BLACK SAGE BENCH GEOGRAPHICAL INDICATION

June 2022

Technical Report

Documentation in support of a formal application to the BC Wine Authority for the creation of a new Geographical Indication named Black Sage Bench, a sub-division of the Okanagan Valley Geographical Indication.

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Cover photo: Extensive planting on Osoyoos loamy sand along the southern portion of the Black Sage Bench. Credit: Winegrowers of BC

Black Sage Bench Geographical Indication

TECHNICAL REPORT

EXECUTIVE SUMMARY

The concept of the Black Sage Bench Geographical Indication (GI) is to incorporate all the benchlands (glaciofluvial and fluvial terraces) east of the Okanagan River between Gallagher Lake in the north and Osoyoos Lake in the south. On these benchlands lie the largest concentration of commercial vineyards in the province. The area of the GI is 3,650 ha with a total reported vineyard area of 875 ha.

The glacial materials that comprise the terrace landforms of the GI were deposited during the deglaciation phase of the last glacial event of the Pleistocene some 10,000 to 15,000 years ago. Since that time erosion has modified the landscape leaving four discrete levels of terraces and slopes. Because the glacial sediments were deposited by high energy meltwater and outburst floods, the soils of the GI are all coarse-textured, that is, composed of mainly sand and gravel in varying proportion. The soil series that have been established by soil surveyors for the area are defined based on these proportions. The northern extent of the GI is underlain by primarily gravelly soils, the southern extent by sandy soils.

The climate of the region provides the greatest summer heat accumulation of anywhere in the southern interior of the province. Landscape characteristics like elevation, slope and aspect have a controlling impact on site-specific growing conditions which leads to spatial variation over the GI area. Vineyards at lower elevations experience warmer temperatures than those at higher elevations. Elevations are generally lower in the southern portion of the GI which contribute to the higher growing degree-day values observed there.

The ample growing season heat makes the GI particularly well suited for producing Cabernet Sauvignon, Cabernet Franc, Merlot and Syrah. Most vineyards lie on gently sloped sites that drain cold air and have long frost-free growing seasons that allow for extended fruit maturation. Cooler sites, located at higher elevations and at the northern reach of the GI, are well suited to producing Pinot noir, Merlot, and white wine cultivars. There are a total of 540 ha of red wine cultivars and 335 ha of white wine cultivars grown in the Black Sage GI.

BACKGROUND

This work was initiated in response to the release of a set of recommendations prepared by industry representatives to the BC Wine Authority and the BC Ministry of Agriculture (Appellation Task Force 2015). Following an initial on-line meeting in April 2021, Scott Smith was retained by Bartier Bros. Vineyard and Winery on behalf of a group of neighboring wineries to help define the extent of a Geographical Indication (GI) east of the Okanagan River in the southern Okanagan Valley. During the summer of 2021, soil and geological surface materials were examined in several locations and climate information was compiled. The result is this technical report which describes the physical, climate, and viticultural characteristics, as well as the placement and rationale for the boundary, of this proposed Black Sage Bench GI.

The authors wish to acknowledge those who shared information contained in this report. Climate data for the proposed GI area was supplied by Victor Faraco of Sebastian Farms and Mike Watson of Arterra Wines. The time series of growing degree-days for Osoyoos was produced by Brad Estergaard of the Summerland Research and Development Centre. The list and area coverage of cultivars grown in the GI was provided by Tammey Hodgins of the BC Wine Authority. Sandra Oldfield of Elysian Projects provided direction and facilitated several meetings with industry stakeholders during the course of the technical work.

GEOGRAPHIC EXTENT AND BOUNDARY

The Concept

The concept of the Black Sage Bench Geographical Indication (GI) is to incorporate all the benchlands (glaciofluvial and fluvial terraces) east of the Okanagan River between Gallagher Lake in the north and Osoyoos Lake in the south, a distance of 18 km from north to south. On these benchlands lie the largest concentration of commercial vineyards in the province. The area of the GI is 3,650 ha with a total reported vineyard area of 875 ha. Most vineyards have westerly or southerly aspects and climatic conditions suitable for production of a wide range of red and white *Vitis vinifera* cultivars.

Figure 1. The boundary of the proposed GI is shown in red. The extent of the Osoyoos Indian Reserve, shown in light brown shading, covers much of the vineyard acreage in the northern portion of the GI.

