TERROIR CONSULTING

Re-Planting Guidelines and Recommendations

Prepared for the British Columbia Ministry of Agriculture and Food

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Photo credits: Wine Growers BC

Executive Summary

This report, prepared by Terroir Consulting for the British Columbia Ministry of Agriculture and Food, outlines comprehensive replanting guidelines and recommendations for the BC wine grape industry under the Enhanced Replant Program. The program, announced in March 2024, allocates $23 million to support grape growers in replacing existing acreage with climate-resilient varieties that produce in-demand premium fruit.

The key findings and recommendations of the report focus on ensuring equitable funding support for both large and small grape growers across all BC grape growing regions. There is a need for simple and accessible funding applications to accommodate administrative capacities, and immediate financial support to address cash flow needs exacerbated by the 2024 winter freeze. The report stresses the importance of replanting with strategic economic return, market viability, and climate resiliency in mind.

The report identifies several mandatory criteria for funding, including the use of certified plant material to prevent disease spread, disclosure of replanting reasons, and implementation of risk management strategies for planting the same variety. Additionally, it emphasizes the need to focus on one of the top five marketable wine styles to ensure financial viability. The report identifies five key marketable wine styles: Quality Sparkling Wines, Workhorse Whites, Light Reds and Rosé, Super Premium Reds, and Experimental and Quaffable wines. Grape varieties are suggested to match these styles, accommodating BC's diverse climates and growing conditions, with notes on yield, quality, price and consumer targets.

To prioritize funding, projects demonstrating business planning, as well as environmental protection, resiliency planning, and sustainable practices will be given preference.

A detailed cost analysis of replanting one acre of *vinifera* grapes is provided, considering plant material, vineyard preparation, trellising, and irrigation. The report outlines grower-preferred replanting techniques, including total vineyard replacement, interplanting, layering, and field grafting, each with its own cost and management implications. Horticultural considerations emphasized in the report include soil testing, cover cropping, clean plant material, rootstock selection, variety selection, irrigation planning, water storage/treatment, trellising, and planting density to support successful replant projects.

This Re-Planting Guidelines Recommendations Report provides a strategic framework for the BC Ministry of Agriculture and Food to implement the Enhanced Replant Program. By aligning funding priorities with industry needs and market opportunities, the program aims to foster a resilient, economically viable, and environmentally sustainable grape-growing sector in British Columbia.

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Background

In March 2024, the British Columbia Ministry of Agriculture and Food announced a new 5-year Enhanced Replant Program to provide up to $70 million to support wine grape, berry, and tree fruit producers to replace existing acreage with climate-resilient varieties that produce in-demand, premium fruit. The wine grape industry was allocated $23 million from this fund, to address the specific planting needs for BC grape growers.

Within the Enhanced Replant Program, the wine grape industry has unique needs and considerations for effective support. Specifically, the BC wine grape industry is a supportive market for value-added products. Due to complex quality, style, and pricing factors for wine, as well as very specific, complex consumer demands in the context of a global market, wine grapes do not function as an interchangeable commodity. Therefore, any planting decisions must take into account climatic constraints and farming decisions, as much as market viability for the end products.

This Re-Planting Guidelines and Recommendations Report, prepared by Terroir Consulting, is the second report in a two-part project. Previously, a document prepared in 2023 by another consultancy entitled, *An Opportunities Assessment for the BC Grape and Wine Industry*, sought to address the challenges the BC wine grape industry was facing and identify solutions for the 2023 Perennial Crop Renewal Program. Gaps were identified in that report that required additional investigation; therefore, the first part of this project was for Terroir Consulting to research and write the 2024 Grape Gap Analysis report for the BC Ministry of Agriculture and Food.

The 2024 Grape Gap Analysis report, the first part of this project, included industry consultation, an industry survey, and strong data research, providing science and market-based background for the replanting funding and processes.

This Re-Planting Guidelines and Recommendations Report is the second part of the project. The guidelines and recommendations in this report are strongly informed by the previous "*An Opportunities Assessment for the BC Grape and Wine Industry*" report, and the 2024 Grape Gap Analysis report concurrently completed by Terroir Consulting. The resulting report clearly identifies the wine grape specific planting guideline recommendations to be used by the Province to implement the Enhanced Replant Program.

SECTION 1

Funding Priorities

Key Success Factors

Extensive industry consultation, in the form of thirteen in-depth interviews with all four key stakeholder groups and additional industry members, informed the Grape Gap Analysis report and as well as the following recommendations for equitable, strategic distribution of the BC Ministry of Agriculture and Food's Enhanced Replant Project funding. Consultation revealed a high level of industry consensus on strategic priorities, and identified both mandatory criteria for successful projects, as well as value-added criteria that will prioritize key industry strategies.

Industry Priorities

The BC wine grape growers articulated several key industry priorities during consultation, including:

- Funding allocation should be equitable and support both large and small grape growers, and address replanting issues in all regions.
- Funding must take into account the variety of farming and land ownership relationships common in the wine grape industry.
- Funding applications should be easy and accessible for grape growers, who have varying levels of capacity for project administration.
- More funding must be accessible in the short term for grape growers to deal with the cash flow needs exacerbated by the 2023 and 2024 cold snaps.
- Replanting projects must not make the same mistakes as previously unsuccessful projects, without mitigation measures to reduce risk.
- Projects should be judged on merit, and advance common priorities for the wine grape industry, including farming for quality, resiliency, and care for the land.
- Grape growers should be provided with guidance on marketability without dictating the varieties to meet the marketable styles.
- A diversity of varietal plantings is obligatory to meet the varied regional growing conditions, and to encourage climate resiliency (Bosshart, 2020).
- Grape growers should be encouraged to re-plant with strategic economic return in mind.

Mandatory Criteria

The following criteria are widely accepted to be mandatory criteria for Enhanced Replant Program funding. Please see Section 2, Funding Distribution, for example questions for the funding application forms.

- To discourage the spread and prevalence of disease, all new plant material must be sourced from either CGCN-approved nurseries or a CFIA-approved exporting nursery with an international equivalent certification.
- To decrease the likelihood of project failure, all grape growers must disclose why they are replanting each vineyard plot, and if intending to plant the same variety, identify what prevention and mitigation measure they are taking to increase resiliency and the chances of success.
- To ensure the financial viability of the wine grape industry, all new plantings must be targeted to valued-added production of marketable wine styles.

Although industry consultations identified a strong preference for planting varieties suited to specific vineyard conditions, the recommendations in this report do not support mandatory criteria based on climate suitability at this time, as the scientific data to match varieties to climatic zones, such as sub-geographical indications, is not widely available. Climate suitability may be a criteria for the Enhanced Replanting Program funding when robust, comprehensive, specific variety matching work is complete.

Priority Criteria

To encourage the evolution of the wine grape industry towards financial and environmental sustainability, there is broad industry consensus that project funding through the Enhanced Replant Program should prioritize the following criteria. Please see Section 2, Funding Distribution, for example questions for the funding application forms.

- To support the most financially viable projects, grape growers should show evidence of business planning for their intended project.
- To encourage the care and resiliency of BC's wine grape vineyard lands, funding should prioritize projects that can demonstrate environmental protection, thoughtful resiliency planning, and/or sustainable and regenerative practices.

