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Small-Scale Agri-Food

Back to the Land:
Report 1 – Resource Opportunity Analysis

Community Futures Development Corporation of Thompson Country

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Important Notice

Crane Management Consultants Ltd. and Calissi Consulting, Inc. directed project under contract to Community Futures Development Corporation of Thompson Country. Human Resources Development Canada funded the project through its Local Labour Market Partnerships Program.

This report was funded and written to produce information on small- and medium-scale agricultural issues and opportunities in the Thompson, Nicola Valley, Upper Fraser Canyon, and south Cariboo areas. The information is intended to be used in the planning processes of agricultural producers, prospective producers, Community Futures Development Corporation of Thompson Country, Community Futures Development Corporation of Sun Country, Community Futures Development Corporation of Nicola Valley, First Nations, BC Ministry of Agriculture, Food and Fisheries and other interested parties.

The authors, administrators and funders of this report accept no liability for any direct or indirect damage caused to any person or organization or property as a result of use of or reliance on this report and its contents. Any parties interested in pursuing or supporting or participating in any of this report's suggested proposals or ideas should undertake or fund their own research and should not rely on this report for definitive information, direction or advice.

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1 Executive Summary

This report lays out the agricultural production capabilities of the Thompson-Nicola Regional District and parts of the Squamish-Lillooet and Cariboo Regional Districts and matches them with the resource requirements of a large number of commodities.

It is report no. 1 of a five report series, that included the production of nine GIS maps. Community Futures Development Corporation of Thompson Country (CFDC-TC) sponsored the "Back to the Land" project and a steering committee of stakeholders guided the consultants' work. Human Resources Development Canada provided project funding.

The lands under consideration in this study are generally all within the Provincial Agricultural Land Reserve (ALR) and have been rated according to the Canada Land Inventory (CLI) Soil Capability for Agriculture. The focus was placed on Class 1 to Class 3 lands located within the ALR, since these offer the most opportunities for diverse agricultural production. An assumption is that irrigation is available for these lands - the study area's hot, dry climate dictates that irrigation is generally required for successful agricultural cropping.

The Agriculture Land Reserve and Soil Capability for Agriculture map data was extracted from digital data provided by the BC Ministry of Agriculture, Food and Fisheries and is presented on nine GIS maps (not included in this report), which use provincial TRIM 1: 100 000 map bases.

The study area was subdivided into ten sections within which soil and climate characteristics are generally similar. These characteristics are described in Climate Capability for Agriculture maps (1:100,000 scale) and several soil surveys which cover the study area.

In total, the ten sections together contain about 145,350 ha of Land Capability for Agriculture Class 1 to 3 (improved) lands. Other parts of the project area are also potentially arable but are severely to moderately limited in crop range by adverse climate (eg. short frost free period), stoniness and rockiness, adverse topography and , in small areas, poor soil drainage. Some of these areas currently produce forage for the ranching industry.

The cropping possibilities for the area include the following.

Field Vegetables
Potatoes, carrots, turnips, onions, garlic, parsnips, beans, lentils, peas, pumpkin, various melons, cabbage, broccoli, tomatoes, peppers, sweet corn, garlic, melons, lettuce, celery, leeks, spinach, Swiss chard, radish, celery, carrots, cauliflower, pickling cucumbers, beets and pumpkins

Vegetable production of speciality products such as baby vegetables for the ready to use markets (e.g. baby carrots, corn, beets, cherry and roma tomatoes, leeks, squash, spinach eggplants), exotic greens (curly cress, pink cress, dandelion greens, various types of lettuce such as Escarole, Frizee, Red/Green Oak leaf, red/green romaine, red/green leaf) may provide added opportunities, as well.