Much of the northern portion of the GI lies within the Osoyoos Indian Reserve (brown shaded area in Figure 1). The upper boundary of the GI runs across the base of the steep mountain hillside along the eastern edge of the valley. The western boundary runs along the valley floor but excludes lands situated on the floodplain of the Okanagan River.

Boundary Description and Rationalization

The Northern Extent

The northern extent of the boundary is shown in Figure 2. From Gallagher Lake (marker 1) the boundary follows the base of the eastern slope southward then climbs onto the highest terrace in the GI that lies above Nk'Mip vineyard (marker 2) at an elevation between 425 m and 435 m above sea level.

Figure 2. The northern extent of the GI, roughly from Nostalgia Winery and vineyards in the south to Gallagher Lake in the north. The numbered markers are described in the text.

The boundary then follows the base of the main valley sidewall to the narrowest point in the GI just north of Nostalgia vineyards (marker 3). In this way the high terrace is incorporated, which could support vineyard development in the future.

The western (valley bottom) boundary follows a set of low-lying terraces that sit just above the poorly drained soils found on the Okanagan River floodplain. Although not currently subject to flooding due to dikes and channeling, these floodplain soils contain a high, persistent water table and are not well suited to viticulture. The placement of this eastern boundary is mainly based on the soil type associated with the slightly elevated terraces and slopes above the floodplain. In the

urban area between the intersection of Black Sage Rd and McKinney Rd to Tuc-el-Nuit Lake, the boundary follows Tuc-el-Nuit Drive north to Tuc-el-Nuit Lake (marker 4) where it then follows the soil break northward to Hwy 97, then along Hwy 97 to Gallagher Lake.

The Southern Extent

Figure 3. The boundary in the southern extent of the GI. Numbered labels are described in the text.

From the narrowest point in the GI (marker 5) the boundary runs southward along the base of the rocky outcrops of the eastern valley wall. At marker 6 the boundary extends up onto the rocky slope to capture a landscape that could conceivably support vineyard development in the future. The boundary runs across a large bedrock outcrop in the same area then along the base of the slope to Inkaneep Creek (marker 7). The creek is a prominent natural feature that denotes the southern-most extent of the terrace features that define the Black Sage GI.

As in the northern extent of the GI, the western (valley bottom) boundary follows a set of small terraces that lie just above the valley floor so as to exclude the floodplain of the Okanagan River.

Surficial Geology and Landforms

The glacial history of the Okanagan Valley was described by Nasmith (1962) and his work still stands as the principal reference for the surficial geology of the region. The glacial materials that comprise the landforms of the GI were deposited during the deglaciation phase of the last glacial event of the Pleistocene some 10,000 to 15,000 years ago.

There were three main depositional/erosional events during deglaciation that created the landforms found today in the south Okanagan valley.

- As glaciers advanced over the valley or, alternatively, as ice initially receded from the valley bottom, meltwaters were temporarily impounded south of McIntyre Bluff creating Glacial Lake Oliver. This resulted in the deposition of silty materials that today underlie much of the proposed GI area. Little is known of Glacial Lake Oliver including the extent, timing, and duration of the impoundment due to the subsequent burial and erosion of these silts.

- Following the draining of Glacial Lake Oliver, sandy and gravelly materials (known as outwash) were deposited over the silts. The high terrace (>400 m elevation) in the GI (Figure 4a) resulted from early outwash transport and deposition both within the main truck of the Okanagan Valley and from the side valley of Wolf Cub Creek.

- As the ice and moraine dam at McIntyre Bluff was breached, and Glacial Lake Penticton to the north periodically drained and filled, additional erosion and then deposition occurred in the GI that created the upper terrace with elevations between 370 and 390 m above sea level (Figure 4a and b),

- Following deglaciation, the modern Okanagan River cut down through the glacial sands and gravelly to its current level at just under 300 m elevation. A set of mid and low elevation terraces were constructed by the river over the last 7,000 years.

As a result, the GI is now characterized by a series of four levels of glaciofluvial and fluvial terraces (informally referred to as benches) as shown in Figure 4. The elevation of each terrace has a narrow range of climate conditions that impacts its viticulture within the GI.

