SUMMERLAND VALLEYS GEOGRAPHICAL INDICATION

February 2021

Technical Documentation

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

Scott Smith, Eterrna Consulting, Penticton, BC

Pat Bowen, Summerland Research and Development Centre, Agriculture and Agri-Food Canada

Cover photo: The Garnet Valley Ranch vineyard blocks of Okanagan Crush Pad. This is one of the largest concentrations of vineyards in the GI and some of the highest elevation vineyards in the Okanagan Valley.

Summerland Valleys Geographical Indication

TECHNICAL DOCUMENTATION

EXECUTIVE SUMMARY

The central concept of this Geographical Indication (GI) is to encompass the arable land that exists within the District of Summerland in the areas known as Prairie Valley and Garnet Valley. These valleys are at higher elevation and have cooler climatic conditions than agricultural lands found elsewhere in the District. The Summerland Valleys GI contains some of the highest elevation vineyards in the Okanagan Valley. The GI extends from just south of the Garnet Lake dam to the lower slopes of Conkle Mountain in the south. The GI links the two separate valleys by incorporating land along the lower flanks of Cartwright Mountain. The total area of the GI is approximately 1350 ha (3330 acres). There were some 35 ha (85 ac) of reported grape production in 2019. There is on-going expansion of vineyard area currently in the GI.

The valley floor in these valleys ranges between 500 and 550 m elevation. The placement of the upper limit GI boundary is governed by slope angle, the occurrence of high elevation arable land and bedrock outcropping. Arable land extends up to a maximum of 700 m elevation in the upper reaches of Garnet Valley. Elsewhere the upper elevation of the GI is placed at around 650 m elevation which roughly corresponds to the climatic limit for the consistent production of vinifera grape cultivars.

The landforms and surficial geology of the GI result from depositional process that were active during and following glaciation some 15,000 to 10,000 years ago. Ten predominant soil types (known as series) are identified in the GI. These have formed from a variety of parent materials: wind-blown fine sands overlying glacial till, gravelly and/or sandy glaciofluvial deposits, silty glaciolacustrine deposits, recent stream deposits and the decomposed organic materials that have accumulated beneath Dale Meadows.

The vineyards in this GI experience a range of cool meso-climatic conditions determined by both elevation, slope position and slope direction (aspect). These generate an array of sites conditions best suited to growing white *Vitis vinifera* cultivars. Vineyards above the valley floor on sloped sites with good air drainage have a sufficient frost-free period for producing many white cultivars, primarily Chardonnay. Red wine grapes suited to cool climates include Pinot noir which is the most commonly planted variety. The GI is also well suited for sparkling wine production. Vineyard sites on frost-prone lower slopes and the valley floor are often used for the production of ice wine.

BACKGROUND

This documentation is based on a modification of an original conceptual framework presented in April 2019 to the Bottleneck Drive Association for the creation of several sub-Geographic Indications within the boundaries of the District of Summerland, British Columbia. The framework concept was developed following contact with Rick Thrussell of Sage Hills Winery who provided vision for the initial work and acted as liaison with the Association and local grape growers.

This is one of a series of technical reports that outline the extent and character of proposed Summerland sub-Geographical Indications. This document describes the extent and rationale for a Summerland Valleys GI. It combines the areas of the Garnet Valley and Prairie Valley proposed in the framework with minor adjustments to the topographic positioning of the boundary.

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). The intent of this report is to provide the required technical documentation for the formal application to the BC Wine Authority for GI status.

GEOGRAPHIC EXTENT AND BOUNDARY

The Concept

The central concept of this Geographical Indication (GI) is to encompass the arable land that exists within the District of Summerland in the areas known as Prairie and Garnet Valley (Figure 1). These valleys are at slightly higher elevation and have cooler climatic conditions than agricultural lands found elsewhere in the District.

Figure 1. Overview of Prairie Valley and Dale Meadows looking westward toward upper Trout Creek valley and the Thompson Plateau.

The GI extends from just south of the Garnet Lake dam in the north to the lower slopes of Conkle Mountain in the south. The GI links the two separate valleys by incorporating land along the lower flanks of Cartwright Mountain (Figure 2). The total area of the GI is approximately 1350 ha (3330 acres).

The placement of the upper limit of the GI is governed by slope angle, the occurrence of high elevation arable land and bedrock outcropping. The ridge separating Garnet Valley from Okanagan Lake runs at approximately 800 m elevation. Arable land along the ridge extends up to a maximum of 700 m elevation in the northeastern extent of the valley. Elsewhere in the GI and throughout Prairie Valley, the upper elevation limit of the GI is placed at 650 m which roughly corresponds to the climatic limit for the consistent production of vinifera grape cultivars. The vineyards located in this GI experience a range of cool meso-climatic conditions determined by both elevation, slope position and slope direction (aspect). These generate an array of sites conditions that are best suited to growing white *Vitis vinifera* cultivars.

Extent and Boundary

The geographic extent of the GI is shown in Figure 2. Currently, pasturing and forage production are the dominant land uses in Garnet Valley while orcharding is the most common land use in Prairie Valley. Vineyards tend to be scattered throughout the agricultural land of both valleys and most commonly on slopes above the valley floor proper.

Figure 2. Aerial view of the Summerland Valleys GI. The extent of the GI is outlined in red.

In the Garnet Valley, the extent of the GI encompasses the mid-reaches of the Eneas Creek watershed (Figure 3). The GI is bounded by the slopes of Garnet Valley up to a maximum elevation of 700 m. Defining the exact limits of the GI was based mainly on topography. The northern limit is based on the extent of arable terrain within the valley, which narrows and becomes much steeper northward toward Garnet Lake.

Figure 3. In the northern portion of the GI, the valley floor becomes very narrow, but some south-facing upper slopes above provide suitable sites for viticulture. The black arrows point to several vineyards on these slopes.

The middle portion of the GI connects Garnet Valley with Prairie Valley by contouring the western boundary across Cartwright Mountain and to just above the residential development along Hermiston Drive. The eastern boundary of the GI traverses the top of the ridge above the outlet of

Garnet Valley southward to Jones Flat Rd then south along Garnet Valley Rd and Cartwright Rd to Dale Meadows (Figure 4). This portion of the eastern boundary is shared with the Summerland Bench GI which extends off to the east (not shown).

