Growing Cabernet Sauvignon at Wynns Coonawarra Estate – the influence of vintage, clones and site.

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Abstract

Wynns Coonawarra Estate are custodians of important vineyards in the heart of the Terra Rossa strip. We are focussed on optimising wine quality in response to seasonal climatic challenges whilst protecting and enhancing our most valuable resources of soil, ground water, vines, and people.

Seasonal conditions, clones, and site, all impact on wine quality and wine style, understanding these factors is critical. No two vineyards are the same, as no two vintages are the same. Imposing planned vineyard diversity is key in adapting to seasonal variability. Clonal material, rootstocks, and canopy management are all very useful in achieving diversity in Cabernet Sauvignon. A very detailed knowledge of individual vineyards, and the ability to react to the season via practices such as winter pruning methodology, shoot thinning, shoot trimming, shoot positioning, leaf removal, fruit thinning, soil and irrigation management are all important.

Wynns heritage vineyards growing higher quality fruit have been renovated and rejuvenated during the last decade. Vineyards exhibiting poor health, or planted to the incorrect clone, or variety have and are being removed and replanted. These new vineyard plantings incorporate proven Australian clones, new international clones, and material carefully selected and propagated from the Wynns heritage vineyards.

Wynns have invested in a detailed understanding of vineyard soils, geology, subtle differences in elevation, and local climatic variance. Cabernet Sauvignon tannin, colour and wine style across a range of soil types, clones, and seasons has also been assessed.

Growing world class Cabernet Sauvignon that best expresses Coonawarra’s potential is a complex undertaking. It is a long term focus at Wynns.
Introduction

Wynns Coonawarra Estate is located in the Coonawarra Region within the Limestone Coast of South Australia. Coonawarra has an international reputation for high quality Cabernet Sauvignon from its vineyards located along a long narrow strip, approximately 2 kilometres wide and 21 kilometres long of red soil commonly referred to as Terra Rossa. Coonawarra is dominated by red winegrape varieties, comprising 90% of the total vineyard area, with Cabernet Sauvignon and Shiraz being the main red varieties (Longbottom et al. 2011). Just over half of Wynns vineyards are planted to Cabernet Sauvignon.

![Image](image.png)

**Figure 1. Wynns Coonawarra Estate. Heritage Circa 1896**

John Riddoch built the first winery in Coonawarra, now known as Wynns Coonawarra Estate in 1896. Samuel and David Wynn, wine merchants from Melbourne purchased the estate in 1951 and in 1954 the first labelled Wynns Coonawarra Black Label Cabernet Sauvignon was made. Wynns Black Label Coonawarra Cabernet Sauvignon has a magnificent history and is one of Australia’s most collected and cellared Cabernets (McInerney, 2009). Since the release of Wynns Black Label Cabernet in 1954, the focus with Cabernet Sauvignon has expanded to include the single vineyard labels presenting Coonawarra’s regional diversity since 2001, and the Langton’s classified “Exceptional” John Riddoch Cabernet Sauvignon (first vintage 1982).

To grow Cabernet Sauvignon that truly expresses an individual site requires a sound understanding of the differences between, as well as within individual vineyards. Site complexity evolves from variance in rainfall, temperature, soil, vine planting material, and both historical and current management practices.
Climate

The Coonawarra cool climate along with well drained, red limestone based soils with good water for supplementary irrigation is considered ideal for medium to full boded table wines (Gladstone, 1992). Due to its flat terrain, proximity to the southern ocean and the cold water from the Bonney Upwelling (figure 3) Coonawarra is cooler than its 37° S may suggest. It has a long, relatively dry ripening period, with 1392 growing degree days (Longbottom et al. 2011) and an annual rainfall of 582mm, with 228mm throughout the growing season (Bureau of meteorology 2013). Good quality supplementary irrigation water is sourced from an unconfined limestone aquifer with an average water table depth of five metres.