Acknowledging that not all grape growers have prioritized financial and environmental criteria in past plantings, multiple options to fulfill priority criteria will enable grape growers to make changes and enhance their applications over the multiple years of funding access.

SECTION 2

Funding Distribution

Industry Distribution

In order to meet industry priorities (detailed above), the following recommendations will ensure the more equitable, practical distribution of Enhanced Replant Program funding.

- Allocation of funding should be based on farmed land acreage.

- Land owners, or lessees with a five year written lease or letter of intent for a five year lease to demonstrate vested interest AND signed permission from land owner, may apply for the funding.

- The multi-year funding cycle should be front-loaded, due to immediate cash concerns in the wine grape industry. Some funding should also be available over the long term for the regular replacement cycle of vines due to disease and other non-urgent factors.

  For a five year funding cycle, roll-out may be distributed with the following percentages of total funding per annum:

  Year 1: 40% of total project funding
  Year 2: 30% of total project funding
  Year 3: 10% of total project funding
  Year 4: 10% of total project funding
  Year 5: 10% of total project funding

- In the initial year of funding, replant applications may address vineyards in need of replanting in 2023 or 2024.

- Any unused funding from one year should be available for distribution in the subsequent years to both previously successful and new applicants. In each funding cycle, projects should be judged on merit according to the mandatory and priority criteria.

- As projects will be judged on merit, a timed intake for applications is necessary. A one month application period should take place in the fall of 2024, and in subsequent years, in the late spring (April/May).

Suggested Application Questions

The following are suggested Yes/No questions for the Enhanced Replant Program funding application form, that will ensure both mandatory and priority criteria are identified.

Applications MUST meet the following mandatory criteria. Please note, all application answers are subject to audit and verification.

- Do you agree to use certified plant material (vines and rootstocks, or vines if field grafting) from either a Canadian Grapevine Certification Network (CGCN) certified nursery, or an international-equivalent certification if plant material is sourced internationally?
  Y/N
- Why is replanting taking place?
  Trunk disease Y/N
  Virus Y/N
  Cold damage Y/N
  Fire Y/N
  Other Y/N
- Are you proposing to plant the same variety in the same vineyard plot?
  Y/N
- If yes, do you commit to implementing new risk management strategies to address the site challenge? (ie: planting certified plant material, blanketing vines in winter) Note your responses will be subject to audit.
  Y/N
- Which of the five top marketable wine styles (link to Terroir Consulting's Appendix 1: Marketable Wine Styles and Suggested Varieties) does your planting project support? Note, variety selection is subject to audit. Gewürztraminer is not available for funding.
  Wine Style 1 (Workhorse Whites) Y/N
  Wine Style 2 - (Light Reds / Rosé) Y/N
  Wine Style 3 - (Traditional/Tank Sparkling) Y/N
  Wine Style 4 - (Super Premium) Y/N
  Wine Style 5 - (Premium Experimental) Y/N

For Enhanced Replant Program funding, the following criteria will be prioritized. (For each criteria, the applicant must provide one relevant document per criteria as proof in an audit.)

- Financial viability: Have you completed any of the following related to your planting project? Note, evidence is subject to audit.
  A business plan
  A business case (See template on Sustainable Winegrowing BC's website)
  A 3+ year purchase contract for the resulting grapes
  Y/N
- Care and Resiliency: Have you completed any of the following, which cover the vineyard you are applying to replant? Note, evidence is subject to audit.
  Biodiversity plan
  Biodynamic certification
  Environmental Farm Plan
  International Wineries for Climate Action membership
  Organic certification
  Natural lands held in trust
  Salmon Safe certification
  Sustainable Winegrowing BC vineyard certification (or the free year zero SWBC assessment if applying for funding in 2024.)
  Y/N

Note, if projects do not meet the second priority criteria (Care and Resiliency) applicants should be encouraged to pursue Sustainable Winegrowing BC's vineyard certification, which is the most comprehensive but also the lowest-cost option for grape growers to enhance future applications. Completing the free year zero SWBC assessment would qualify them for funding priority in 2024; however, SWBC certification, or completion of another Longevity and Resiliency criteria, would be required to be considered for priority funding in subsequent funding rounds.

SECTION 3

Wine Styles and Varieties

Key Market Opportunities

As detailed in the 2024 Grape Gap Analysis report, British Columbia and Canada have a growing wine consumer base that greatly values British Columbian wine (Halstead, 2021). Currently the market for BC wine is 79% domestic, with 20% sold in the rest of Canada and 1% sold abroad (Terroir Consulting, 2024). Although sales have diminished in the domestic market in recent years, supply has not met the demand within key categories such as sparkling wine, supporting imported wines to increase market share (Wine Intelligence, 2020).

In 2022, there were 3,306,258 British Columbians that consumed wine at least yearly, spending an average of $116 per person/year (Wine Growers BC, 2022). The overall domestic wine market share for BC VQA wine has been relatively consistent the past six years between 13.2% in 2018 and 12.8% in 2023 (Wine Growers BC, 2024). Every indication shows that the provincial market will continue to support BC wine. Supply has decreased the past two years (Wine Growers BC, 2024), highlighting the need to ensure supply of BC wine keeps up with the strong provincial demand for the product.

Marketable Wine Styles

The original project outline for the Grape Gap Analysis and this Re-Planting Guidelines and Recommendations reports requested 3-5 recommended wine grape varieties to be planted in British Columbia. Extensive industry consultation and subject matter expertise did not support the narrow scope of this request. Dramatically varied climates throughout the province, layered quality and price points for end-products, market suitability, consumer preferences, and climate resiliency (Bosshart, 2020) suggested instead to identify 3-5 marketable wine styles that could be met with careful, plot-specific grape variety selection. The BC Ministry of Agriculture and Food agreed to the reframing of this very important question. As results, five key marketable wine styles were identified:

1. Quality Sparkling Wines: Produced in both traditional and tank methods. Traditional method wines may be produced from globally classic, high acid white and black grapes, farmed at moderate to high yields for premium quality and price levels. Tank method wines may be produced from moderately aromatic, fruity white and black (low tannins) grape varieties, farmed at moderate yields for mid-market and premium quality and price levels.
2. Workhorse Whites: Produced from neutral or moderately-aromatic white grape varieties that at moderate yields, maintain appropriate concentration for the production of mid-market white wines.
3. Light Reds and Rosé: Produced from black grape varieties with lower anthocyanin levels, ability to retain freshness, and slow to moderate sugar accumulation, resulting in fresh mid-market to premium wines.
4. Super Premium Reds: Produced from key globally-benchmarked black grape varieties, farmed at high density with low yields of high quality fruit, and made with premium wine making tools, for super premium quality and price levels.
5. Experimental and Quaffable: Produced from a wide array of rare and even hybrid grapes, farmed at moderate yields and produced according to recent market trends, resulting in low volume, eclectic, premium quality and price wines.

Please see Appendix 1, Marketable Wine Styles and Suggested Varieties for a much more thorough description of each wine style.