Figure 4. The middle portion of the GI incorporated the lower slopes of Cartwright Mountain to connect the Garnet Valley portion of the GI with Prairie Valley to the south.

The extent of the Prairie Valley portion of the GI is outlined in Figure 5. Most of the land in the valley is arable with little urbanization. Tree fruits, predominantly apples and cherries, dominate the cultivated landscape. Vineyards cover a relatively small area, about 20 ha.

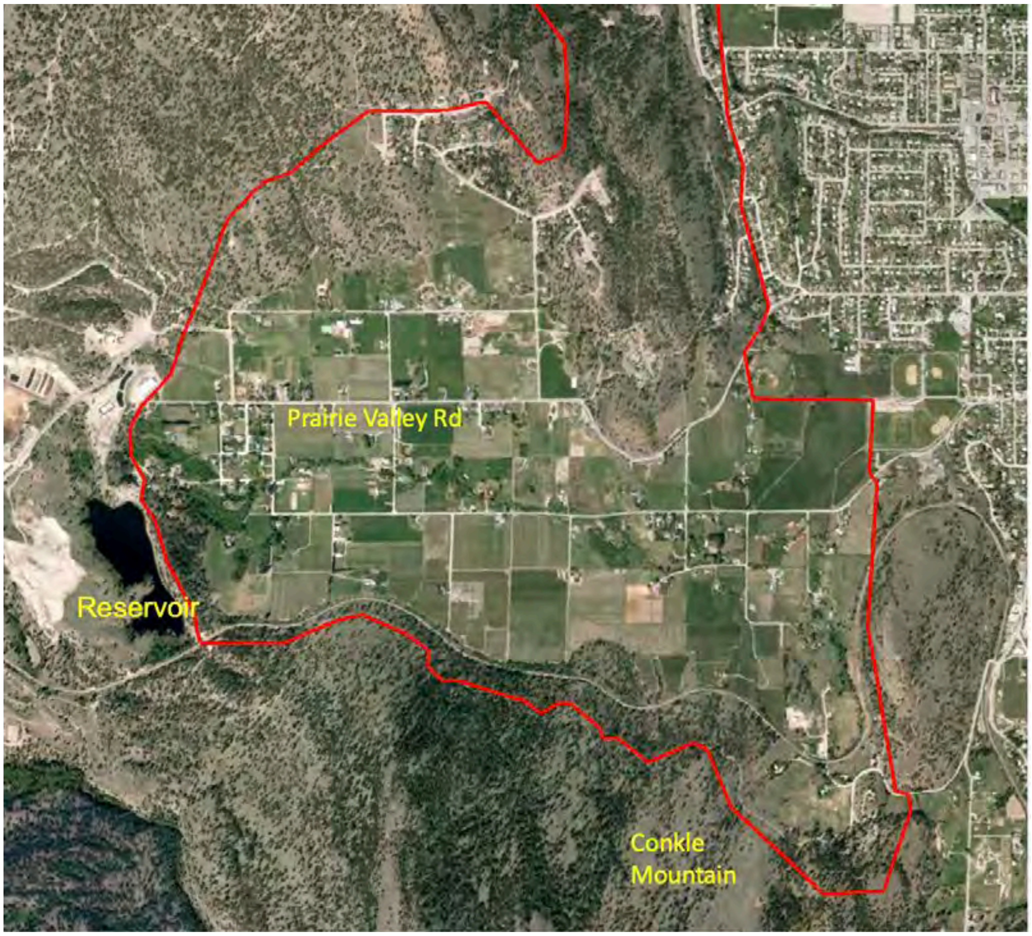

Figure 5. The extent of the Summerland Valleys GI (shown in red) in the vicinity of Prairie Valley.

The southern boundary of the GI is defined by the foot slope of Mount Conkle and runs just above the Kettle Valley Railroad (KVR) right-of-way. The western boundary is set at the base of the steeply sloping gravel and moraine deposits that contain the reservoir for the water treatment plant.

The eastern boundary cuts across the Dale Meadows immediately west of the ball parks (Figure 6). This boundary initially runs southward along Cartwright Rd to intersect with Prairie Valley Rd. At Walker Ave the boundary runs along an east-west right-of-way to the ball parks parking lot then southward along a second right-of-way to intersect with Dale Meadows Rd and the KVR.