Much of the southern portion of the GI is dominated by sloping terrain (Figure 4b) rather than the more level terrace or bench landforms. The formation of the slope is a topic of debate amongst surficial geologists.

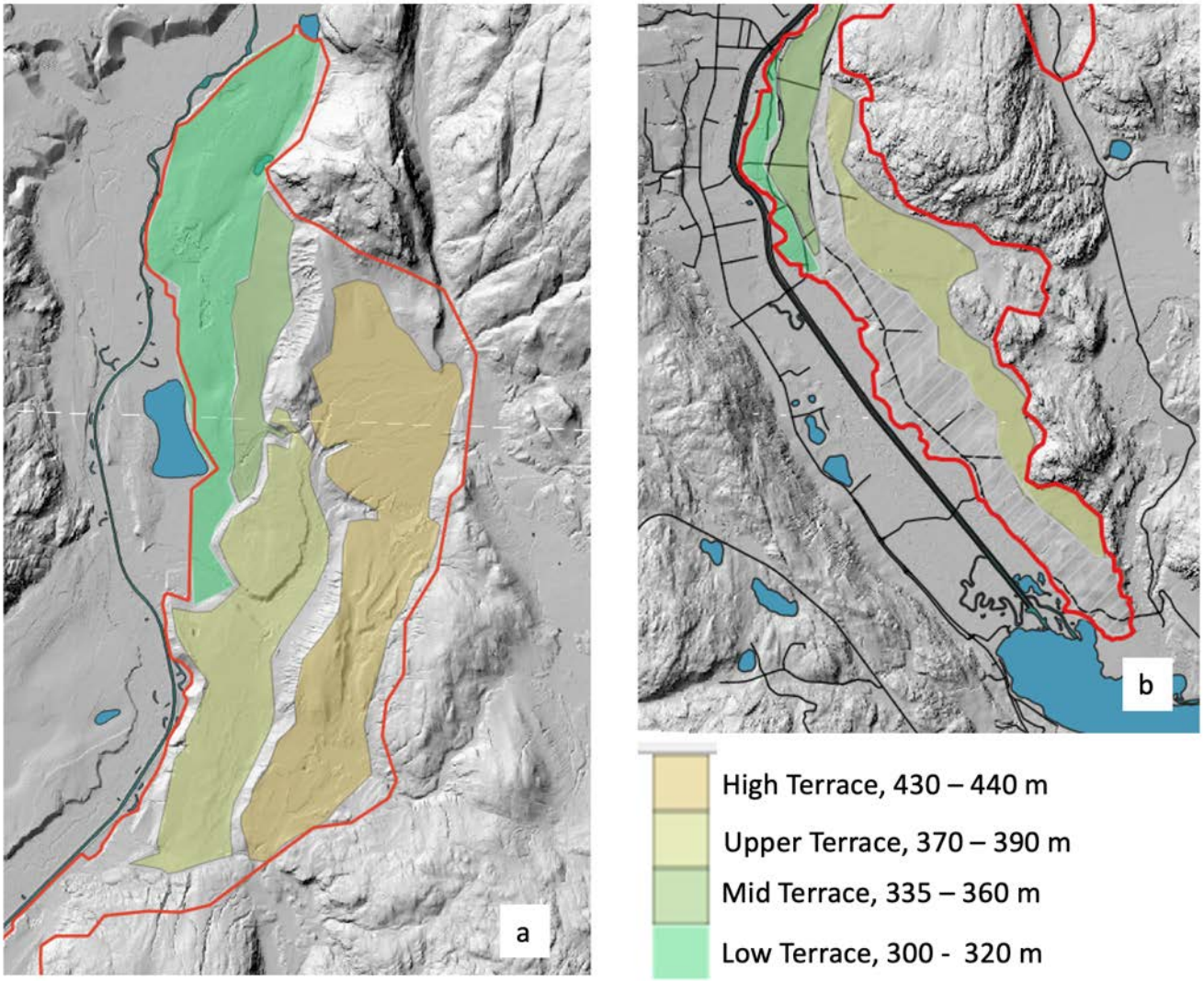

Figure 4. Topographic images of the northern (a) and southern (b) extents of the GI and the position of the terraces on each landscape. All four terrace levels are present in the northern portion of the GI, all except the high terrace are present in the southern extent. Also of note is the slope (white cross-hatching) that dominates the southern portion of the GI east of the Black Sage Road.