Key Varieties for Market Opportunities

Globally, it is estimated that over 6,000 grape varieties are in production to make wine. Although a handful of varieties are planted in almost every wine-producing country in the world, the vast majority of varietal plantings are specific to each country and region of origin (OIV, 2017). There are three reasons for the broad diversity of grape varieties grown across the world: historical cultural practices and trade routes, varieties matching changing local growing conditions (Bosshart, 2020), and ever-evolving markets for marketable wine styles.

Currently there are 102 wine grape varieties planted in British Columbia (BCWGC, 2023).

For each of the top five marketable wine styles identified in this report, top and additional suggested varieties have been detailed in Appendix 1, Marketable Wine Styles and Suggested Varieties. The intention behind the lists of varieties is not to discourage diversity of plantings; rather, to encourage targeted decision making that accounts for the wide array of BC's climates within each marketable style.

High Risk Varieties by Market

There is one variety widely planted in British Columbia that is not aligned with the market opportunities and should not be publicly funded through the Enhanced Replant Program: Gewürztraminer. As a highly aromatic grape variety, Gëwurztraminer is unsuitable for the identified top five marketable wine styles. Additionally, Gëwurztraminer was identified as one of the top five hardest varieties to sell by BC grape growers in the Grapevine Impact Survey (2024). Even in its French and German regions of origin, Gëwurztraminer struggles with broad market popularity, is oversupplied in the wholesale markets, and is only successful in niche markets at super premium price points.

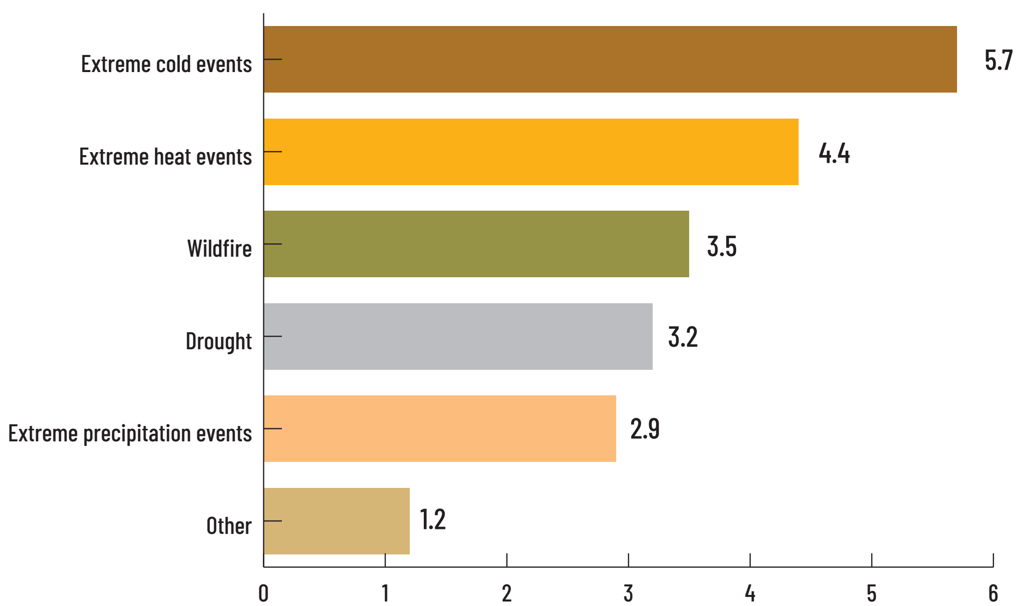
Other highly aromatic white grape varieties should only be planted if they fit one of the top five highly marketable wine styles.

Undetermined Varietal Risk by Climate

When asked to rank potential climate-related threats to BC's wine grape industry by risk level, respondents to the Grapevine Impact Survey (Terroir Consulting, 2024) indicated that extreme cold events are the greatest risk. However, this self-reported data may have a recency bias.

As detailed in the Grape Gap Analysis Report (2024), extreme cold events impact the productivity of grape vines and may cause vine damage and death. Extreme heat events impact the growth cycle of vines, impacting fruit development, with the potential to impact wine quality and style. Wildfire may destroy vineyards; however more commonly, wildfire smoke dramatically negatively impacts the quality of wine. Drought reduces vine productivity and may either positively or negatively impact grape and wine quality. Extreme precipitation events damage fruit, negatively impacting yield and grape quality, although vineyard damage is uncommon.

FIGURE 1: CLIMATE-RELATED THREAT TO GRAPE GROWING REGION - RANKED



Base: n= 72
Q15: Please rank the following events in the order you consider them to be a climate-related threat to your grape growing region? (6- Largest Threat, 1 - Smallest Threat).
Source: Terroir Consulting, 2024

In the Grapevine Impact Survey, respondents were asked if there were any grape varieties that should not be supported by the Enhanced Replant Program. As noted above, the same survey respondents are chiefly concerned with extreme cold events. Syrah was the most mentioned variety in the survey, which has been greatly impacted by the recent cold events. Other varieties (and very young vines) are more greatly impacted by extreme heat and drought (Christensen et. al., 2003). Further work must be done to identify heat and drought tolerant varieties that are appropriate for sub-geographical climates.

TABLE 1: GRAPE VARIETIES THAT SHOULD NOT BE FUNDED THROUGH A GRAPE REPLANT PROGRAM

VARIETAL (MINIMUM 3 MENTIONS)	MENTIONS
Syrah	18
Merlot	4
Pinot Noir	4
Sauvignon Blanc	3
Grenache Mourvedre	3
Cabernet Sauvignon	3

Base: n= 45
Q12. In your experience, are there any grape varieties that should not be funded through a grape replant program? List up to three varieties and what region they should not be grown.
Source: Terroir Consulting, 2024

There is a current lack of information about which grape varieties are generally suitable for specific climates in British Columbia. At the time of writing, a research project is being conducted by the BC Wine Grape Council to answer this very complicated question; however, results are not available at this time. It is the recommendation of this report that this crucial information be available, before any grape varieties are disallowed from Enhanced Replant Program funding based on climate viability, and then, only specific to sub-geographic indication locations. If the results of future projects are conclusive for high climate-risk varieties specific to sub-geographic indications, then results may be incorporated into funding considerations in the future.

No High Risk Rootstocks

Rootstocks supporting grafted grape varieties are mainly for these purposes: preventing phylloxera, managing vigour of the vine, tolerating to the soil's calcium content, and managing water sources and drainage. Climate suitability is only a consideration indirectly, as some rootstocks are better at handling drought and water-retaining or free-draining soils than others (Christensen et. al., 2003). For vineyard resiliency, it is important that rootstocks are chosen to fit the site constraints including soil and water, and are appropriate for the variety and intended wine concentration and style. No rootstocks are considered generally higher risk for the Enhanced Replant Program; it is important that growers have multiple options to consider when planting vineyards.

SECTION 4

Replanting Guidelines

Cost of Replanting

In July, 2024, the cost of grafted, *vinifera* vine plant material from a Canadian Grapevine Certification Network (CGCN)-certified nursery required to replant one acre of wine grapes is $15,038.57, assuming 3' vine spacing and 7' row spacing (2,074 vines per acre at $7.25ea). The cost of plant material is approximately ⅓ of the total cost to replant one acre of *vinifera* grapes (Ministry of Agriculture and Food, 2023), with the remainder of costs including vineyard preparation, trellising and irrigation.