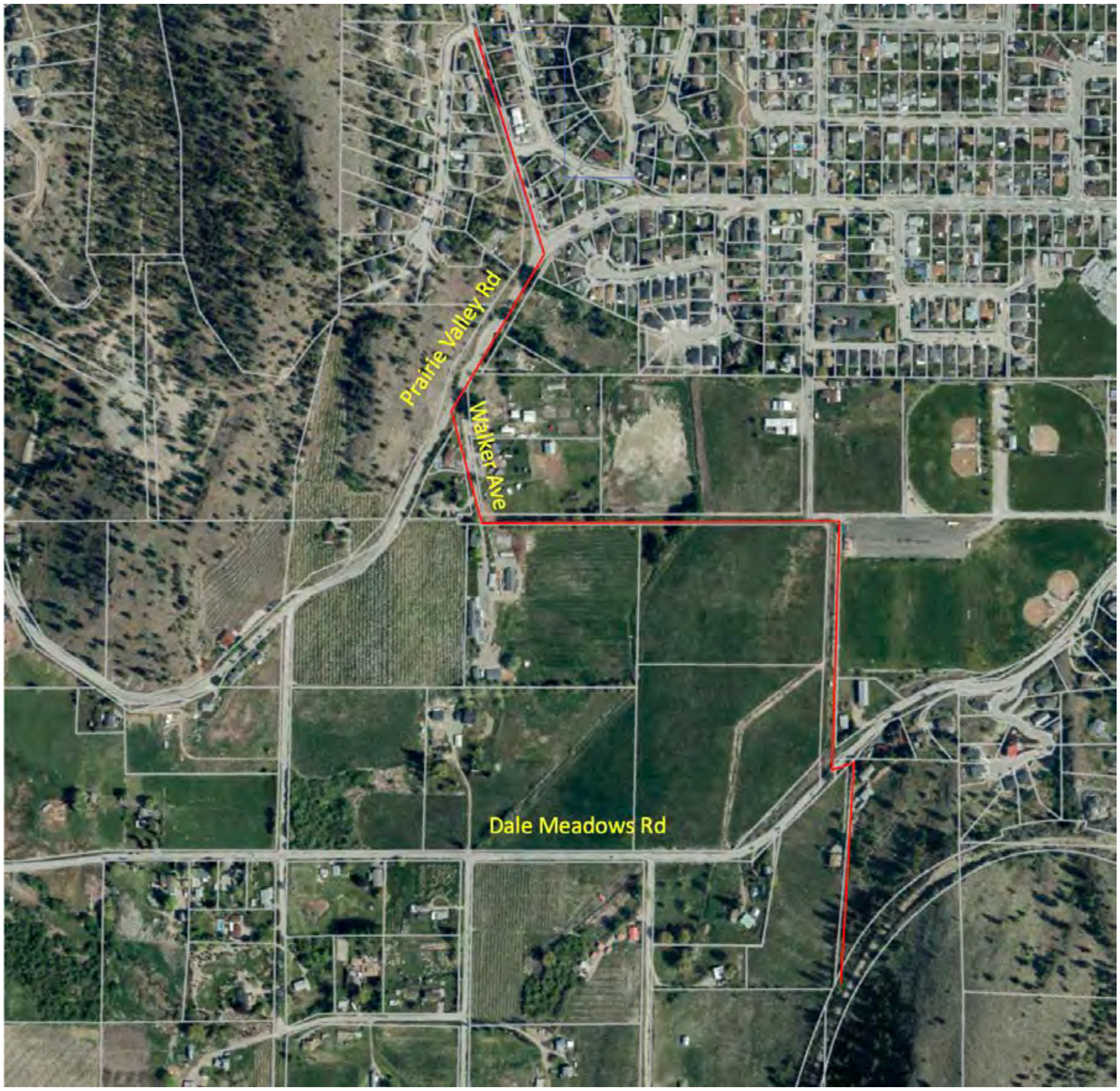

Figure 6. To define the placement of the GI boundary where no obvious natural breaks across Dale Meadows, a series of parcel lot boundaries and rights-of-way are used instead.

SURFICIAL GEOLOGY AND LANDFORMS

Surficial Geology

Multiple glaciations during the Pleistocene epoch (2 million to 10,000 years ago) scoured the Okanagan Valley of most unconsolidated sediment and left behind the rounded bedrock summits of Giant's Head, Conkle Mountain and Cartwright Mountain. However, below about 600 m elevation in the main stem of Okanagan Valley, this rugged terrain was buried by thick deposits of sediments derived from glacial movements and associated meltwater (Nasmith 1962). For the most part, agriculture today is situated on these glacial sediments.

As the remnants of the Pleistocene Cordilleran glacier retreated from the Okanagan region, remnant masses of ice continued to fill side valleys, one of which would have been the basin currently known as Prairie Valley. Nasmith (1962) postulated that the strongly hummocky terrain that exists in the vicinity of the Summerland land fill operation was created by small advances and retreats of this marginal valley ice (blue arrow Figure 7a). At this time of deglaciation, most of the Summerland region was still under glacier ice with the exception of the summits of Giant's Head Mountain and the Garnet Valley ridge. It would have also been at this stage of deglaciation when water running off the de-glaciated upland plateaus would have been diverted southward to create the very large volumes of sand and gravel found today south of Mount Nkwala above the West Bench of Penticton.

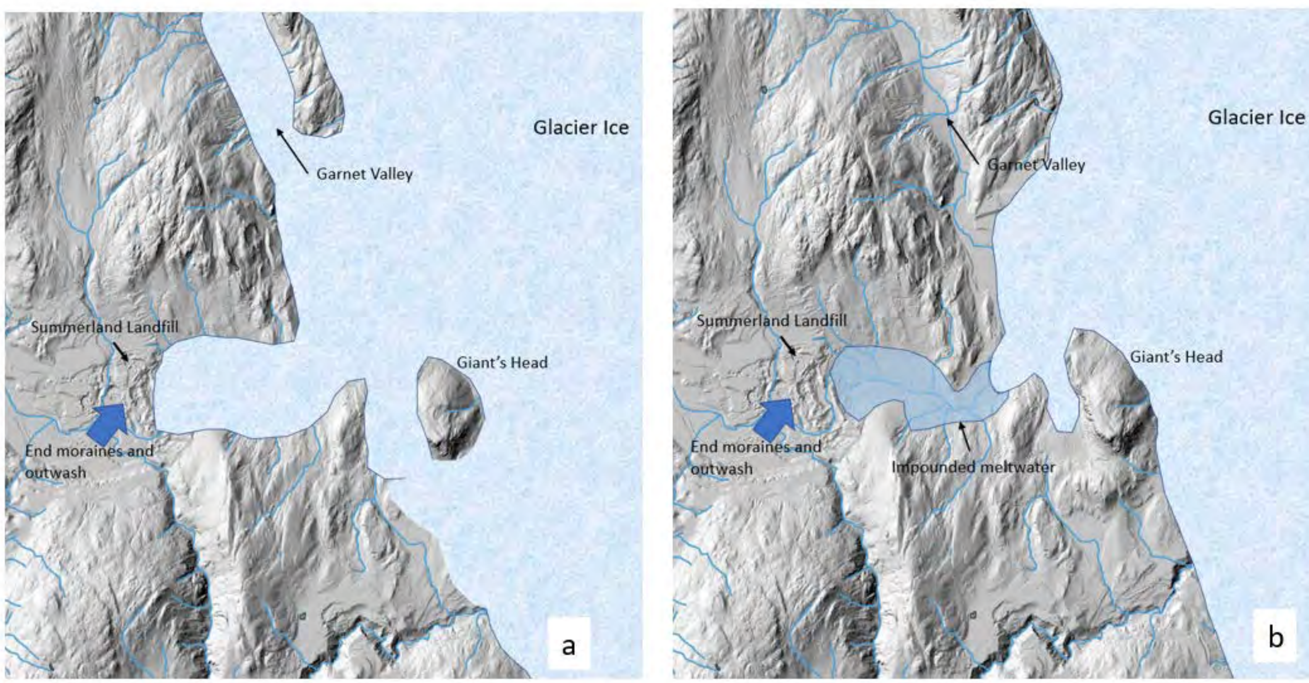

Figure 7. Conceptual illustration of the formation of end moraines (a) and lake bottom sediments (b) during deglaciation in the vicinity of Prairie Valley. Mapping adapted from Nasmith (1962).