Soil Development

The glacial sediments that comprise the terraces and slopes of the GI act as the parent materials that weather to produce the soils of the region. Because these sediments were deposited by large volumes of fast moving meltwaters, they are coarse-textured and composed primarily of sand and gravel with little silt or clay. The soil series defined by Wittneben (1986) in his detailed soil survey of the Okanagan Valley are largely set by soil texture, that is, the proportions of gravel, sand, silt and clay in the host sediments.

All the soils of the GI formed under grassland vegetation and belong to the Chernozemic soil order of the Canadian System of Soil Classification (SCWG 1998). In undisturbed natural settings, Chernozemic soils have humus enriched topsoil layers with alkaline chemistry and calcareous subsoil layers.

Table 1. The most common soils found in the Black Sage GI. All soils are coarse-textured with low available water holding capacity. Several soil series contain considerable volumes of gravel and cobbles which necessitate careful monitoring of irrigation applications.

Soil Series Name	Geological Material	Profile Characteristics	Distribution and Agricultural Use
		Soils formed on glaciofluvial materials	
Osoyoos	Glaciofuvial	Sand and loamy sand>100 cm deep	Widespread occurance in the southern portion of the GI. Used extensively for viticulture.
Rutland	Glaciofuvial	Thin (<25 cm) cover of loamy sand over gravelly sand	Most common in the northern portion of the GI and on lower elevation terraces. Used extensively for viticulture
		Soils formed on alluvial fan materials	
Burnell Lake	Glaciofluvial	Thick (25 to 60 cm) sandy surface overlying gravelly loamy sand	Common in northern portion of the GI, commonly used for viticulture
Glenfir	Fluvial	Up to 100 cm of sandy loam overlying gravel	These soils have formed where eroded material from a higher elevation terrace has been deposited on a terrace below. They are found intermittantly along the base of escarpents and commonly used for viticulture.
		Soils formed on wide-blown materials	
Haynes	Eolian (wind deposit0	Thick deposits of fine sand	Occurs intermittently along the interface between rocky hillsides and glaciofluvial terraces where sand has been deposited by wind.. Soils are fully suited for viticulture with properties similar to the Osoyoos series

Two soil series formed on glaciofluvial sediments predominate the landscape: the gravelly loamy sand soils belonging to the Rutland soil series and the sandy soils belonging to the Osoyoos soil series (Table 1). Together these two soils cover over 80% of the GI. Two additional soil series that formed on alluvial fans occur to a much lesser extent; the Burnell Lake series occurs where

sandy loam materials overlie gravel and the Similkameen series occurs where sandy and silty materials have collected at the base of terrace escarpments.

Figure 5. Four main soil series found in the Black Sage GI. The Rutland soil has a sandy surface cover overlying rounded gravels (a). The Osoyoos soil is composed entirely of a stone-free loamy sand (b). The Glenfir soil (c) is composed of sandy loam soil with few stones while the Burnell Lake (d) is very stony alluvial fan soil. The photographs show the top 100 cm of each soil profile.

The Osoyoos loamy sand has extensive distribution on the terrace and slopes east of the Black Sage Road south of Millar Road. The Rutland soil is the predominant soil in the northern portion of the GI north of McKinney Road and on the lower terrace levels in the south along Ryegrass Rd.

Climate

The climate of the region provides the greatest summer heat accumulation of anywhere in the southern interior (Table 2). Two long-term weather stations provide a 30-year dataset to characterize the climate of the proposed GI (Environment and Climate Change Canada 2022).

Although Osoyoos lies south of the GI boundary, it best represents climate conditions in the southern extent of the GI. Oliver best represents the lower elevations of the northern portion of the GI. Both stations are located on the valley floor about 20 km apart at elevations below 300 m. There is little difference in temperature between them. Both stations record around 325 to 330 mm of annual precipitation. Irrigation is required throughout the GI for wine grape production.

Table 2. The Osoyoos and Oliver long-term weather stations provide averages for the period 1981 to 2010 for mean summer temperature (MST) and growing degree-day (GDD) values. A short term weather station located along Black Sage Road between Osoyoos and Oliver provides comparison data for 2020 and 2021.