Greenhouse vegetables
Tomatoes, peppers, and cucumbers

Greenhouse floriculture
Roses, geraniums, chrysantheums, poinsettia, freesia, gerber, azaleas, and other indoor and outdoor garden plants

Berries, Fruits and Nuts
Blackberries, blueberries, saskatoons, currants, gooseberries, chokecherries, strawberries, raspberries, grapes, hardy Kiwi fruit, hardy tree fruit varieties, and hazelnuts

Field Crops
Buckwheat, cicer milkvetch, fenugreek, fodder kale, canola, grass pea, industrial hemp, grass and shrub seeds, peppermint, spearmint, spelt, sweet white lupines, tritcale, winter hardy orchard grass

Others
Mushrooms, nursery crops, dried flowers, honey, herbs and spices, ginseng, medicinal plants, stevia and Christmas trees

2 Introduction

This report lays out the agricultural production capabilities of the Thompson-Nicola Regional District and part of the Squamish-Lillooet and Cariboo Regional Districts and matches them with the resource requirements of a large number of commodities for study area small- and medium-scale agriculturalists.

Community Futures Development Corporation of Thompson Country (CFDC-TC) has a mandate to facilitate the development of new and support the growth of existing small businesses in its service area. Agri-food businesses have comprised a small portion of its lending and other activities. It secured funding from Human Resources Development Canada to identify and promote agricultural opportunities for small agri-food operations in the Thompson-Nicola Regional District and part of the Squamish-Lillooet and Cariboo Regional Districts.

CFDC-TC hosted a meeting in September 1999 to explore new opportunities for further development of agriculture in its service area. Many interested organizations had representatives in attendance: provincial and federal agriculture ministries, transportation concerns, agri-tourism businesses, market gardeners, organic and non-organic produce farmers, ranchers, retailers, First Nations, Interior Science and Innovation Council, University College of the Cariboo Department of Horticulture, and economic development agencies. The participants developed the idea of staging a regional forum for presenting information about opportunities, various marketing strategies and available resources for smaller agri-businesses.

Coming out of this meeting, a large ad hoc committee of stakeholders was formed. The committee identified a need for a coordinated review to assess the current state of smaller agri-business in the area. It decided that a feasibility study would assist in the development of a strategy for supporting entrepreneurs who pursue small-scale agriculture business ventures. A number of priority areas were identified, such as value-added products, agri-tourism, identifying marketing mechanisms to access new and existing markets, and assessing the current flow of information and support (training and financing).

CFDC-TC has designed a three phase project. This assignment is the first phase, a study that identifies and analyzes agriculture opportunities and the means to support the development of these opportunities. The second and third phases will provide for dissemination of information from Phase 1 and implementation of some support mechanisms for further development of the region's small agri-food businesses.

2.1 Purpose

The purposes of this project are to:

- Explore the history of small acreage agriculture in the area and provide an overview of the changes that have occurred over time and the impact of these changes on the area.
- Review recent literature to identify new and existing agriculture related business opportunities that may be viable on land from one to one hundred acres within the area. Make recommendations for new and alternative opportunities.
- Assess land availability, soil quality, water sources, and climatic conditions used to grow or to process agricultural products within the area. Make recommendations for new and alternative opportunities.
- Assess/identify current marketing strategies that are successfully used by small acreage producers, processors and agri-tourism operators. Provide suggestions for future marketing strategies.
- Assess current financial and management skills of the operators of existing and future agriculture businesses. Make recommendations

for new and alternative financial and management training opportunities.
- Identify sources of financing to assist individuals to establish new or expand existing operations. Make recommendations for new and alternative financing options.
- Review and describe existing information resources for agriculture business. Identify areas that are lacking within this information system. Investigate the viability of an information network that would be primarily used to link area producers, processors, buyers and the public. Provide recommendations to improve the access to existing information.

2.2 Study Area

The study area generally includes the Regional District of Thompson-Nicola as well as a small portion of Squamish-Lillooet Regional District in the Lillooet area and the southernmost portion of the Cariboo Regional District. More specifically the study is confined to valley and plateau areas where the favourable climate provides the most opportunities for the production of a wide range of agricultural commodities.