Later, as glacier ice downwasted (lowering of the ice surface by in place melting) to an elevation of approximately 500 m, Garnet Valley and the area south of Giant's Head became ice-free and meltwater from the valley glacier filled the Prairie Valley basin (Figure 7b). As is typical of ice-margin glacial lakes, the impoundment was only temporary. This left a legacy of silty deposits that today act as one of the parent materials for the soils of the GI. These lake bottom sediments, known as glaciolacustrine sediments, are similar to the more extensive silty sediments that comprise the bluffs along the shores of Okanagan Lake in the region. However, the Prairie Valley deposits are slightly older than those seen along Okanagan Lake. The Prairie Valley deposition was local in nature. The duration of sedimentation into this glacial lake is uncertain but likely in the range of only hundreds of years.

Most of the hillsides in the GI above 550 m are covered with a veneer of sediment known as 'till' . This material was deposited directly by moving glacial ice. The till varies in thickness from 50 cm to greater than 10 m. The land surface topography is controlled by the form of underlying bedrock and in many locations, bedrock may be at, or very near, the surface (Figure 8).

The till is a heterogenous mixture of rocks and minerals from surrounding regional bedrock. The predominant bedrock type underlying the GI is. a suite of granitic rocks of early Jurassic age (~190 million years old) belonging to the Bromley Batholith. Much younger volcanic rocks (Eocene age – 40 -50 million years old) belonging to the Marron Formation are also present (Okulitch 2013). The volcanic rocks are finer-grained and when overridden by glaciers generate loamy-textured soils rather than the stony, sandy loams associated with till derived from granitic rocks.

Figure 8. Slopes above the valley floor in both valleys are covered with glacial till. Note the large granite boulders in the background (arrows). These were deposited directly under glacier ice in Garnet Valley. Large boulders like these occur on till surfaces throughout the GI.

The lower slopes of the valleys are covered with mixed sediments. In Garnet Valley there are small pockets of glaciofluvial sediments, sands and gravels, that comprise narrow benches along the western valley wall some 30 to 60 m above the floor. However, most of the valley floor is covered with more recent deposits, either fluvial fans which form long smooth foot slopes composed of rubble eroded from higher elevation slopes, or as floodplain deposits of Eneas Creek. These sediments can be highly variable in their properties and result in a mixture of contrasting soils on the valley floor.

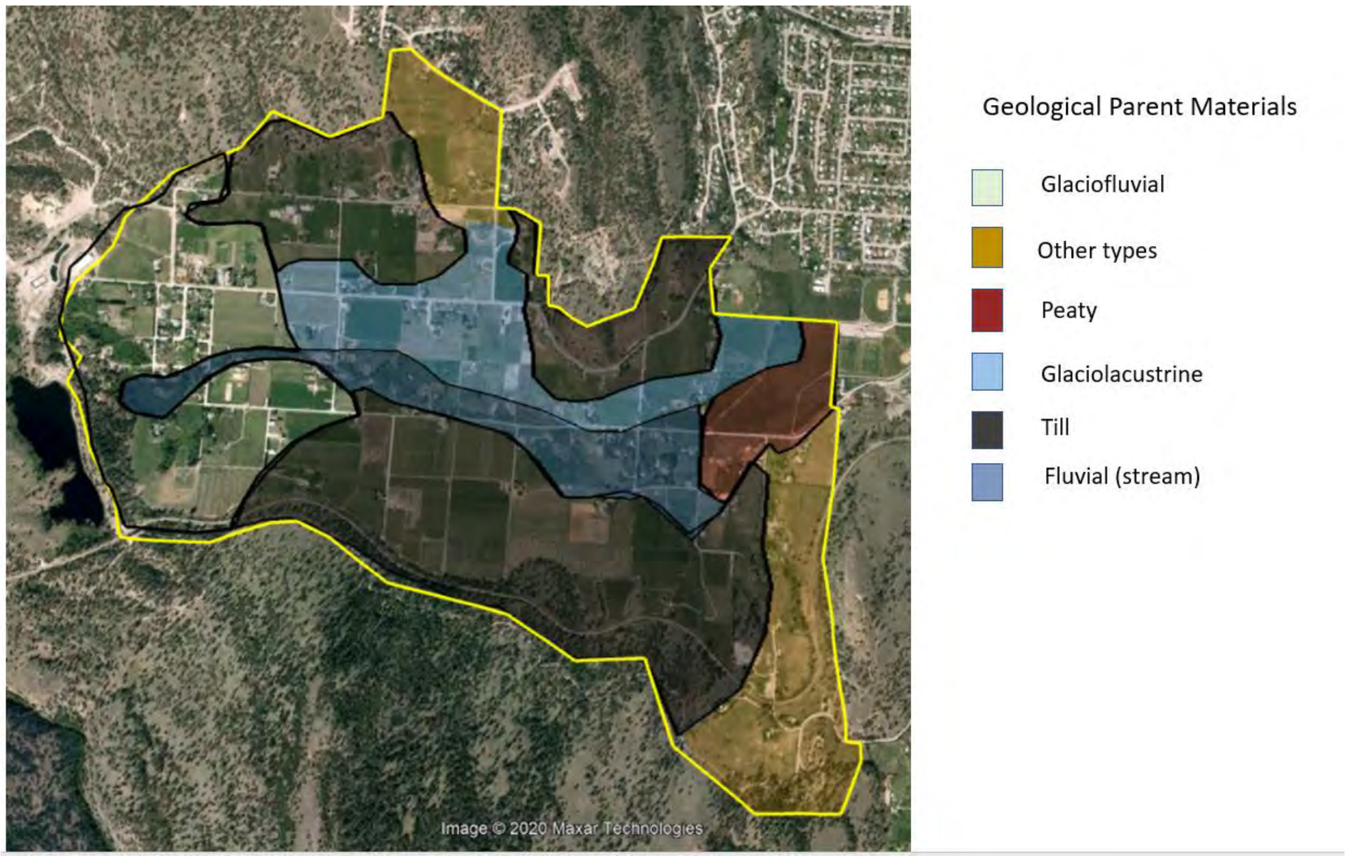

Figure 9. Map of the surficial deposits that make up the geological parent materials for the soils of Prairie Valley. Adapted from soil mapping by Wittneben (1986).