Some factors that may affect price of plant material include, but are not limited to variety, clone, rootstock, availability, place of origin, organic or CGCN virus-free certification.

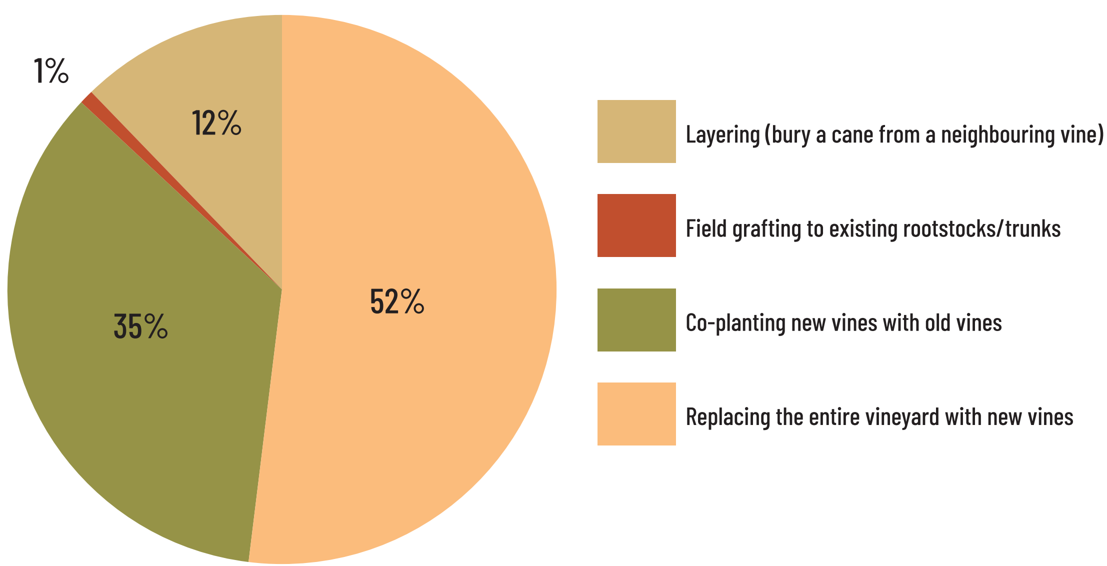
VINE COST

$15,038
Average cost of plant material to replant 1 acre

$7,519
50% funding of plant material to replant 1 acre

Timelines for ordering material from different sources vary. One CGCN-certified supplier reported that live vines are grafted in winter and available for pick up the following summer; whereas, bare root vines are grafted in winter, maintained for one year and ready for pick up the following spring (Upper Canada Growers 2024).

FIGURE 2: THE PERCENTAGE OF FARMED ACRES THAT WILL USE THE FOLLOWING TECHNIQUES TO REPLANT VINEYARDS



Base: n= 70
Q11. Thinking about the acres your are planning to replant, please estimate the percentage of farmed acres that will use the following techniques to replant your vineyards? Your responses should add up to 100.
Source: Terroir Consulting, 2024

PLANTING TACTICS

In the Grapevine Impact Survey, respondents identified they intended to replace 52% of farmed acres with completely new plantings. Total replacement is likely the preferred technique as a homogenous vineyard is most manageable with regard to age, health and productivity, ensuring consistency in pruning, harvesting and conducting routine maintenance.

Respondents identified interplanting young vines within the established vineyard as the method they would use to replant 35% of the acres they farmed. This is certainly less costly than replanting entire vineyards but new vines have different nutrient and water requirements so labour needs will go up depending on the irrigation options and nutrient management program. This method does not allow fallowing of the vineyard land, and may encourage spread of disease from old vines to young vines. Notably, interplanted vineyards are not covered under BC Production Insurance due to increased risk to the young vines (Ministry of Agriculture and Food, 2023).

Layering, where a cane from a neighbouring plant is buried and allowed to root as a new plant was how respondents planned to replant 12% of their farmed acres. This is more labour intensive than replanting and interplanting but has lower material costs as there is no need to purchase a vine, nor to update trellising. With layering, the plant would not have any protection or benefit from a selected rootstock; however, it would not compete with old vines as the new plantings access the deep roots of the older vine.

Only 1% of farmed acres were identified as intended for field grafting on existing trunks. This is not a common practice in British Columbia, although it is common in other international regions. This method does not provide long-term disease resistance through the vascular tissue between the existing trunk or rootstock and the grafted material; however, field grafting does prolong the life of infected vines and enables the new scion additional years of productivity before requiring replacement (Urbez-Torres, 2024).

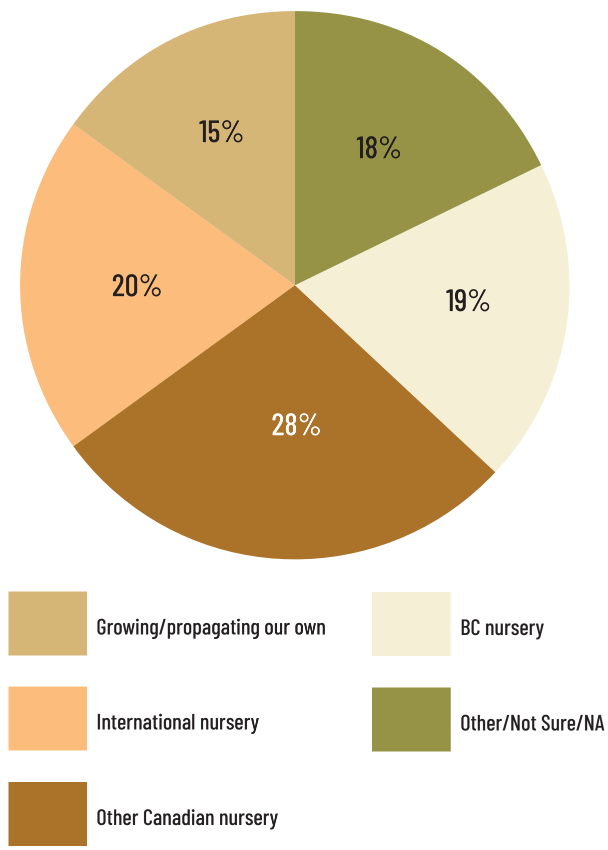
Plant Material Availability

NEW PLANT MATERIAL ORIGIN

The Grapevine Impact Survey (Terroir Consulting, 2024) showed respondents intended to reestablish their vineyards with a wide variety of plant material sources. Respondents indicated they intend to source 19% of new plant material from BC nurseries, 28% from Canadian nurseries and 20% from international nurseries. Perhaps in response to limited stock and options, 15% of material is anticipated to be grown/propagated by the grower, with an additional 18% coming from other unidentified sources (See Figure 3 below).

This wide distribution of plant material sources demonstrates that growers will purchase what they can find, and potentially grow the rest. There is a need for education around clean plant material as well as a need for increased supply of clean plant material and a clear understanding of proper sourcing and the risks associated with in-house propagation without disease analysis etc.