<table>
<thead>
<tr>
<th>Location</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Elevation (m)</th>
<th>Annual</th>
<th>Late Autumn, Winter &amp; early Spring</th>
<th>Growing Season</th>
<th>Relative Humidity (%)</th>
<th>Key fruit development /ripening months (JFM) Ave Temp °C</th>
<th>Growing Season GDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coonawarra</td>
<td>37° 29' S</td>
<td>140° 83' E</td>
<td>51 to 63</td>
<td>582</td>
<td>354</td>
<td>228</td>
<td>45</td>
<td>18.8</td>
<td>1392</td>
</tr>
</tbody>
</table>

Figure 2. Coonawarra climatic summary (Longbottom et al. 2011 and Bureau of meteorology 2013).

Figure 3. Sea surface image showing strong cold water upwelling in the Bonney Coast (Longbottom et al. 2011)
Figure 4. Degree day summation (October – April) calculated from weather stations across the Limestone Coast (based on long term average climatic data from Bureau of Meteorology 2011) and other wine regions (light blue). Margaret River data from Gladstones (1992). Marlborough (Blenheim airport), Bordeaux (Mérignac Airport) and Barossa (Nuriootpa) from Gladstones (2011). (Longbottom et al. 2011)

While long term averages are important tools in the general understanding of the region, understanding the variability between vintages and within the region is critical, especially with the likelihood of an increase in extremes due to climate change. Figure 5 highlights the relationship between growing degree days, rainfall and the variability between seasons. Figure 6 illustrates the variability in rainfall within Coonawarra. The mean difference in rainfall between the townships of Coonawarra and Penola within the Coonawarra wine region is 34 mm, an increase of 3.3 mm for every kilometre south travelled. These subtle differences influence wine styles as well as the management requirements, which include harvest dates, canopy manipulation, irrigation and planting material for new vineyards.
Figure 5. The relationship between Growing Degree Days (GDD) and Rainfall (mm) in Coonawarra for the growing season (24th Sept – 9th April)

Figure 6. The rainfall comparison of the Penola and Coonawarra townships
Site

The two main local influences on vineyard temperature in Coonawarra are elevation and latitude. Elevation is the most important as for every metre drop the temperature falls by around 0.8°C. The higher areas like the Wynns V&A Lane vineyards at around 63 metres are warmer and tend to ripen earlier than cooler areas to both the north and south. Overall, the region tends to fall from around 63 metres in the south to 51 metres in the north. The Terra Rossa ridge forms a centrally aligned back bone of the Coonawarra strip. Latitude partly balances this elevation influence, with the landscape warming by around 0.4°C per kilometre as you go north of the V&A Lane vineyards.
Figure 7. Coonawarra vineyard map based on an elevation survey of the Wynns Coonawarra Vineyards.
Figure 8. The Wynns V&A7 Vineyard elevation range 58 - 60.5 metres influences the temperature variability within the vineyard. The growing season average temperature range for V&A7 is 18.7°C – 20.1°C, based on the temperature model (Tave 1st September – 10th April).

The aerial view in figure 9 of the northern half of Coonawarra shows flat topography with the Naracoorte Range dune (see darker trees) to the north east which was the original coastline approximately 750,000 years ago. The soils to the east tend to be sandier, whereas the 27 km long strip of vineyard is narrow, and perched on the slightly higher Terra Rossa ridge at 51 to 63 metres above sea level. The land drops off to around 50 metres as you go west, and the soils progressively change to heavier, black coloured Rendzina soils.
Soils

The best Wynns Cabernet Sauvignon fruit is always grown in Terra Rossa soils. These soils are free draining, yet have adequate water holding capacity and persistent structural integrity. Maschmedt (Longbottom et al. 2011) describes these soils as well structured red sandy loam to clay loam, with moderately low to moderately high inherent fertility depending on clay content. They have very high Ca saturation, an open crumbly structure with good aeration and drainage. The water holding capacity is linked to the depth of the soils, which varies from a few to 50 millimetres of readily available water (RAW). The depth of these soils does vary, but the higher quality fruit usually comes from the more uniform soils, which have a depth of around 50cm. The Terra Rossa soils consistently produce balanced vines, exhibiting the ripe tannin and flavour characteristics that we look for in Cabernet Sauvignon at 13 to 13.5 baume.
Vine Planting Material

Due to Wynns rich history, around half of the Wynns vineyards are older than 30 years and 20% are greater than 40 years in age with the oldest Cabernet in Coonawarra being the Johnson’s Block planted by Wynns in 1954. Wynns have made a serious commitment and investment for the future through the renovation of old vineyards or the replanting of poor performing vineyards located on precious Terra Rossa soil.