Location	1981-2010		2020		2021	
	MST	GDD	MST	GDD	MST	GDD
Osoyoos EC	16.5	1448	17.0	1616	18.0	1758
Oliver RTP	16.4	1440	17.3	1568	18.3	1775
Black Sage SF*	na	na	16.8	1602	17.5	1786

*Data provided courtesy of by Sebastian Farms

Temperature and growing degree-day values for recent years are significantly greater than those from historical averages. The summer of 2021 was exceptionally warm and accumulated over 1700 GGD (Table 2). However, annual variation in temperature remains significant with 1998 and 2003 being two of the warmest summers on record at Osoyoos (Figure 6).

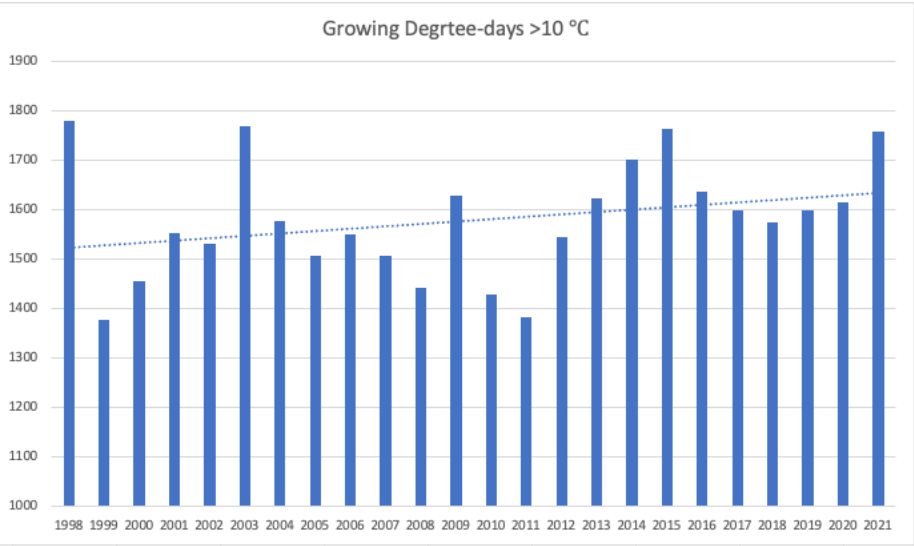

Figure 6. Growing degree values as calculated from the Osoyoos long-term weather station for the period 1998 to 2021. While there is a slight warming trend (dashed line) over this period, annual variation in temperature is an on-going challenge to wine grape production in the region. (Compiled from data provided by B. Estergaard, Summerland Research and Development Centre).

Landscape characteristics like elevation, slope and aspect have a controlling impact on site-specific growing conditions which leads to spatial variation over the GI area (Figure 7). Some key points derived from this spatial variation are:

- Generally southern sites are up to 200 GDD warmer than northern sites, a function of slightly lower latitude and elevation,

- Elevation is a key driver in temperature variation; the coolest site in Figure 7 is located at 435 m on highest terrace adjacent to the motorsport track and is 200 GDD less than the adjacent site at 380 m on the terrace immediately below it,

- Vineyards at lower elevations experience warmer temperatures than those at higher elevations. Elevations are generally lower in the southern portion of the GI which contribute to the higher GDD values observed there,

- Significant climate variation can exist within a single vineyard. There is almost as much variation in ambient temperature and total growing season heat (200 GDD) within the Bullpine vineyard (located just beyond the southern boundary of the proposed GI) as exists in the rest of the GI. These landscape-based temperature variations require careful selection of cultivars and viticulture practices for each site.