It includes the following areas:
- Fraser River valley from the vicinity of Pavilion downstream to Lytton;
- Thompson River valley from Clearwater southward to Kamloops and onward to Lytton including the tributary Bonaparte and Nicola River valleys and Deadman Creek valley;
- South Thompson River valley eastward from Kamloops to Chase;
- that part of the Salmon River valley in the vicinity of Westwold;
- and the lower plateau areas in the vicinity of Merritt and south of Kamloops.

A map of the study area and its most viable crop-growing areas is presented on the opposite page. The crop growing areas are listed as sections on the map. Section numbers do not indicate an order of precedence. Nine GIS maps that show detailed agricultural capability for the study area were also produced for the project.

2.3 Farm Size

There is no widely-accepted definition for small-scale farming. Statistics Canada, in its publication entitled "Canadian Agriculture at a Glance", defined them as having product sales of $40,000 or less before expenses are deducted. Under this definition half of all Canadian farms are small farms. Almost 80% of BC farms (and in the study area) in the 1996 Census of Agriculture had incomes of less than $40,000. Only a quarter of these BC small farms reported a positive net income. However, the number of BC small farms increased by 14% between the 1991 and 1996 Census years, bucking an overall national decline of 5.6% in farm numbers.

The US authorities set a higher bar for defining a small farm, gross income of $250,000 (US) or less. Size of farm is another way of classifying farm size but a small grain farm will have many more hectares than a large vegetable or tree fruit operation.

The number of in the study area of less than 10 acres increased by 29% between the two most recent Census years (1996 and 1991). Thirteen percent of farms were ten acres or less in the 1996 Census.

This project's steering committee chose not to construct an arbritary definition because, in practise, farmers define themselves. Livestock production was not included in the project because it has been the subject of previous reports and is dominated by ranchers who view themselves as having large or at least medium-scale ranches or farms.

2.4 Project Process

This project has been directed by CFDC-TC and a steering committee that includes agricultural producers and representatives from BC Ministry of Agriculture, Food and Fisheries, BC Ministry of Community Development and Cooperatives, CFDC of Sun Country, CFDC of Nicola Valley, First Nation Agricultural Lending Association and Interior Science and Innovation Council.

The consulting team was led by Calissi/Crane, a joint venture of Crane Management Consultants Ltd. and Calissi Consulting, Inc. Kelowna-based Herb Luttmerding and John Vielvoye worked on resource capability issues. Victoria-based Sa Su Services compiled the GIS maps. Gerry Hutchison of Kamloops and Pritchard consulted with members of First Nations. Jodi Houghton of Chase researched and drafted several profiles. Glen Lucas of Kelowna interviewed persons in the retail, wholesale and HRI segments. Jill Brown-John of Horsefly and Kamloops prepared a piece on delivery of organic foods.

The consultants completed the following research tasks.

- compilation of BCMAF and Statistics Canada data;
- agricultural resource capability analysis;
- GIS analysis and mapping;
- mail survey of small and medium-scale agricultural producers;
- interviews with members of First nations who are involved with agriculture;
- phone interviews with agricultural extension officers, farmers, food makers, retailers, wholesalers, and institutional food buyers in and outside the study area;
- identification and review of print and internet sources of information.

2.5 Project Reports

Five reports and nine GIS maps were prepared.

Report 1 - Resource Opportunities: study area agricultural statistics; resource capability for agricultural production; and agricultural production possibilities for small- and medium-scale producers in the study area.

Report 2 - Survey Results: presentation of results from a mail survey of small-scale agricultural producers and interviews with First Nations agriculturalists.

Report 3 – Marketing: local market; agri-food products; post-harvest management; marketing channels; collaboration; and branding.

Report 4 – Development Strategies: Organizational development, communications, marketing, and financial strategies for furthering the growth of small-scale agriculture in the study area.

Report 5 – Appendices: information sources and financial programs

The GIS maps use the Canada Land Inventory system for identifying areas of better agricultural potential.