Vineyards with a history of growing high quality fruit have been renovated. Since 2001, around 150 hectares have been cut back to 30 to 80 cm above ground, to remove the old cordon, before being re-trained and re-trellised. This method is referred to as "complete cordon removal" (CCR). This process is shown in figures 11 and 12. Figure 11 shows the Glengyle vineyard in 2002 immediately after cordon removal and pre the installation of new posts and wire. Figure 12 shows the Glengyle vineyard in 2007 after it was reconstructed. This process enabled the vineyard to produce quality fruit suitable for the Wynns Glengyle single vineyard Cabernet Sauvignon in 2007 and 2009. The technique has proven to improve fruit quality and prolong the life of vineyards provided there is good genetic vine material and terroir. Converting old vineyards that currently produce high quality fruit, at extremely low yields to cane pruning, is another technique being used to prolong the life of important heritage vineyards.

Figure 10. Davis and Harold vineyards, both located on Terra Rossa but with different depths to the limestone resulting in different management practices and very different wines.
Figure 1. Glengyle vineyard at the start of the CCR process, immediately after the cordon was removed.

Figure 2. Glengyle vineyard in 2007 after it was reconstructed in 2002.

Typically previously top-worked Chardonnay, Riesling, and Merlot vineyards, are being replanted, as are vineyards with inferior heritage or health, or vineyards that deliver fruit quality below the potential of the site. The focus is to improve the flavour diversity and quality available from our Cabernet Sauvignon plantings by having the best variety and clone for the site. A significant proportion of Wynns vineyards are planted on Terra Rossa, and we need to optimise the wine quality expression from this limited resource, and replanting is important to achieve this. This long term program has resulted in a quarter of Wynns vineyards being replanted since 2002.

The aim is to grow world class Cabernet Sauvignon that best expresses Coonawarra and the Wynns style. Considerable focus has been given to clonal diversity, with a range of material being used from proven commercial clones, material propagated from key Wynns heritage vineyards, as well as new imported
clones. This diversity is considered important in managing the risk of seasonal variability. Hopefully the clonal and rootstock diversity will reduce the impact of cool, warm, dry or wet vintages in term of fruit quality as well as providing a range of different wine styles.

Commercial Australian clones have been assessed in terms of quality and performance within Coonawarra, on the different soil types and over different seasons. These assessments have occurred both through general observations and trials. The AWRI (Australian Wine Research Institute) in conjunction with Wynns, assessed the impact of vintage, soil type and clonal material on the phenolic profiles of Cabernet Sauvignon from 2009 to 2012. The results found the seasons climatic conditions were the most significant factor for tannin and anthocyanin development compared to clone and soil type (Scrimgeour and Kidman, 2013). Clone SA125 on Terra Rossa consistently made wines that were preferred based on sensory assessments (Scrimgeour and Kidman, 2013).

<table>
<thead>
<tr>
<th>Clone</th>
<th>Baume</th>
<th>Colour mg/g</th>
<th>Phenolics</th>
<th>Epicatechin</th>
<th>Bunch</th>
<th>Yield</th>
<th>Wine</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>fw</td>
<td>au/g</td>
<td>mg/g dm</td>
<td>number</td>
<td>kg/vine</td>
<td>score</td>
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<tr>
<td>SA125</td>
<td>13.8</td>
<td>2.4</td>
<td>1.7</td>
<td>20.88</td>
<td>74</td>
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<td>1.7</td>
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<tr>
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<tr>
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<td>13.6</td>
<td>2.3</td>
<td>1.6</td>
<td>19.96</td>
<td>71</td>
<td>3.5</td>
<td>15.3</td>
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<td>Reynella</td>
<td>13.9</td>
<td>2.33</td>
<td>1.6</td>
<td>19.57</td>
<td>66</td>
<td>2.6</td>
<td>15.38</td>
</tr>
</tbody>
</table>

Figure 13. Coonawarra tannin trial, 2009-2012 completed by the AWRI in conjunction with Wynns to assess the impact of vintage, soil type and clonal material

Smaller areas have been planted to new imported Cabernet Sauvignon clones, including French clones ENTAV 412, ENTAV 338, ENTAV 169 to compare their fruit quality and suitability to proven Australian clones and the Wynns heritage material. The selection of these clones has been based on industry trials both in Australia and internationally, as well as via direct feedback from respected producers in France and Italy that at present craft world class Cabernet Sauvignon.