FIGURE 3: PERCENTAGE OF NEW PLANT MATERIAL FROM EACH SOURCE



Base: n= 70

Q10. Please indicate which percentage of your new plant material (scions/rootstocks) will come from each of the following sources. Your responses should add up to 100.

Source: Terroir Consulting, 2024

DOMESTIC

The Canadian Grapevine Certification Network (CGCN) was formed in 2017 to support the wine grape industry in Canada by ensuring a certified, disease-free supply of grape vine propagative material. CGCN had five certified nurseries in its network as of June, 2024. CGCN tests plant material from certified nurseries for Grapevine Leafroll Viruses and Red Blotch Virus.

1. AgriForest Bio-Technologies
2. Canadian Fruit Tree Nursery
3. Upper Canada Growers
4. Viticulture A&M
5. Vitis-import

The capacity to supply certified virus free plant material is complicated to determine, as most nurseries require an order to start growing and there are many variables to what one might order. Own-rooted vines are produced in tissue culture tubes and can be prepared for transport within the same year; whereas, grafted vines may take up to two years to heal and be sold as bare root dormant vines. Each facility has its own production protocols, timelines and order requirements.

The best estimate of domestic availability of virus free material at this time is that CGCN certified nurseries have the capacity to produce 2-10 million own-rooted vines by tissue culture and 1.5 million grafted plants per year. This would satisfy demand for 723 acres per year assuming a planting density of 2,074 vines per acre (Ministry of Agriculture and Food, 2023). Additional concerns include the availability of grape varieties to meet marketable styles, and if grated, rootstocks suited for each vineyard soil and site. There is a need to certify additional domestic nurseries to increase the availability of certified propagative material in Canada.

INTERNATIONAL

Canada regulates the importation of plant material to protect agricultural interests through the mandate of The Canadian Food Inspection Agency (CFIA). The United States has state-specific importation requirements on par with Canadian standards and therefore CFIA-approved sources from the U.S. are allowed. For example, California has the Grapevine Registration and Certification Program administered by the California Department of Food and Agriculture (CDFA). The CDFA collects samples and analyses for Grapevine Fanleaf Virus, Tomato Ringspot Virus and Grapevine Leafroll Viruses (CDFA, 2024).

The only countries outside of North America that have CFIA approved nurseries are France and Germany. Some Canadian and American nurseries might at least in part operate as a broker of material from European or other production nurseries (Úrbez-Torres, 2024). A list of CFIA approved international nurseries can be found here.

There exists a need for further compilation of information on trusted vine/rootstock and scion sources, pricing and availability.

Horticultural Considerations

A rigorous decision-making process with thoughtful considerations regarding sustainability and resiliency, supports successful replant projects. Each vineyard planting program should include the following considerations.

SOIL TESTING AND AMENDMENTS

Understanding of the soil type, base material, and structure is a crucial first step when replanting. Using the Soil Management Handbook from the Province of British Columbia's will help identify opportunities and challenges of water-holding capacity, nutrient availability, root penetrability, compaction and other inherent characteristics present.

COVER CROPPING

Inter-row and undervine crops, as well as volunteer natural plants offer erosion control, aggregate stability, organic matter addition, increased biodiversity, improved water and nutrient availability, and decreased release of greenhouse gas emissions in the vineyard (Abad, J. et al, 2021). Cover cropping can be challenging when water is less available and it is necessary to match the crop to the site as well as soil and water availability. The British Columbia Climate Agri-Solutions Fund offers further information on the details of cover cropping.

CLEAN PLANT MATERIAL

The need for clean plant material is evident in that Grapevine Trunk Disease (GTD) appears to be widespread throughout the province, with 95% of vineyards demonstrating some level of GTD (Úrbez-Torres et al., 2014a; Úrbez-Torres et al., 2014b). Clean plant material may be sourced from domestic sources through CGCN-certified nurseries, or internationally from the U.S., Germany or France if they are CFIA certified.

ROOTSTOCK SELECTION

Grafting rootstocks and *vinifera* vines was the solution to phylloxera, a pest that devastated European vineyards in the 1800s. Prior to this outbreak, the desired grape varieties were not grafted but instead own-rooted. The most commonly employed rootstocks in BC are Riparia Gloire (RG), 3309, 101- 14, and S04 (BCWGC, 2024). These are, broadly speaking, generalists in their requirements and behaviour, and have not so much been carefully selected for the landscapes of BC but instead chosen based on availability.

There is a gap in knowledge around rootstock and soil interaction, and clonal variation with respect to resilience to changing climatic conditions (Hall, 2024). Well-paired rootstock with scion, soil, and production goals is a useful tool for climate change resilience (CGCN, 2024).

VARIETY SELECTION

Climate suitability of the selected variety and marketability of the resulting wine are imperative decisions when planting a vineyard. See Appendix 1, Marketable Wine Styles and Suggested Varieties for recommended varieties based on marketable wine styles. Note, climate suitability mapping for all possible varieties in BCs sub-geographic regions is not available at the time of publication, and each grape grower should independently research the suitability for considered varieties.

IRRIGATION PLANNING

Irrigation plans should take into account the soil type, behaviour and vigour of chosen rootstock and scion, intended cover cropping and infrastructure needs in the vineyard. A dual irrigation system, with drip irrigation as well as overhead irrigation may be useful when establishing young vines or cover crops. Drip irrigation offers direct application of water to the rootzone of plants as well as efficient application of fertilizer through fertigation; however, it can limit the depth of roots by not requiring the plant to search for water on its own. Overhead irrigation spreads water over all areas of the plant and between vine rows. Overhead irrigation was previously all but abandoned because of its overconsumption of water and tendency to spread fungal pathogens. Farms employing dual irrigation systems typically have drip irrigation in place for the maintenance of cover crops.

WATER STORAGE/TREATMENT

In the continental climate regions of British Columbia, wine grape production is dominantly reliant on irrigation. Water storage and treatment projects can be costly but the Government of British Columbia, through the Ministry of Agriculture and Food, funded projects administered through Investment Agriculture Foundation in the 2023/2024 fiscal year to help operations adapt to climate change by investing in water infrastructure.

TRELLISING

Trellising infrastructure and training methods can help control vigour, and balance the vegetative growth of a vine with the fruit load. The most commonly employed training system in BC is vertical shoot positioning (VSP) where a one-year old cane, or a mature cordon with spurs, is positioned parallel to the ground, and shoots are allowed to grow vertically up the trellising system. VSP can make cultural practices such as tying, leaf removal, thinning and harvest more manageable than many other methods. For especially vigorous varieties or exceptionally fertile soils, Scott Henry, where four arms are laid out horizontally and shoots are grown both up and down the wires, or Geneva double curtain, where arms are parted to two parallel wires and the canopy is grown downward, are occasionally employed in BC. These methods allow the vine to spend more energy that may be present due to the vigorous variety or the excess fertility.