Several profiles of interesting agri-food producers from around BC are included in Report 3. Their business approaches and efforts illustrate the potential for smaller-scale agri-food production and some key operational points.

3 Study Area Agriculture

3.1 Introduction

Thompson region agriculture has historically been dominated by a beef cattle industry. Ranchers utilize the natural grasslands in the summer and feed alfalfa and hay in the winter. Cattle are bred and calves raised to a point at which they are mature enough to be switched to a high-energy diet (typically around 800 lbs.). At this point the cattle are sent to a feed lot. Feed lots typically utilize a grain based diet to obtain the high energy ration, necessary to finish the cattle.

In recent years, an energetic and entrepreneurial ginseng industry has emerged in the Kamloops area.

3.2 Beef

Although the region has natural advantages in cow/calf operations, it has few advantages in the feed lot and slaughter business. Feed lots must source a cost minimized, high energy (usually grain based) diet. Since the Thompson region does not possess advantages in the production of grains, cattle are shipped to Alberta for finishing rather than importing grains from the Prairie provinces[1]. Another issue with finishing cows is the hot climate in the region which makes the area less competitive with colder climate Alberta. To add to these disadvantages, there are several foundation factors that have arisen over the past decade that places southern Alberta at an advantage over the central Interior of BC for cattle finishing and slaughter.

The elimination of the Crow rate has resulted in a decreased price for grain on the Prairies. Consequently, the producer is looking for ways to generate extra profits from grain growing via feeding grain to animals. The response has been a growth in feed lots, as well as poultry and hog production. Southern Alberta now boasts the highest concentration of cattle in the world. In order for the Thompson region to become cost competitive for finishing cattle, grain prices on the Prairies would need to increase substantially.

The feedlot issue is connected to the processing of beef. The increase in health inspection requirements for slaughter-houses has resulted in a large increase in the minimum size for inspected facilities. It is difficult for smaller facilities to become established and to stay open. Consequently, slaughter-houses must be large or not at all.

A regional development constraint is that there are no federally or provincially inspected beef slaughter facilities[2] in the Southern Interior. The study area does not fall into a provincial meat inspection area so there are only a few small custom kill operations. They can sell slaughtered product without inspection but established retailers and HRI outlets are unlikely to purchase uninspected meat products.

In Kamloops, KamLake View Meats and Dunn Meats have custom kill services as do Riverside and Petty Meats in Salmon Arm and Finlay Meats and Fawn Ridge in 100 Mile House. The small, specialized Rodear operation in remote Horsefly is the nearest federally inspected plant. Now closed Blue Mountain in Salmon Arm was a large operation built for slaughter of hogs and bison. With the bankruptcy of J& L Beef in Cloverdale, its beef slaughter facility was shut down, eliminating the largest facility for killing of cull cows in the province. The new owners bring in frozen carcasses from Alberta for manufacture into hamburger. The three largest inspected beef slaughter plants, Grand'Maison in Langley, Johnston Packers in Chilliwack and Pitt Meadows Meat in Pitt Meadows, are much smaller beef operations than was J&L Beef.

[1] There are some feedlots in the southern Interior; Douglas Lake Ranch rents a modern feedlot facility from White Creek Dairies in Tappen and the Southern Plus operation in Osoyoos is a major shipper to the US. There is a small holding yard and feeding operation in Kamloops and Kohler Meats in Cache Creek. Nicola Ranch near Merritt has its own feedlot.

[2] It is also a constraint in the further development of the specialty poultry sector in the area as there are no inspected poulty plants in the Southern Interior.

Another issue is that large buyers, such as Safeway, have consolidated buying and warehouse operations in Calgary. All shipments must first go though the Calgary operations before being shipped into other markets (including British Columbia). It is easier and more cost effective to service chain store buyers if a food processing facility is located in Alberta.