Over the last 15 years, the best vines have been isolated in the heritage Wynns vineyards to select high quality propagation material. Cabernet Sauvignon selections have been taken primarily from the historic Redman, Childs, and Davis vineyards. Based on the historical performance of these vineyards, the aim is for the new selections to deliver more evenness within the vineyard and hopefully facilitate earlier harvest at optimal flavour and fine tannin maturity coupled with lower alcohols. Some of these heritage selections
are being planted on own roots to provide an important improved source of propagation material into
the future. However, the majority are being grafted onto rootstocks which have been carefully chosen
to provide biosecurity from Phylloxera and optimise future yield and canopy balance depending on soil depth
and type. With climate variation in mind, we are trialling many rootstock combinations aimed at providing
not only high quality grapes, but also drought tolerance and flexibility in growing season length.
In collaboration with the Phylloxera and Grape Industry Board of South Australia and Coonawarra Grape
and Wine Incorporated, Wynns planted a trial in 2009 to evaluate long term fruit quality of Cabernet
Sauvignon grafted to nine rootstocks within the Wynns Alexander vineyards, located on Terra Rossa soil.

The 9 rootstocks grafted to CW44 Cabernet Sauvignon scion included in the trial:

- Ramsey (*Vitis champini*)
- 1103 Paulsen (*Vitis berlandieri x Vitis rupestris*)
- 140 Ruggeri (*Vitis berlandieri x Vitis rupestris*)
- 110 Richter (*Vitis berlandieri x Vitis rupestris*)
- Boerner (*Vitis riparia x Vitis cinerea*)
- Merbein 5512 (*Vitis berlandieri x Vitis cinerea*)
- Merbein 6262 (*Vitis berlandieri x Vitis cinerea*)
- Merbein 5489 (*Vitis berlandieri x Vitis cinerea*)
- Cabernet Sauvignon ungrafted (*Vitis vinifera* L.)

The rootstocks included are a mixture those commonly used and new. The Boerner rootstock was
selected based on overseas studies, such as Becker 1988. The three new Merbein rootstocks have been
recently released from CSIRO. Not included in the trial but also being assessed in the Wynns vineyards
are *Vitis riparia x Viitis Rupestris* rootstocks 101-14, Schwarzmann and 3309C.

Prior to planting new vineyards, soil type and depth to limestone are mapped using an EM38 survey and
ground truthed with strategically located soil pits. Rootstocks are then selected based on this
information and historical performance in similar soil types within Coonawarra, with a diverse range of
rootstocks being used within each vineyard. The rootstocks are selected to match the soil type and a
range of rootstocks are also used to assist manage seasonal variability.
Figure 14. Careful mapping of soil type and depth is very important when replanting a vineyard, as rootstock and clone decisions will influence long term future fruit quality.
Management Practices

Understanding the climatic, soil and vine material difference and adjusting the management practice accordingly is key, both between vineyards and within vineyards. It is also important to have a range of management practices and to be able to adjust to the seasonal climatic variation.

The variation in spring temperature dramatically impacts bud fruitfulness in Coonawarra. As a result, a great deal of attention is placed on pruning to the appropriate bud number to ensure that not only is the target yield met, but that the canopy is balanced to the desired shoot number, length and density. To assist with this, prior to pruning, dormant bud dissections are completed to predict the potential yield by estimating the inflorescence number inside the buds. Wynns bud fruitfulness history from the last decade is very useful in pruning decision making as ‘like’ seasons can be compared.

A range of canopy management practices are used within the Wynns vineyard. Both traditional sprawl and VSP (vertical shoot positioned) canopies are used, with some vineyards a mixture of both. For example, a VSP on the eastern side and a trimmed sprawl on the west to protect the fruit from the afternoon sun. The canopy management is based on the row orientation, soil and vigour potential. A range of canopy management practices are also used due to climatic variability, as different practices have proven to perform well in different seasons.