Glaciofluvial sands and gravels cover most of the terrain at the western end of Prairie Valley (light green area, Figure 9), while areas in the bottom of the valley are covered by recent stream deposits of Prairie Valley Creek. The Dale Meadows are underlain by peaty materials formed over thousands of years through the growth and decay of aquatic plants (red area, Figure 9). In many places, wind-blown sandy materials overlie older glaciolacustrine and till deposits. Often, usually immediately adjacent to bedrock side slopes, a mix of slope-transported sediments can be found including fluvial fans and shallow colluvial deposits overlying rock.

Understanding this complex distribution of surficial materials is important in that they generate the array of different soil types that occur in close proximity within the extent of the GI.

SOIL DEVELOPMENT AND SOIL PROPERTIES

The area encompassed by the Summerland Valleys GI has a range of geologic parent materials and soils that formed on these. Unconsolidated surface geologic deposits act as what are termed “soil parent materials”. Parent materials weather over time to form soil horizons. These are layers of soil with differing colours and properties such as the amount of organic matter or water holding capacity. In the report *Soils of the Okanagan and Similkameen Valleys,* Wittneben (1986) mapped a dozen or so common soil series within the GI. Soil series are soil types depicted on soil maps. These are defined by the nature of the soil profile and the type of parent material the soil has formed on.

Figure 10. On south-facing slopes in the Garnet Valley, brown topsoils formed on till over thousands of years under shrub and grass vegetation. The growth and decay of plant roots builds up organic matter in the top of the parent material and generates a soil horizon of dark colours. The underlying unweather till is grey in colour and largely without organic matter.

Soils formed under shrub and grassland vegetation (on south and westerly aspects) and have well developed topsoil layers (Figure 10). These soils all share the same properties of having an organic matter enriched topsoil horizon (unless eroded) and all the soils belong to the Chernozem taxonomic group according to the Canadian System of Soil Classification (Soil Classification Working Group 1998). On cooler aspects (north and east facing), the soils formed under forest vegetation share properties that place them under the Brunisolic taxonomic group of the Canadian System of Soil Classification (Soil Classification Working Group 1998). These soils have a different set of soil horizons and generally lack an organic matter-rich topsoil.

Within the GI, there are 10 soils that occur commonly and are important to viticulture. These soils are grouped by parent material in Table 1 and are described in more detail below.

Table 1. The major soil types important to viticulture in the Summerland Valleys GI.

Soil Series Name	Landscape position	Profile Characteristics	Viticultural Use
		Soils formed on glacial till parent materials	
Kelowna	Mid to upper slopes, common in Garnet Valley	Grassland soils, rich in sub-surface lime, often stony with well developed topsoil layer	Where slopes are gentle, these soils are well suited for viticulture.
Harrland	Widespread soil on the lower to mid-slopes above Prairie Valley Creek	Surface cover of 10-30 cm of fine sandy loam wind-blown sediment overlying gravelly sandy loam till	Well suited and often used for viticulture in Okanagan Valley
Giant's Head	Slopes and rocky side hills	Sandy surface horizon overlying gravelly sandy loam till	While well suited to irrigated viticulture, this soil has only limited distribution in this GI.
		Soils formed on glaciofluvial parent materials	
Rutland	Terraces along lower portions of valley wall in Garnet Valley	Gravelly sandy soils, many stones	While this soil has limited distribution within the GI, it is used extensively elsewhere in the Okanagan valley for viticulture.
Paradise	Western end of Prairie Valley	Up to 60 cm of sandy loam over gravel	Well suited to irrigated viticulture
Parkill	Western end of Prairie Valley	Largely stone-free sands and loamy sands	The uniform sandy texture is well suited to irrigated viticulture.
		Soils formed on glaciolacustrine parent materials	
Munson	Lower and mid slopes in central part of Prairie Valley	Relatively uniform stone-free soils composed of silty, fine sandy or occasionally clayey texture	These soils have very favourable topsoil layers but highly alkaline and often saline subsoils. When these occur on the surface, they can be problematic for viticulture
Summerland	Lower slopes in central part of Prairie Valley	Poorly drained silty or clayey soils	Unsuited due to poor internal drainage
		Soils formed on fluvial floodplain parent materials	
Strutt	Soils on valley floor adjacent to Eneas and Prairie Creeks	Silty and clayey, influenced by high watertable, poorly drained	Unsuited for viticulture
Kinney	Soils on valley floor adjacent to Eneas Creek	Sandy loam, influenced by high water table in spring, imperfectly drained	Marginally suitable due to high water table and cold air drainage

Till parent materials dominate the slopes above the valley floor and soils formed on till on the warmest slopes are utilized for viticulture. The most common of these soils is the Kelowna soil series, a Dark Brown Chernozemic soil. While the soil has the characteristic dark topsoil (A and B horizons), this soil can also be underlain by thick layers of cemented by lime (calcium carbonate) as shown on Figure 11. This can be broken up by deep plowing when developing a vineyard or replanting.