3.3 Crops other than forage

The acreage under cultivation for growing vegetables remained static over the 1986-1996 period, as did the acreage under cultivation for growing berries and grapes. Tree fruit production increased slightly over the 1986-1996 period but remained a very small portion of total provincial production. Potato acreage doubled to approximately 200 acres but is also a very small portion of total BC production. There were no commercial mushroom growing operations in the area.

Bucking the national trend, the number of small farms in the study area, whether measured by acreage (less than 10 acres) or annual gross receipts ($50,000 or less), increased, 29% and 15%, respectively. The proportion of larger agricultural operations is larger because of the importance of cow-calf raising in the study area's agriculture. The following table presents data from the 1986, 1991, and 1996 Censuses for a few agricultural indicators for the study area.

Study Area Census of Agriculture Statistics[3]

	1996	1991	1986
No. farms reporting	1,150	1,008	905
Total area farmed	1,005,246	1,006,967	936,373
Total area in crops	74,260	75,666	97,200
Pasture – Tame	45,652	45,666	53,973
- natural	714,760	639,858	772,309
Summer fallow	1,879	2,199	4,949
All other land	168,695	243,580	7,942
Irrigation-no. farms	704	556	632
- area irrigated	66,885	50,331	66,277
Farm size			
- less than 10 acres	151	117	104
- 10 to 69 acres	364	309	234
- 70 to 129 acres	125	107	101
- more than 129 aces	510	475	466
Gross farm receipts	$ 87,675,580	$ 53,492,044	n/a
Receipts under $ 50,000	904 farms	788 farms	N/a
Major crops produced			
- Field crops	72,971 acres	52,373 acres	93,349 acres
- Fruit trees & nuts	212 "	178 "	167 "
- Berries and grapes	26 "	26 "	N/a
- Vegetables	331 "	314 "	328 "
- Potatoes	207 "	111 "	90 "

[3] The most recently available Agriculture Census statistics are from 1996. The data for the Thompson-Nicola Regional District was combined with data for the Squamish-Lillooet Regional District to create study area statistics. BCMAF develops annual production and value statistics for agriculture on a provincial basis only.

	1996	1991	1986
- Nursery products	33 "	N/a	N/a
- Sod (turf)	N/a	N/a	149 "
- Christmas trees	498 "	N/a	N/a
Greenhouse products	225,909 sq. ft.	284,409 sq. ft.	168,712 sq. ft.
- flowers	111,177 sq. ft.	N/a	N/a
- vegetables	81,972 sq. ft	N/a	N/a
- other products	N/a	N/a	N/a
Mushroom houses	0	0	0

Ginseng cultivation has been the most interesting agricultural story in the region over the past decade. Currently, there are an estimated 2,200 acres of planted ginseng. The region has competitive strengths over other North American regions, notably a dry climate with lesser disease problems. One of the production problems with ginseng is the build up of pathogens in the soil while the crop grows. Usually the build-up is so great that the soil becomes unsuitable for ginseng to re-planted in the same site. Consequently, ginseng growers constantly search for new land.

Growers in the Thompson region with lower pathogen levels may be able, using fumigants, to move back to "old" ginseng land after a shorter rotation period than other competing regions. This suggests that the region is well suited to the production of the crop. In addition, ginseng is a crop that requires a high degree of technical knowledge; the region is currently well endowed with technically qualified farmers, a competitive strength.

In recent years, dried ginseng root has seen a drop in prices. Traditionally, a significant portion of the crop was destined for China and was first sold to Hong Kong and smuggled into China to avoid paying the high tariff. The other half of the crop, directed to China, was sold through official channels. Hong Kong's reversion to China has brought a high Chinese import tariff. Growers are now looking more closely at the North American market for processed ginseng products, as an alternative to selling the dried root to China.

