Strategies to Recover from Winter Damage!

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Knowing that winter injury has occurred and where it has occurred in the vineyard is half of the process of dealing with winter injury. The second half involves what strategies to use depending on severity of injury, whether the vines can be easily renewed by retrunking or complete block removal is the best choice (SEE ADDITIONAL ARTICLE – MAKING DECISIONS AFTER WINTER DAMAGE).

There are generally accepted guidelines for how a vineyard will perform after being subjected to winter injury. Vine survival and long term health is the first priority in trying to have a vineyard return to full productivity as soon as possible.

Assessing injury levels is very important as this will be used as a guide for pruning, retrunking or replanting. If you have not taken advantage of hilling or have single trunks that are old and have not produced suckers for a few years, the chance of recovery is very poor to slim. Experiences after the freeze events in 2003 and again in 2005 demonstrated that many trunks were " blind" and did not push sucker growth from the scion wood to recover and instead pushed rootstock suckers or were just plain dead! **Blocks with vines that had multiple trunks of different ages and hilled HAD MUCH HIGHER survival rates and successful renewal than those vineyards with a single trunk. The use of double or multiple trunks for cold tender vines should be standard, especially in higher risk locations or those not capable of using wind machines or other practices or where hilling is not annually practiced.**

Additionally, vines in the 3 years and under category (no crop) and older well balanced vines had better survival rates than those in the 4 to 7 year category producing full heavy crops. Unbalanced vines with excess or too little crop (with excessive shading and wood growth – large canes) had more injury than properly balanced vines.

Another observation was the increased presence and development of crown gall, not just the season following injury, but for multiple years afterwards. The presence of crown gall in a vine is not enough to cause galls; rather it is the infection of outer cambium cells (conductive tissue just beneath the outer bark layer of the trunk) that become infected as they attempt to heal wounds caused by freeze injury. These cells are altered such that they continue to form callus tissue that continues to enlarge and eventually block the conductive tissues and cause a physiological girdling of the vine. When this occurs, the entire vine parts above the galled area die.

Table 1. Pruning Modifications

Bud Mortality and Suggested Pruning Modifications

Primary Bud Mortality (%)	Pruning Adjustments
0-15 %	None – prune as normal for balanced crop
16 to 30%	Increase buds retained by 50% Bring up renewal suckers to establish future trunks
31 to 50%	Leave double the number of buds If pruning, hedge only leaving long spurs Bring up multiple renewal suckers to establish future trunks
>60%	Don't prune Bring up multiple suckers if scion pushes any from above graft union

Pruning Strategies

The goal of pruning a vine after winter injury episodes is to get the vine back to full health, fruitful productivity and balance. Some vines may die immediately or trunks may collapse over a period of 2 to 4 years after damage.

Removal of the parts known to be damaged or suspected to be injured should be part of the pruning process. However, do not remove old trunks if they are supporting canes to provide a better balance of bud numbers during a recovery period. There is no need to prune out a crown gall infected trunk immediately if it is supporting some buds during renewal/retraining. Once new trunks are established this crown gall infected trunk should be cut out and removed from the vineyard.

With severe winter episodes in 2003, 2005 and now 2011, it is apparent that we need to protect vintages and reduce risks at all times. The first step should be looking at multiple trunks and regular trunk renewal. The use of double or multiple trunks should be a STANDARD practice to provide extra protection against winter injury. This will allow the vine to be capable of being renewed on a regular basis.

Bringing up several suckers will allow for better balance of shoot growth to establish new trunks and to support the existing large root systems and to minimize the growth of bull wood renewals. Any non-needed suckers can be removed the following year.

