyard blocks where sections are distributed spatially throughout each vineyard block to capture variability. In this example, the vineyard manager chose to use five 5-vine sections to estimate the leaf area across the vineyard. Samples are taken within the weak areas of each block and noted as separate from healthy areas.

where you want to sample vines. Reference-vine sections should be positioned spatially throughout the vineyard block and include sampling within these variable areas (Figure 3). In some cases, you may not know your weak areas until you begin monitoring your blocks more closely. You can use this quantitative pruning weight data to assign a value to your observations on the map. Once you begin management of weak or overly vigorous areas, annual measurements of the same vines will help you identify if your management practices have altered vine size and productivity. It is important to return to these same reference vines for other measurements, such as cluster number, yield, etc., throughout the year and in subsequent years to track how your management practices are impacting vine growth.

Step 2: Obtain shoot counts before pruning

Shoot counts are important to include with the pruning weight of a given vine or section of vines. This allows you to calculate average cane weight, which provides another method for measuring vine vigor. Before pruning, count the number of shoots on each of your reference vines and record the number

on your data sheet. Make note of the number of canes to be retained at pruning for next year's fruiting cane if you are cane pruning or using 'kicker canes' in your vineyard. This is important because this number of shoots should be removed from your cane weight calculation. Once you know the pruning weight, you will divide by the number of shoots removed to get your cane weight measure.

✿ KEY TERM

Kicker cane – one or more canes left on the vine at pruning in addition to the main canes required for the next season's growth. These canes are kept on the vine in cane-pruned vineyards to delay bud break or ensure additional buds are available in case of a frost event near bud break. Kicker canes are pruned off the vine in spring after bud break but before bloom.

Step 3: Pruning the vine and preparing for measuring

Prune the vine as you would prune the rest of your vineyard. Place all of the 1-year-old wood (shoots that grew last growing season) from each vine in individual piles at the base of the vine from which



Figure 4. Canes pruned from individual vines are bundled together and placed at the base of the vine from which they were removed (left). This helps in preparation for the weighing step. Once ready to collect your pruning weight, measure the bundled canes using a weatherproof hanging scale (right). (Photos: Patricia A. Skinkis, © Oregon State University)

they were removed (Figure 4). Be sure to remove older wood (more than 1 year) that was pruned from the vine, including the fruiting cane that was tied down for last season, old spurs, or large parts of the vine head that are being removed. Only 1-year-old wood should be measured with your pruning weights as this wood most accurately represents the growth that occurred over the previous season.

Step 4: Weighing

Gather the bundles with a piece of twine, string, or bungee cord and hang from the hook on the hanging scale. Hold the bundle up so that none of the canes are touching the ground or your body (Figure 4). If canes are too long or the bundle is off balance and hanging vertically, cut the canes shorter and place all pieces in a tidy bundle that can be balanced.

Wait for the scale to equalize and record the weight. If your bungee cord or string has a significant weight, be sure to record the weight on your data sheet before measuring or take the weight before you measure the pruned wood. A data sheet is provided at the end of this document.

Step 5: How to use the data

There are a number of ways to use the data you have collected to compare vine vigor within a vineyard block or to compare blocks or vineyards. The most basic way is to compare the ***whole vine pruning weight*** that you measured, which is useful for vines that are planted to the same spacing. However, vineyards can have blocks with different cultivar, spacing, and training systems; therefore, comparisons of whole vine data across blocks does not compare the same units. For example, a vine with 2 pounds of pruning wood from a vineyard with 5-foot vine spacing is likely much more vigorous than a vine with 2 pounds of pruning wood from a 10-foot spacing vineyard. Therefore, the best way to compare pruning weights across vineyard blocks or across vineyards is to use comparable units, including ***pruning weight per foot*** and ***average cane weight***. A description of how to calculate each of these metrics is provided:

■ **Pruning weight per foot:** This is determined by dividing total vine pruning weight by the number of linear feet of canopy per vine. The

recommendation for moderate vigor is 0.2 to 0.4 pounds of pruning wood per linear foot of row. A few examples are provided below.

❑ **Single canopy training systems:** A VSP-trained vine (Guyot training system) in a vineyard with 5 feet between vines in-row and 5 feet of canopy length along the row has a pruning weight of 1.5 pounds per vine during dormant pruning. The calculation for pruning weight per foot is 0.3 lb/ft.

$$1.5 \text{ lb} / 5 \text{ ft} = 0.3 \text{ lb/ft}$$

❑ **Double canopy training systems:** A Scott Henry-trained vine in a vineyard with 6 feet between vines in-row has 12 feet of canopy length along the row due to the upper and lower canopies. The pruning weight gathered from the vine at pruning is 3 pounds per vine. The calculation for pruning weight per foot is 0.25 pounds per foot.

$$3.0 \text{ lb} / 12 \text{ ft} = 0.25 \text{ lb/ft}$$

■ **Average cane weight:** This is determined by dividing the total vine pruning weight by the number of shoots counted on the same vine, minus the number of canes retained on the vine at pruning (if using cane pruning). This is not quantified by measuring each cane. Cane weights can be used to compare vines, but also help determine vine vigor levels (Table 1). For example, a vine with 2 pounds of pruning wood and 30 shoots, 2 of which will be used as fruiting canes next season, would have $(2 \text{ lbs wood}) / (30 - 2 \text{ shoots}) = 0.07 \text{ lbs/cane}$, indicating moderate vine vigor.

Table 1. Vine vigor classification related to dormant cane weight

Vigor level	Cane weight (lb)
Low	<0.02
Moderate	0.04 to 0.09
High	>0.13

From Kliewer and Casteel (2003).

Pruning weights are also used to calculate the Ravaz Index, or crop load, which is the balance between reproductive growth (fruit yield) and vegetative growth (pruning weight). It is a simple calculation that compares vine yield at harvest and the pruning weight from the following dormant season (yield/pruning weight).

The Ravaz Index has been closely tied to fruit quality in numerous studies, especially sugar and anthocyanin levels. Research suggests that a Ravaz Index of 5 to 10 is ideal for most viticulture production regions, but research in the Willamette Valley of Oregon finds that typical vineyards have values well below 5.

Therefore, new vine balance metrics are needed to determine optimum fruit composition, especially for low-yielding cultivars such as Pinot noir. In general, vines with low Ravaz Indices have a larger canopy size relative to fruit production and vines with high Ravaz Indices have smaller canopies relative to their yields.

Knowing where your vineyards fall on the crop load spectrum and defining your own vineyard balance will help you maintain better productivity and fruit quality.

Literature cited

Kliewer, W.M., and T. Casteel. 2003. Canopy management. In *Oregon Viticulture*. E. Hellman (ed.), pp. 177–184. Oregon State University Press, Corvallis, OR.

Further reading

For more general information on pruning, please see *eViticulture* (<http://eViticulture.org>), an online Extension resource for viticulture. For other publications in this canopy management series, please see the following:

Skinkis, P.A. 2013. *Understanding Vine Balance: An Important Concept in Vineyard Management*. EM 9068. Corvallis, OR: Oregon State University Extension Service.

Skinkis, P.A. and R.P. Schreiner. 2013. *How to Measure Grapevine Leaf Area*. EM 9070. Corvallis, OR: Oregon State University Extension Service.

Vance, A.J., A. Reeve, and P.A. Skinkis. 2013. *The Role of Canopy Management in Vine Balance*. EM 9071. Corvallis, OR: Oregon State University Extension Service.