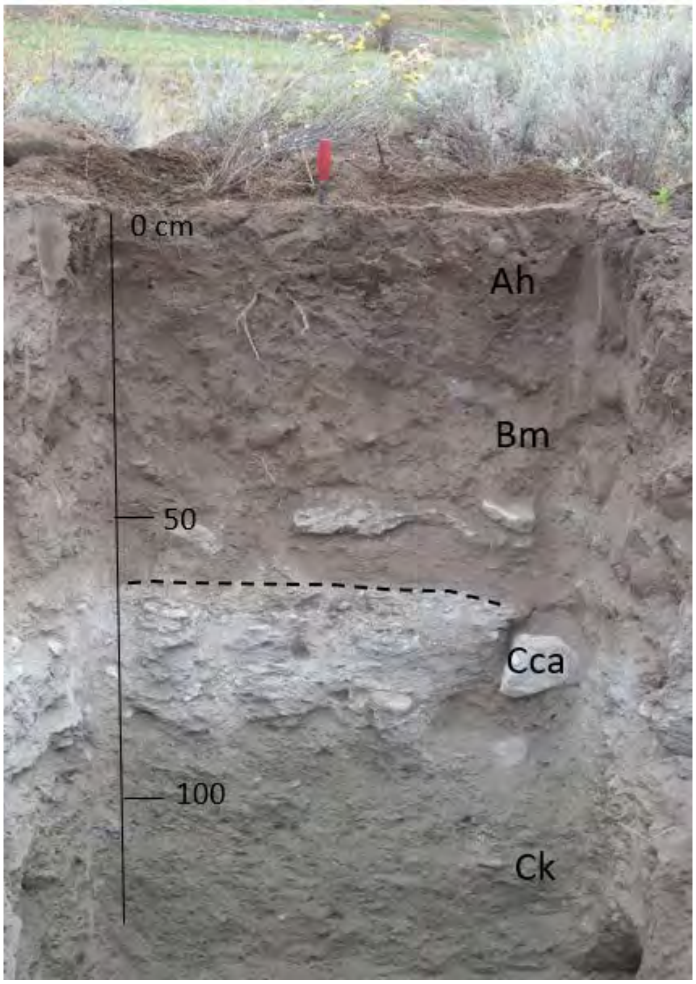

Figure 11. Profile of a Chernozemic soil formed in till. In this profile of the Kelowna soil series, the surface 50 cm are enriched with organic matter (Ah horizon) and oxidized (Bm horizon. Below 50 cm depth is a cemented white layer of calcium carbonate (lime) shown below the dashed line. When this layer, denoted as a Cca horizon, is highly cemented it can restrict root penetration into lower soil layers and some vineyard managers will mechanically rip the subsoil before planting vines to alleviate this condition.

During the later stages of deglaciation, when the landscape was still largely devoid of vegetation cover, tremendous amounts of silt and fine sand were picked up by the wind and re-distributed. These sediments, referred to as eolian sediments, are common in the GI. This surface addition of fine particles creates ‘stratified’ soils whereby the texture of the upper portion of the soil profile is very different from that in the subsoil (Figure 12). The Giant’s Head and Harrland soil series are both examples of stratified soils with silty or loamy surface horizons underlain by gravelly material.

Glaciofluvial soils are those formed on sediments deposited by glacial meltwater. These sediments are most often very gravelly but sometimes they can be sandy with little or no gravel. The soil textures are determined by the flow energy of the meltwater at the point of deposition. Where soils are composed of rounded gravel and formed under grassland conditions they are classed as belonging to the Rutland soil series. These have limited distribution as small terraces and benches on lower slopes in Garnet Valley. Where gravels have weathered under forest vegetation, they are classed as belonging to the Paradise series. Where these forested soils are sandy with few to no gravels, they are classed as belonging to the Parkhill series. The Parkhill and Paradise soils are both found in Prairie Valley. They often occur together throughout the Okanagan Valley.

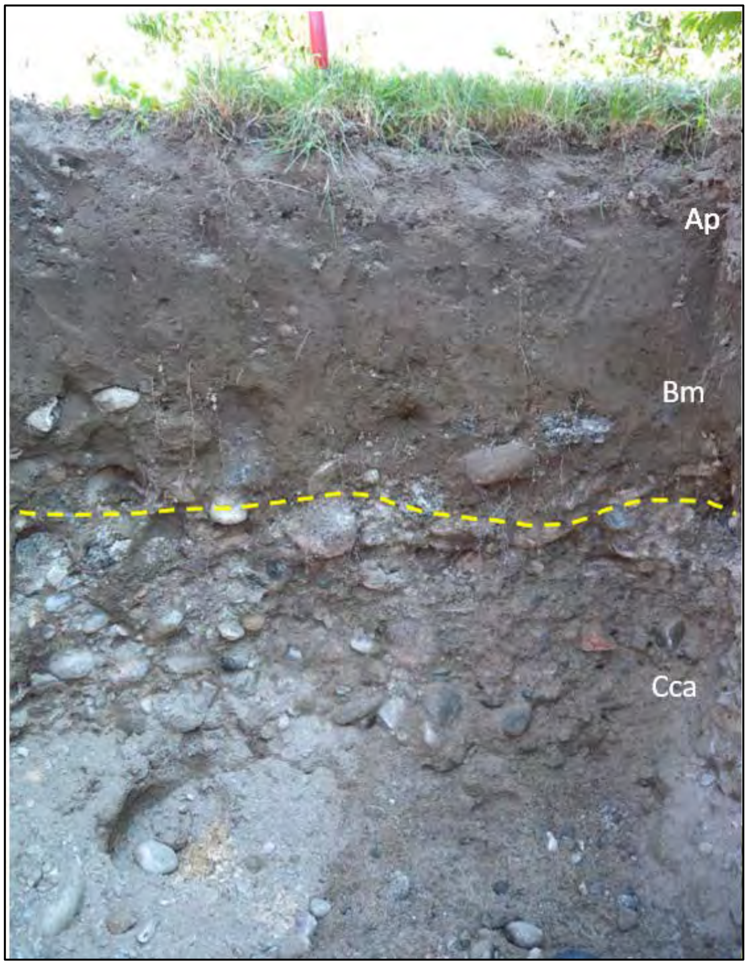

Figure 12. An example of a stratified soil. The yellow dashed line follows abreak between sandy loam topsoil and gravelly sand subsoil. The letters along the right-hand side of the figure designate the soil horizons. Many of the soils in the Summerland Valleys GI have this arrangement of materials. The stone-free topsoil is often composed of silty and sandy wind-blown sediments that overlie either glacial fluvial gravels or gravelly till. Stratified soils are very common in the Okanagan Valley region and are widely utilized for viticulture.

The impoundment of glacial meltwater and the creation of the temporary glacial lake in the valley laid down the parent materials for the Munson and Summerland soil series. These glaciolacustrine soils occur in the central part of Prairie Valley (blue area, Figure 9). The Munson soil series can be very suitable for viticulture so long as the highly alkaline subsoils are not exposed to the surface where they can be detrimental to vine health. The silty texture of these soils provides excellent water holding capacity, and these soils are used extensively elsewhere in the region for viticulture. In low-lying areas where the water table is close to the surface, and very wet conditions exist, these soils are classed as belonging to the Summerland soil series.

Modern streams (Eneas Creek in Garnet Valley, Prairie Creek in Prairie Valley) have left their mark on the soils of the GI. Prairie Valley Creek drains the valley eastward toward Okanagan Lake. In some areas, the creek has eroded the valley floor sediments to create a narrow channel some 2 to 4 m below the surrounding land surface. In other areas, where the down-stream slope gradient is less, the creek has deposited material on its floodplain. The soils of the flood plain are variable, usually raw and unweathered, and support riparian vegetation adapted to periodic flooding and deposition. The floodplain soils belong to the Strutt and Kinney soil series.