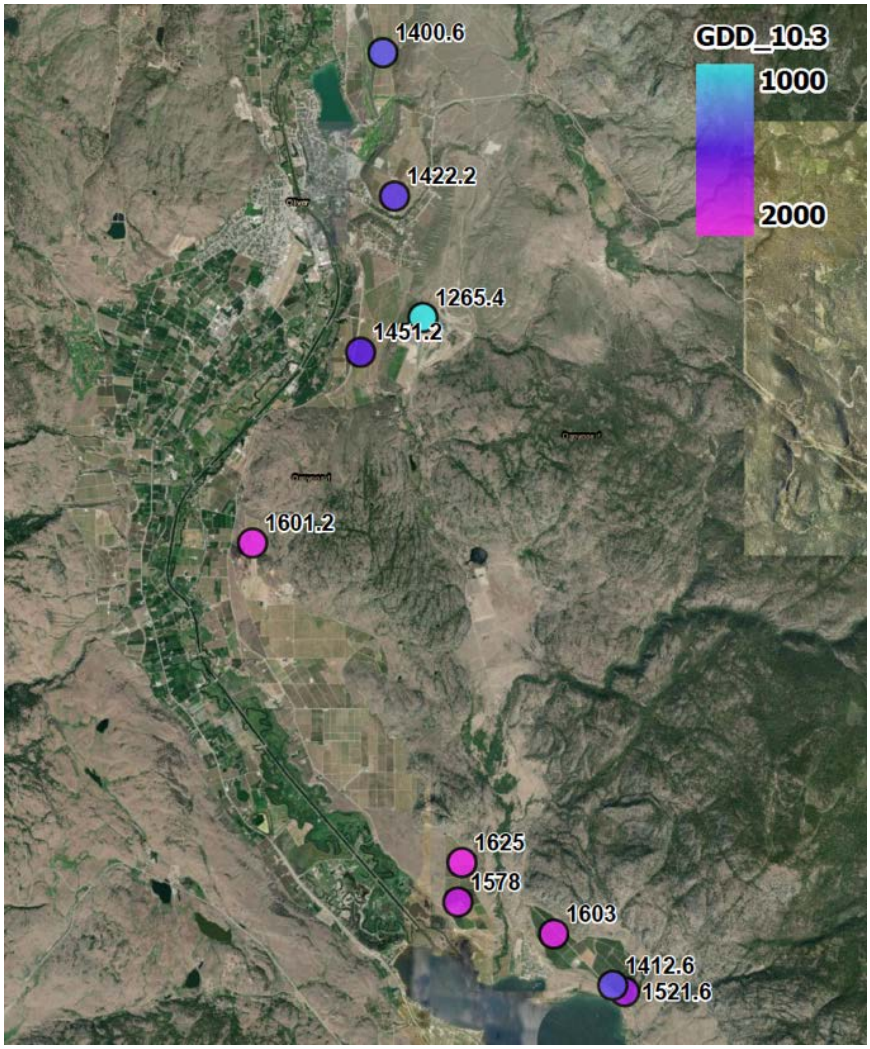

Figure 7. Site-specific growing degree-day values (>10°C) averaged over the period 2016 to 2020 for the area within the proposed Black Sage GI. (Dated provided by Mike Watson, Arterra Wines Canada).

Viticultural Characterization

The Black Sage Bench is home to some of the warmest vineyard sites in the Okanagan Valley. Its ample growing season heat makes it particularly well suited for producing Cabernet Sauvignon, Cabernet Franc, Merlot and Syrah. Most vineyards lie on gently sloped sites that drain cold air and have long frost-free growing seasons that allow for extended fruit maturation. On the predominantly western slope aspects growers combine row orientation with carefully managed leaf canopies to optimally expose fruit clusters to sunlight. During late summer and fall, nighttime temperatures are cooled by katabatic winds that enhance the development and retention of fruit acids and aromatic compounds in maturing fruit. As a result, red wines are complex and full-bodied with ample soft tannins and dark fruit flavors and aromas.

Cooler sites, located at higher elevations and at the northern reach of the GI, are well suited to producing Pinot noir, Merlot, and white wine cultivars (Table 3). There are a total of 540 ha of red wine cultivars and 335 ha of white wine cultivars grown in the Black Sage GI.

Table 3. Principal cultivars grown in the proposed GI. There are an additional two dozen cultivars grown with only small area coverages.

Cultivar	Percent of total vineyard area
Merlot	18
Cabernet Sauvignon	15
Chardonnay	10
Cabernet Franc	9
Syrah	9
Pinot gris	7
Riesling	6
Sauvignon blanc	5
Pinot noir	5

The coarse textured soils of the GI require frequent irrigation which is carefully metered to control vine vigour while enhancing photosynthesis to support fruit development and maturation. Drip irrigated vineyards on sandy sites generally require inter-row irrigation to support the growth of floor vegetation and cover crops.

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