PLANTING DENSITY

Spacing between the vines and the resulting plant density is a complex decision, considering the vigour of the variety, as well as the intended yield of fruit, and the resulting quality of the grapes. Spacing may also be tailored for mechanical equipment. Vigorous varieties or vines grown on vigorous soil may be spaced more widely to enable the vine to be in balance; whereas less vigorous vines or those grown on less rich soil may be spaced closely to balance in competition with each other. Another important consideration is water management, in the context of increasing water scarcity in BC. By reducing competition between vines, the drought resilience increases. In designing a vineyard that is less dense, individual vines might be more productive and maintain moderate water usage (Naulleau, A. et. al. 2021). Adequate irrigation water is crucial to the production of premium wine grapes as it mitigates vine stress, and determines the concentration of flavours and volumes in wine production.

Re-Planting Guidelines and Recommendations

APPENDIX 1: MARKETABLE WINE STYLES AND SUGGESTED VARIETIES

Prepared by Terroir Consulting, for the British Columbia Ministry of Agriculture and Food

Grape-growing Context

For information on British Columbia's vineyard acreage, varietal composition, grape-growing climate, disease, and other viticultural information, please see the 2024 Grape Gap Analysis report prepared by Terroir Consulting for the BC Ministry of Agriculture and Food. Details on the British Columbian, Canadian and international wine markets for BC wine, and both global and domestic consumer preferences, are also found in this document.

Top 5 Marketable Wine Styles

British Columbia has an exceedingly broad array of climates available to grow wine grapes, and these climatic factors in combination with soil conditions and water availability dictate the viability and productivity of the grape varieties for each region, vineyard and plot.

At this point, climate viability for each possible variety in the context of British Columbia's diverse growing regions is not available. The following are highly marketable wine styles with suggestions for possible grape variety plantings to meet those styles. Suggested varieties represent marketable solutions, but each variety must be examined by a grape grower for climate, soil, and general suitability in the specific intended planting area, before planting. Matching marketable styles and varietal viability on a provincial scale is work that remains to be done.

To produce marketable styles, grape varieties and related farming methods must support the target price, quality, and yields, with the constraints of the region. To that end, notes on quality targets, consumer segments, market price, and yield levels are suggested for each marketable style.

QUALITY SPARKLING WINE

In Canada, sparkling wine has experienced tremendous momentum, with an annual growth rate of 6% between 2014 and 2018. The COVID pandemic globally boosted international sparkling wines sales, and the growth persisted post-pandemic with double-digit annual growth rates in most international markets splitting between retail and on-premise growth (Wine Analytics Report, 2024c).

Canada's domestic sparkling wine offerings represented only 17% of consumption in 2018, as stable production failed to keep up with the growth of imports (annual growth rate of 9%) in this segment. Of all sparkling wines sold in Canada, Italy represented 33% of sales, led by tank method Prosecco, consumed by 19% of Canadian wine drinkers at least once a year. Prosecco showed statistically significant growth between 2014 (12%) and 2018 (19%). The most marketable sub-category for tank (Martinotti, Charmat) method wines is extra dry, followed by brut and dry.

The combined 28% of French and Spanish wine sales were more dominated by traditional method bottling, indicating another market for this type of sparkling wine. A quarter of Canadian wine drinkers (25%) reported consuming French traditional method Champagne at least once a year: this number was stable between 2014 and 2018. The most marketable sub-category for traditional method wines is brut nature, followed by extra brut. For both methods, preferred sweetness levels vary by gender and age group (Kiefer & Szolnoki, 2023).

It should be noted that the average price for Italian, mostly tank method wines was $12 USD, and the average for French wines, produced mainly in the traditional method, was $34 USD, showing the gap in value between the two methods from the world's leading countries of production (Wine Intelligence, 2020).

Ancient method sparkling wines are included in the recommended Experimental and Quaffable wine style below. Carbon-injected sparkling wine is not recommended as a marketable wine style for British Columbian production, as it lowers consumer quality expectations and has a price-limited market appeal.

TRADITIONAL METHOD SPARKLING TOP GRAPE VARIETIES

- Arinto
- Chardonnay
- Chenin Blanc
- Pinot Blanc
- Pinot Noir
- Meunier
- Riesling

TRADITIONAL METHOD SPARKLING OTHER SUGGESTED GRAPE VARIETIES

- Assyrtiko
- Baga
- Furmint
- Monastrell
- Olaszrizling
- Parellada
- Sémillon
- Sumoll
- Viura
- Xarel-lo

TANK METHOD SPARKLING TOP GRAPE VARIETIES

- Glera
- Lambrusco Sorbara*
- Pinot Gris
- Riesling

TANK METHOD SPARKLING OTHER SUGGESTED GRAPE VARIETIES

- Barbera
- Bonarda
- Bacchus
- Brachetto
- Chardonnay
- Friesa
- Gamay
- Lambrusco Salamino*
- Madeleine Angevine
- Malvasia family
- Moscato Bianco
- Pinot Auxerrois
- Seyval blanc
- Other moderately-aromatic grape varieties

*Note, these varieties must be co-planted.

QUALITY TARGETS

Traditional method wines may be made in a non-vintage blended house style, or a vintage style aged at least 18 months to fit the premium category, and at least 36 months on lees to fit the super premium category.

Tank method wine production should be aimed at the mid-market and premium levels to align with international offerings. These wines should have minimal lees contact or aging, instead aiming for freshness and fruit expression.

CONSUMER SEGMENTS

In 2022, Wine Growers BC conducted a consumer segmentation study to identify the attitudes, behaviours, and preferences of BC wine consumers. The full report is available through their organization, which also details the demographic profile and communication preferences of each segment. Both traditional method and tank method wines are suitable for BC's Social Samplers and Passionate Advocates consumer segments. Secondarily, traditional method wines are suitable for Engaged Explorers (Wine Growers BC, 2022).

MARKET PRICE

Target market price for traditional method sparkling wines should align with international quality-focussed regions making similar wines, such as crémants from France, Franciacorta and Trentodoc from Italy, as well as Australia and American traditional method bottles. Note Cava and Spanish traditional method wines are perceived to have lower value in the Canadian market and should not be used as cases for price alignment.

Target market price for tank method wines should follow style, with mid-market and premium wines aligning to Prosecco and Lambrusco in Italy.

YIELD LEVELS

As the focus for traditional method wines is on aromatic compounds and textures from secondary fermentation, moderate to higher cropping for modern fruit concentration is appropriate. Conversely, tank method wines require more primary fruit expression and should be cropped to a moderate level to ensure primary fruit concentration.

WORKHORSE WHITES

As red wine sales have fallen globally, white wine sales have increased, with annual growth of nearly 5% to the end of 2022, to a total global value of $39 billion, and an expectation to reach around $67 billion by the end of 2033 (Carter, 2024). In 2021, white wines accounted for 43% of global wine sales. The country with the largest increase in white wine consumption was the USA, with an increase of 65% in the 2000-2021 period (Ruitenberg, 2023). As per the shift from heavy red wine to light red and rosé, white wine has benefited from decreasing meat consumption and a change in consumers to more healthful options (Carter, 2023).

In Canada, regular wine drinkers reported drinking the following top white varieties in the past 6 months: Sauvignon Blanc (52%) followed by Pinot Gris (51%) and Chardonnay (51%) (Wine Intelligence, 2020). White blends have shown a statistically significant increase since 2017; however, aromatic varieties including Gewürztraminer and Viognier have seen a statistically significant decline in consumption (Wine Intelligence, 2020).