On the level floor of the eastern end of Prairie Valley are soils subject to flooding and periodic saturation. Since de-glaciation, a persistent high water table and slow drainage of water through the broad flatlands of Dale Meadows, spawned the growth of aquatic vegetation. Over time, aquatic plant debris has accumulated and decomposed to create what are termed ‘muck’ soils. These soils consist mainly of decomposed plant material and contain little mineral (sand, silt or clay) material. They are often used for seasonal vegetable production when the water table is controlled by draining. However, their often-frosty, low-lying landscape position and saturated conditions make these soils generally unsuited to viticulture.

CLIMATE

While there is no long-term weather station within the GI, the weather station located on the grounds of the Summerland Research and Development Centre (SRDC) provides a reference to compare with the shorter climate records recently collected from within the GI. The SRDC site is located at relatively low elevation on an open slope fully exposed to Okanagan Lake. The two shorter-term stations used for comparison within the GI are located at the Garnet Valley Ranch, a weather station operated by Okanagan Crush Pad, and station 215, a temperature monitoring sensor installed by SRDC for research purposes at the southern end of Garnet Valley (Table 2).

Table 2. Annual growing degree-day >10°C (GDD) and frost-free period (FFP) for three climate stations over varying time periods. The long-term station on the grounds of the Summerland Research and Development Centre (SRDC) is located at 454 m elevation. Garnet Ranch weather sensors are located at 625 m elevation in the northern end of the Garnet Valley. Eight years of temperature data are averaged from research station 215 located on the valley floor at the south end of Garnet Valley at 500m elevation.

	SRDC[1]		**Garnet Ranch**[2]		**215**[3]
	2018	**2019**	**2018**	**2019**	**2009-2016**
GDD>10°C	1333	1348	1167	1135	1105
FFP (days)	198	197	163	154	160

[1] data supplied by Brad Estergaard, SRDC

[2] data supplied by Duncan Billings, Okanagan Crush Pad

[3.] SRDC research monitoring site 215, data supplied by Steve Losso

The growing degree day accumulations (GDD) and the frost-free period (FFP) are indices calculated from daily temperatures. These are typically used to characterize climate conditions for viticulture. The length of the growing season is calculated as the number of frost-free days between the last frost in the spring and the first frost in the fall. At SRDC the FFP typically begins in the middle of April and runs until late October and resulted in a growing season lengths of just under 200 days in 2018 and 2019. The two Garnet Valley stations recorded a FFP approximately 30 days shorter.

Data for these same two years from Garnet Ranch indicate a GDD total some 200 GDDs less than at SRDC. This is a significant difference, as much as the difference between Summerland SRDC and Osoyoos. The much cooler temperatures are largely the result of elevation difference and landscape position. By comparison, even though temperature sensors at station 215 are located at lower elevation, they recorded about the same GDD total as Garnet Ranch in recent years. station 215 temperatures reveal the influence of landscape position, in this case valley floor, which is subject to cool nighttime air flows which depress daily mean temperatures and shrten the frost-free period.

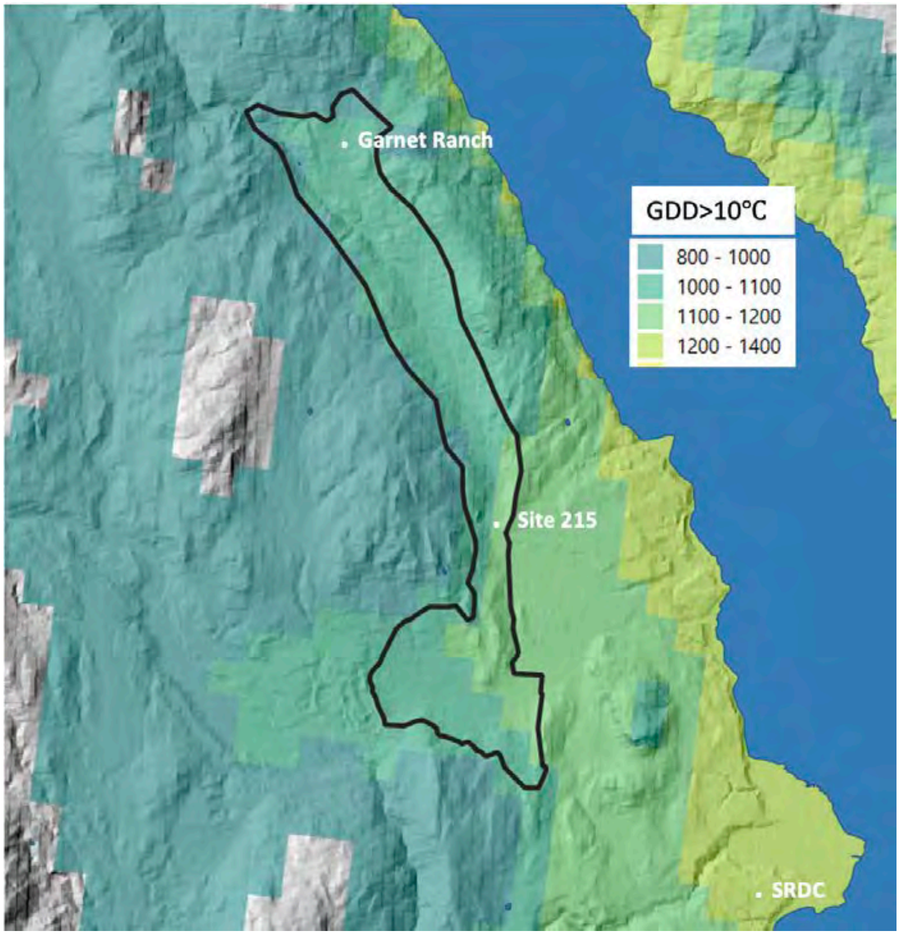

Figure 13. Map of modelled temperatures over the landscape based on extrapolated 2000 to 2010 recorded data. Colour pattern depicts classes of growing degree days above 10 C (GGD>10) values. Locations of the three weather stations listed in Table 2 are shown in white. The boundaries of the GI are shown in black.