A **balanced vine** will have strong, but not overly vigorous, **cane growth (roughly pencil size in diameter)** that developed all retained buds the previous season. If some canes are **weak or spindly**, this may correspond to have too many retained buds or **excessive crop levels**. This should be a guide to reduce the number of buds per vine for the next season. If some canes were a **large diameter** (thumb size diameter or greater) this is an indicator of excessively vigorous growth with too **low a crop level** perhaps

because too few buds were retained the previous year. Other signs of excessive vigour in the previous season are dense thick canopies requiring multiple hedging and leaf removal in season, uneven fruit maturity and quality and high percentages of non-fruitful shoots (often due to excessive shading the previous growing season.

Determining Vine Balance

Assessing whether a vine is in balance can be undertaken in season or at pruning time. The pruning time decisions can be easily and quickly done by weighing the prunings. The following is a general table showing whether or not a vine is producing too little or too much crop and targets for balance

For measuring pruning weights, do one vine at a time and then repeat the process on a few "average vines" in the block. This must be done before any trimming or pre-pruning.

The prunings you collect are only the growth of the previous season (all shoot growth – primaries and laterals from previous growing season present at time of dormant pruning). Do not include trunk or permanent cordon wood removed due to injury

Record the pruning weight for each vine. By doing this for multiple vines you will quickly develop an eye for estimating the weight of pruning's on a given vine and can adjust the bud numbers accordingly.

General guidelines were developed by Richard Smart (1985) and have been modified and adapted by others depending upon local conditions, site potential and cultivar. These were noted to ensure good, even spacing of nodes along the fruiting wire to get good shoot positions, adequate fruit exposure and optimum (not maximum but optimum) shoot and leaf development over the season and to provide for good fruitfulness in following years

Table 2. Assessing Vine Size

	Too Large Vine	Ideal Vine	Too Small vine
Pruning weight per meter of Row	>0.52 kg per meter	0.22 - 0.52 kg per meter	< 0.22 kg per meter
Pruning weight per foot of Row	> 0.35 lbs per foot	0.15-0.35 lbs per foot	<0.15 lbs per foot
# of buds (Nodes) per meter of Row (VSP)	➢ 16 per meter	5 to 16 per meter	< 5 per meter
# of Buds(nodes) per foot of Row (VSP)	➢ 5 per foot	1.5 to 5 per foot	<1.5 per foot
# of observed nodes(buds) per cane	➢ 20	10 to 20	< 10

The above table is used before pre-pruning and is a guideline to identify of the vine you are observing is too large or too small for the space provided. The target of 5 to 16 fruitful and growing buds per meter is too allow for good shoot spacing and sunlight interception and fruit exposure for fruit quality. If you suspect some bud injury you will need to increase the number of buds left per meter to move vine into a full crop level (SEE Table 1. Pruning Modifications). Another good measurement of vine performance is to record specific vine crop level. This requires measuring sample vines just prior to harvest the previous year to establish crop yield per vine and use along with pruning weight measurements

The goal of achieving a balance between crop level and canopy/shoot growth is often a challenge. Despite the significant impact of pruning on crop levels, it is not enough by itself to achieve the desired vine balance. For instance, Pinot Noir , Riesling, Cabernet Sauvignon, Merlot, etc., grown in Ontario will require additional crop thinning during the season to ensure complete ripening of the fruit AND proper vine maturity going into winter to achieve optimum winter hardiness.

Balanced vines produce the best fruit each year and continue to do so for many years. To hedge our bets, we must practice “spare parts” viticulture as we never know when we will be faced with adverse winter temperatures but we can be sure they will happen!

It has been said that “Those who do not read and remember history are condemned to repeat the same mistakes of their predecessors”. There is no single training system or bud number or crop level that fits all sites and environments just as no one suit fits all people that work in a single company. To allow for the proper of expression of Niagara terroir and premium wines, we must recognize the unique attributes and limitations of each vineyard location and interaction of site, climate, rootstock, cultivar and a multitude of other factors that lead to successful winegrape production and premium wine quality. This includes how we train and grow our grapes at each site.

Keep in mind that not all blocks and cultivars are the same even at one location. Modification to get high quality fruit and keep the vines productive and economical each and every year should be the target!