Soil management and canopy manipulation are used to manage vigour and vine balance. Plant cell density (PCD) images are used to selectively compost under vine to improve the vigour in sections with very shallow soils. Competitive cover crops such as chicory, lucerne, and vigorous annual clover are used to reduce vigour. Native grasses have been trialled as an alternative to traditional cover crops. In collaboration with Wynns, Chris Penfold from the University of Adelaide is trialling a number of under vine cover crop options, which include Kaspah cocksfoot, Uplands cocksfoot and a clover/annual ryegrass blend as an alternative to more traditional practices. Protecting and enhancing soil health is critical in growing balanced vines with healthy canopies, which are required for full Cabernet Sauvignon varietal expression. The soil health, biodiversity and nutrition is monitored closely and plays an important role when assessing management options.
Figure 15. Native grasses (e.g. wallaby grass) are being assessed in an effort to increase soil and vineyard biodiversity, and to reduce mid row grass water use.

Figure 16. Compost application assists improve soil health and buffer water stress where the soils are shallow.

Shoot thinning, leaf removal and fruit thinning are used to reduce variability and improve vine balance and achieve the appropriate light exposure for the season. The aim is to minimise green methoxy-pyrazines (IBMP) and target good colour, intense varietal Cabernet characters, all integrated with fine, balanced and ripe tannins. These reactive vine balance techniques are crucial in reducing the clumping of bunches and shoots as well as to reduce shading. Short shoots which are typically from secondary and tertiary buds are removed and this redirects carbohydrates and nutrients into the remaining primary shoots to reduce variability and enable the fruit to ripen evenly. Leaf removal on the eastern side and shoot trimming are particularly relevant in cool seasons in Cabernet Sauvignon to increase light.
interception to the buds, increase colour and tannin, and particularly decrease IBMP. Removal of green bunches at veraison is used to reduce variability and improve vine balance.

The majority of the Wynns vineyards are located in the middle of the Coonawarra strip where there are minimal eucalyptus trees and 1,8-cineole influence on the wine. Vineyards located on the edge of the Coonawarra strip near eucalyptus trees are managed carefully, with some vines excluded from harvest. Parcels from these vineyards are kept separate and monitored for 1,8-cineole to reduce this character.

Careful irrigation management is also critical in achieving quality targets and managing climatic variability. Vines are monitored based on visual appearance, soil moisture, and stem water potential. To understand how the vines are reacting to the climatic conditions and how stressed the vines are, in collaboration with the University of Adelaide, Wynns have been trialling a hand held Near Infra-Red Spectrophotometer, which potentially will assist in optimising irrigation application and moderating vine stress by correlating measured leaf water status with the Schollander Pressure Cylinder.

At harvest, parcels are selectively picked based on winemaker flavour, tannin, and ripeness assessment of the various soil, vigour, clone and rootstock combinations. Many vineyards are picked over an extended period based on these differences. Figure 17 is an example of selective picking based on flavour differences resulting from variable vine vigour and soil depth to limestone. The excessively stressed vines, marked in green were not picked and the higher vigour vines, marked in black were harvested separately approximately a week later than the vines marked blue. The map was produced using PCD maps before being refined and truthed by fruit assessments in the vineyard with the winemaking team.
Conclusion

The understanding of vineyard soils, geology, subtle differences in elevation, and local climatic variance and the management of clonal material has been a focus at Wynns with the aim to grow world class Cabernet Sauvignon that best expresses Coonawarra’s potential. The influence of the vintage, clone and site all impact on the quality of Cabernet Sauvignon. A detailed understanding of these factors and their impact on individual vineyards, and the variability within each vineyard is critical. It is also important to have a range of clonal material and management practice due to climatic variability. The aim is to use a detailed knowledge of our vineyards to set them up optimally for each phenological stage during the season. Winter pruning, shoot thinning, trimming, and positioning, leaf removal, fruit thinning, soil and irrigation management all play a role in the expression and essence of Coonawarra Cabernet Sauvignon.

Figure 17. Selective harvesting at the Alexander Vineyard.
Acknowledgements

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References