The modelled GDD>10 values, are shown on Figure 13. On this map, elevation is the key driver that controls the assignment of GDD values to the landscape (Neilsen et al 2015). The SRDC site is located at the lowest elevation and falls into the warmest GDD class on the map. Actual recorded temperatures at Garnet Ranch are higher than predicted on the map. This is most likely because the predicted values on the map are averages over the entire landscape while the weather station is located on a south-facing slope with good air drainage which generates slightly higher than average temperatures relative to the surrounding landscape.

Increasingly, climate change factors are influencing vineyard investments. Sites that today are only marginally suitable for viticulture, may in the future be better suited. The long-term growing degree day totals for SRDC indicate two characteristics (Figure 14).

- The warmest years are scattered throughout the period of record, not necessarily concentrated in the last ten years and
- the significant interannual variation in GDD has been, and likely will continue to be, an on-going challenge to viticulture in the region.

There has been a trend toward warmer winters and an increasing frost-free period during the same 20 year timeframe (data not shown).

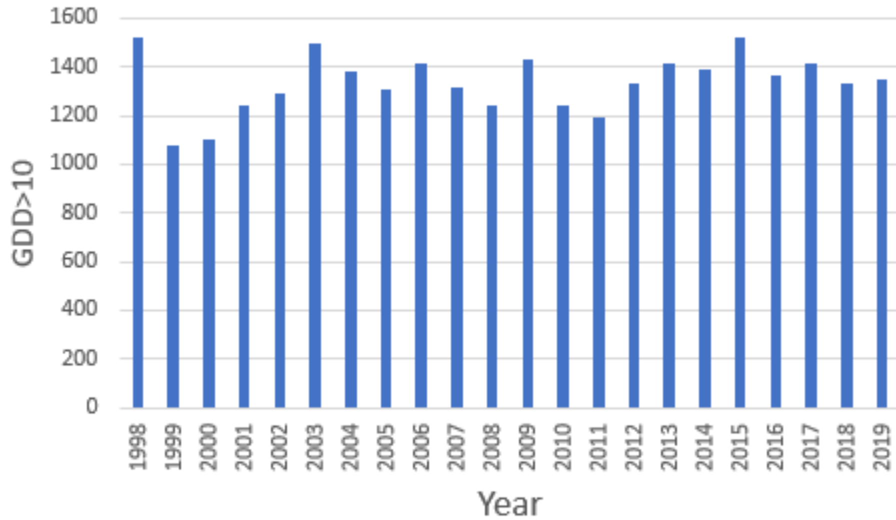

Figure 14. Chart of growing degree day accumulations through the growing season for the years 1998 to 2019 as recorded at SRDC. Data provided by Brad Estergaard, Summerland Research and Development Centre.

VITICULTURAL CHARACTERIZATION

There are approximately 35 ha (86 ac) of vineyards in production within the GI with roughly two thirds of production in the Garnet Valley and one third in Prairie Valley. There are also an estimated 20 ha of land planted to vines that are not yet producing. It is a GI with expanding area of vineyard every year. However, viticulture in all parts of the Summerland Valleys GI is challenged by its cool climate. While GDD accumulation is sufficient for producing many cool climate *Vitis vinifera* cultivars, the short FFP limits the range of cultivars that can be grown successfully without spring frost injury or a fruit maturation period truncated by fall frost. Recent trends in warmer winters and shoulder seasons have mitigated this somewhat.

Vineyards above the valley floor on sloped sites with good air drainage have a sufficient FFP for producing many white cultivars, primarily Chardonnay, and red cultivars suited to cool climates including Pinot noir which is the most commonly planted variety in the GI (Table 3).

The cool growing season is conducive to the development and retention of fruit acids and aromatic compounds that produce vibrant, aromatic and fruit forward wines. The GI is also well suited to viticulture for sparkling wine production. Vineyard sites on frost-prone lower slopes and the valley floor are often used for the production of ice wine.

Table 3. Principal wine grape varieties grown in the Summerland Valleys GI. Values represent a minimum estimate of area of production. Data source: BC Wine Authority.

White Wine Cultivars	Hectares	Acres
Chardonnay	6.4	15.7
Kerner	2.9	7.2
Gewurztraminer	2.9	7.1
Riesling	2.7	6.7
Pinot Gris	1.5	3.6
Muscat Ottonel	1.0	2.5
Chenin Blanc	0.9	2.3
Siegerrebe	0.5	1.3
Total	18.8	46.4
Red Wine Cultivars		
Pinot Noir	13.6	33.6
Leon Millot	1.6	4
Pinot Meunier	0.6	1.5
Total	15.8	39.1
Grand Total	34.6	85.5

Soils at sites having a suitable climate for viticulture are mostly well drained and coarse textured. These soils ease the management of vine vigor and canopy density through deficit irrigation, to optimize crop loads and fruit exposure to sunlight. On fluvial floodplain sites having poorly drained soil, more careful management is needed to control vine vigor and achieve vine balance.

REFERENCES

BC Wine Appellation Task Group (2015). *Wine Industry Turning Point: Recommended Changes to the British Columbia Wines of Marked Quality Regulations*. Report submitted to the BC Wine Authority and BC Minister of Agriculture. 42pp.

Environment and Climate Change Canada. 2019. Canadian Climate Historical Data. https://climate.weather.gc.ca/historical_data/search_historic_data_e.html Accessed November 22, 2019

Nasmith H. 1962. Late Glacial History and Surficial Deposits of the Okanagan Valley, British Columbia. British Columbia Department of Mines and Petroleum Resources, Victoria, BC. 46 pp. plus plates and maps.

Neilsen, D., S. Smith, T. Van Der Gulik, B. Taylor and A.J. Cannon. 2015. Modeling regional water demand for current and future climate in the Okanagan basin, British Columbia, Canada. Acta Horticulturae 1068: 211-218.

Okulitch, A. V. (comp) 2013. Geology, Okanagan Watershed, British Columbia. Geological Survey of Canada Open File 6839, scale 1:100,000. Doi:10.4095/292220.

Soil Classification Working Group 1998. The Canadian System of Soil Classification 3rd ed. Agric. And Agri-Food Canada. Publ. 1646 (revised) 187 pp.

Wittneben U. 1986. *Soils of the Okanagan and Similkameen Valleys,* Technical Report 18. BC Ministry of Environment. Victoria, BC. 229pp. plus maps