The following recommendations for workhorse white varieties were chosen for their moderate or neutral level of aromatics (with the notable exception of Sauvignon Blanc) and the ability of the grape varieties to crop at moderate levels without substantive loss of grape quality, maintaining appropriate concentration for the production of mid-market white wines. This category notably does not include the variety Gewürztraminer, which was noted by BC grape growers as one of the most difficult varieties to sell in the Grapevine Impact Survey, and has low consumer interest.

TOP GRAPE VARIETIES

- Chardonnay
- Pinot Gris
- Sauvignon Blanc

OTHER SUGGESTED GRAPE VARIETIES

- Arneis
- Albariño
- Biancolella
- Catarratto
- Chasselas
- Cortese
- Completer
- Friulano
- Garganega
- Pinot Blanc
- Räuschling
- Verdicchio
- Verdejo

Other neutral to moderately aromatic grape varieties with moderate concentration at moderate crop yields.

QUALITY TARGETS

White wines may be made as single variety or blended wines, with moderate concentration of fruit, in either savoury or fruit-forward styles. Oak usage is not ideal for mid-market target consumers who prefer the fresh fruit from reductive and moderately oxidative winemaking in inert, temperature controlled vessels. These wines are intended for early consumption.

CONSUMER SEGMENTS

In 2022, Wine Growers BC conducted a consumer segmentation study to identify the attitudes, behaviours, and preferences of BC wine consumers. The full report is available through their organization, which also details the demographic profile and communication preferences of each segment. The primary target for mid-market white wines is the Comfortable Casuals market segment, with a secondary target of Engaged Explorers (Wine Growers BC, 2022).

MARKET PRICE

Market price should be determined with a cost basis as a lower bound and price matching to mid-market white wines from New Zealand, Italy and the USA as an upper bound.

YIELD LEVELS

For mid-market selections, moderate concentration of fruit at moderate yields is appropriate to meet the intended style.

LIGHT REDS AND ROSÉ

Big, bold reds from Bordeaux are representative of the general decline of mid-market heavier red wine styles, being replaced by mid-market lighter reds and rosé. According to the Wine Market Council (Wine Analytics Report, 2024a), a backlash against high tannin, high oak red wines is shaping the global market away from heavier red wines to lighter, more elegant red offerings. In France, a global mass market trend leader in both production and consumption, rosé sales have repurposed fruit previously intended for red wine sales. Two thirds of 18-24 year old French wine drinkers do not drink red wine, reporting not to like the taste (Thompson, 2024). Canada ranked among the top ten countries still drinking red wine, with 57% of consumption in this category (OIC, 2023b); however, the countries on this list tend to be market followers, indicating this number may still fall.

Rosé production increased 25% between 2001 and 2021 across the world, accounting for a portion of the much larger concurrent 25% decrease in red wine wine (OIV, 2023b). After a decade of strong growth, the demand for rosé has moderated in the US market, with a 9% annual decline tracked in retail sales in 2023 (Wine Analytics Report, 2024b). In addition to Canadian rosés, Canadians mostly consume rosé wines from the Napa Valley, USA, Maipo, Chile, and Provence, France. (Wine Intelligence, 2020). It is important to realize that the diversity of rosé styles from these regions indicate that Canadians are not as focussed on the very light colour from direct pressing, typical of the Provençal style, as the rest of the world. In fact, consumers may prefer a tone or hue of pink colour from a local wine, simply because it is what they are used to (Peres et al., 2020).

It is important to note that lighter bodied, lower alcohol, fresher red wines, including rosé versions, also provide an option to harvest earlier and mitigate the effects of smoke taint, a persistent oenological issue in British Columbia (Osborne & Tomasino, 2019). At mid market production with moderate crop loads, rosé can also be a more profitable solution for red grapes (Costello et al. 2023). The following varieties were chosen for their lower anthocyanin levels, ability to retain freshness, and slow to moderate sugar accumulation during the growing season, supporting lower alcohol bottlings.

TOP GRAPE VARIETIES

- Blaufrankisch
- Cabernet Franc
- Gamay Noir
- Grignolino
- Nerello Mascalese
- Pinot Noir
- Schiava Gentile

OTHER SUGGESTED GRAPE VARIETIES

- Barbera
- Blauer Wildbacher
- Bondola
- Cinsault
- Dolcetto
- Frappato
- Frühburgunder
- Garnacha
- Hondarribi Beltza
- Kadarka
- Malbec
- Marquette
- Monastrell
- Montepulciano
- Saint Laurent
- Schiava Grigia

QUALITY TARGETS

Light red and rosé wines may be made as single variety or blended wines, with moderate to high concentration of fruit, in either savoury or fruit-forward styles. New oak usage is not necessary for lighter reds and rosés; whereas careful fruit handling and moderate fermentation temperatures to preserve delicacy and fresh fruit are key. These mid-market to premium wines are meant for early consumption or short aging.

CONSUMER SEGMENTS

In 2022, Wine Growers BC conducted a consumer segmentation study to identify the attitudes, behaviours, and preferences of BC wine consumers. The full report is available through their organization, which also details the demographic profile and communication preferences of each segment. Mid-market wines are appropriate for the Comfortable Casuals market segment. Premium light red and rosés are meant for the Social Samplers and Passionate Advocates markets.

MARKET PRICE

Market price should be determined with a cost basis as a lower bound and price matching to mid-market and premium varietal equivalents as an upper bound.

YIELD LEVELS

Fruit should be harvested with freshness and moderate alcohol in mind. For mid-market selections, moderate concentration of fruit at moderate yields is appropriate; for premium wines intended for short aging, higher concentration of fruit from moderate to low-moderate yields is required to meet the intended quality tier.

SUPER PREMIUM REDS

Unlike other wine segments, super premium, or "fine" wine is tracked on resale markets with trading indices. These indexes can be helpful in understanding global preferences for classic wine styles, even outside the original origin of production.

The market for super premium wine grew rapidly for a decade: fine wine outperformed all other global commodities and equities at the end of 2022, except for oil (Liv-ex, 2022). The focus of collectors' attention has been on Burgundy, and secondarily, Champagne. Wildly escalating prices for village to grand cru Burgundy wines was driven by younger wine drinkers. In secondary trading, 28-50 year olds drive the market (Carter, 2022); and Sotheby's wine auctions reports that now 40% of purchasers are under 40 years old (Carter, 2023). Burgundy purchasers are high net worth individuals looking for alternative investments with their escalated post-pandemic earnings (Carter, 2022).

In 2023, as the global economy reacted to the skyrocketed prices of Burgundy and Champagne, a double-digit correction in the fine wine market cooled trading. Despite this recent development, prices for Burgundy remain at an all-time high, and strong market demand has opened the door for super premium Pinot Noir from other regions. Top Pinot Noirs are able to raise prices and are sought by affluent wine lovers as alternatives to cru Burgundy. Notably, British Columbian regular wine consumers rank the Okanagan Valley parallel to Burgundy comparing the percentage of regionally produced wines as "very high quality", indicating the willingness to rank top BC wines in the super premium category. The BC wine trade is more discerning, with 66% associating Burgundy with "very high quality" and only 30% associating British Columbia with "very high quality." Additionally, BC consumers associated the quality of "wines I am proud to serve" higher for all Canadian wines than wines from any other origin (Halstead, 2021).

The escalating prices of Burgundy, strong sommelier following, and the demand for regional Pinot Noir-like replacements has raised the prices and relative value perception of Beaujolais (Schiessel Magrini, 2023). Burgundy producers are now investing in the region, and Gamay-based wines across the world are becoming in higher demand (Abhay, 2024). Canadian Syrah is another variety recognized for its super premium market potential. At Canada House tastings in London (Abhay, 2024, Robinson, 2022), Canadian wine awards (MacNaull, 2024) and international varietal wine competitions (Stephanowicz, 2023), both Gamay and Syrah single-variety wines are attracting attention as notable varieties expressed in a Canadian style.

Other strongly sought-after super premium wines on the secondary market included collectable Italian options such as Nebbiolo from Barolo and Sangiovese from Montalcino. In Canada, Tuscany is the second most recognized global region of origin (after the Napa Valley) and Italy has the highest number of recognized regions of origin with Canadians of any import country (Wine Intelligence, 2020). In international trade, the 2024 Bordeaux release of the 2021 vintage saw a dramatic decline in price offerings en primeur (pre-bottling), with some chateaux setting 2023 prices for the 2020 vintage at 40% less than the vintage before (Cole-Johnson, 2024). These price declines resulted in increased trading; however, it is prudent to understand Bordeaux blends are not as in demand globally, with the exceptions of Super Tuscans from Italy and California big reds. After the Italian theme at the Vancouver Wine Festival, BC Liquor stores saw a jump in demand for Italian wine (Rowan, 2024). Consumption of California wine, including Bordeaux variety blends, remains high in British Columbia. Canada receives 33.3% of all US global wine exports (AAWE, 2023). Big, bold red blends with higher alcohol and full body, often with some residual sugar, have become very popular in the market with millennial men (Carter, 2024).

TOP GRAPE VARIETIES

- Cabernet Franc
- Gamay
- Pinot Noir

OTHER SUGGESTED GRAPE VARIETIES

- Cabernet Sauvignon
- Merlot
- Nebbiolo
- Sangiovese
- Syrah

QUALITY TARGETS

Super premium red wines should be made with the highest possible quality to be expressed, combining careful fruit selection and winemaking, as well as premium barrel selection to set up wines for improvement in bottle for at least 10 years.

CONSUMER SEGMENTS

In 2022, Wine Growers BC conducted a consumer segmentation study to identify the attitudes, behaviours, and preferences of BC wine consumers. The full report is available through their organization, which also details the demographic profile and communication preferences of each segment. BC super premium reds are dominantly appreciated by consumers in the Engaged Explorers and Social Samplers segments.

MARKET PRICE

Market price for super premium BC wines should be positioned with price matching to premium, and lower-tier super premium prices in comparison to international equivalents: Pinot Noir from non-Burgundy quality production regions, Bordeaux blends from Australia and Chile, and Italian varieties from DOC or regional levels.

YIELD LEVELS

In the vineyard, careful methodologies for optimal quality including careful irrigation and canopy management practices should be employed. Vineyards should be planted at higher density in richer soils and moderate density in less rich soils. Yields should be carefully restricted to ensure fruit concentration. Fruit should be carefully selected from only the best plots, harvested with freshness and phenolic development in mind, and carefully sorted to ensure inclusion of only super premium fruit.

EXPERIMENTAL AND QUAFFABLE

Driven by the Passionate Advocates consumer segment, this highly experimental category is continually changing. Blending innovation and tradition, using rare and even hybrid grape varieties, this category produces quaffable, contemporary styles. It is the world's strongest alternative opportunity category (Wine Intelligence, 2022b), yet the most loosely defined. From the consumer and trade standpoint, this category is a place of discovery, with storytelling and novelty being primary value attributes.

The Experimental & Quaffable category is a collection of evolving, trending wine styles that will change over time. In 2024, the wine style segment prioritizes the following sub-categories:

TEXTURAL WHITES: moderately aromatic or neutral grape varieties create wines with moderate alcohol, moderate to medium acid, medium to full body, and texture on the palate from winemaking. If moderately aged, these wines are ready for consumption on release.

SKIN-CONTACT WHITES: pale orange to medium amber in colour, extended skin contact white wines have phenolic grip, low to medium levels of tannins, and pronounced plate texture and concentration. Wines may be aged in the fermentation vessel; however, are ready to drink on release.

ANCIENT METHOD SPARKLING WINES: pétillant naturel wines may use white or black grapes to make a range of colours. In the Canadian market, fully dry, savoury wines with moderate levels of alcohol and moderate level of mousse (2-4 bars of pressure) are preferred.

SAVOURY REDS: similar to the Light Reds and Rosé category; however the winemaking focus is on enhancing savoury character. Grapes with higher levels of anthocyanin are also acceptable if made with moderate alcohol. If moderately aged, these wines are ready for consumption on release.

VIN GRIS: using black grapes to make an almost white wine, this category is useful for bleeding juice quickly off skins, including for avoiding smoke taint, and for creating delicate, fruity wines. Aging is not required and wines should be consumed immediately on release.

Suggested grape varieties are a very wide selection, as variety is a key success element of this category. Hybrid grapes are included, as knowledge of producing quality wine at the premium level is increasing. As an indication of evolving quality, in 2024, the Decanter World Wine Awards awarded the first gold medal to Pennsylvania's Mazza, The Perfect Rosé 2022, produced from 100% Chambourcin – a French-American hybrid variety.

SUGGESTED GRAPE VARIETIES

- All white and red varieties listed in Workhouse White and Light Reds/Rosé.

ADDITIONAL SUGGESTED GRAPE VARIETIES

- Chambourcin
- Frontenac
- Gamaret
- Grüner Veltliner
- Marquette
- Saperavi
- Savagnin
- Semillon
- Timorasso

QUALITY TARGETS

This wine style is premium in nature, requiring careful fruit selection, thoughtful winemaking, expressing savoury or moderately fruity styles. This group of wines is meant for immediate consumption, with any aging done pre-release.

CONSUMER SEGMENTS

In 2022, Wine Growers BC conducted a consumer segmentation study to identify the attitudes, behaviours, and preferences of BC wine consumers. The full report is available through their organization, which also details the demographic profile and communication preferences of each segment. This experimental category is led by the Passionate Advocates market segment, with broad support and engagement from the Social Samplers segment.

MARKET PRICE

Market price for experimental BC wines should be aligned with premium wines appealing to the same curious market segment, from contemporary wine regions, such as the Loire Valley and Jura, France, Sicily and Lazio, Italy, Swartland, South Africa, Patagonia, Argentina, Tasmania, Australia, Greece, Croatia, and Hungary.

YIELD LEVELS

Fruit should be harvested with freshness and moderate alcohol in mind. For premium wines intended for short aging, higher concentration of fruit from low-moderate yields is required; whereas moderate yields may be appropriate for wines for early release. Some hybrid grape varieties may be produced at high yields, without loss of concentration, for premium wines.

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