Currently, there are a handful of processors in Kamloops, Vancouver and Kelowna. A disadvantage of the specialty crops processing industry is the characteristic veil of secrecy that limits collaboration and exchange of information between participants. Like the primary production of ginseng, processing of medicinal herb crops requires substantial technical knowledge. The BC processing industry for ginseng and other herbaceous crops is in its infancy stage. There is a recently started industry association, Vernon-based BC Herb Growers Association[4]. The Science Council of BC and BC Ministry of Agriculture, Food and Fisheries have taken an interest in furthering this industry's development and sponsored studies to examine development issues.

Historically, an interesting factor was the production of superior quality potatoes in the Ashcroft area, a region well suited to the production of processing potatoes. It has competitive strengths over the Fraser Valley since potatoes grown in the Ashcroft area do not possess a high water content, making them more desirable for processing. The rental price of vegetable land in the area is about $300 (CAN) per acre, which is substantially less than potato land in Washington's Columbia Basin where potato land rents for $500-1000 (US) per acre.

Currently there are no potato processors (e.g. processing into potato chips or flakes) in the area and one would need to be established before growers would have a financial incentive to put widespread plantings in the ground. There was a very small potato processor in Kamloops about a decade ago. Clearly, it is a "chicken and the egg" case and illustrative of a common conumdrum in agricultural development, primary production may be possible but nearby processing is lacking.

[4] As well, there is a The Associated Ginseng Growers of BC, BC Functional Food and Nutraceutical Network, BC Industrial Hemp Growers Association, and BC Sea Buckthorn Association. BCMAFF has compiled a directory of sources of information for the BC herb sector (phone Food Industry Branch, 604-666-5259 to obtain a copy)

The crop could be grown in rotation with other crops, such as alfalfa and ginseng, and may offer the potential for ginseng growers to plant an alternative crop on irrigated ginseng land as a rotation, and also as a hedge for fluctuations in ginseng prices.

4 Resource Capability

4.1 Introduction

Agricultural production opportunities in any area are dependant on soil characteristics and climatic conditions. As well, a stable marketing and economic infrastructure is required as are farm operators with the appropriate management skills and knowledge.

This report addresses the first two items identified above, that is, the availability and location of land with soils and climates suitable for a variety of agricultural production.

The lands under consideration in this study are generally all within the Provincial Agricultural Land Reserve (ALR) and have been rated according to the Canada Land Inventory (CLI) Soil Capability for Agriculture. The focus was placed on Class 1 to Class 3 lands located within the ALR, since these offer the most opportunities for diverse agricultural production. An assumption is that irrigation is available for these lands - the study area's hot, dry climate dictates that irrigation is generally required for successful agricultural cropping.

The Agriculture Land Reserve and Soil Capability for Agriculture map data has been extracted from digital data provided by the BC Ministry of Agriculture and Food and is presented on provincial TRIM 1: 100 000 map bases.

The study area was subdivided into ten sections within which soil and climate characteristics are generally similar. These characteristics are described in Climate Capability for Agriculture maps (1:100,000 scale) and several soil surveys which cover the study area.

The previously described sections of the project area contain the majority of those lands which provide the most agricultural cropping options from both a climatic and soils perspective. *In total, the ten sections together contain about 145,350 ha of Land Capability for Agriculture Class 1 to 3 (improved) lands.* Other parts of the project area are also potentially arable but are severely to moderately limited in crop range by adverse climate (eg. short frost free period), stoniness and rockiness, adverse topography and , in small areas, poor soil drainage. Most of these areas lie at substantially higher elevations than those described and commonly occur in relatively remote locations. Some of these areas currently produce forage for the ranching industry.

4.2 Section 1 - Fraser River Valley

4.2.1 Fraser River Valley from Pavilion to Lytton and Thompson River Valley south from Spences Bridge including the lower reaches of the Nicola River Valley

The arable parts of this portion of the study area consists mainly of relatively small, discontinuous glaciofluvial and fluvial terraces and terrace remnants and fluvial fans located along the steep walls of the deeply entrenched rivers. Elevations are mainly below 300 m. Topographies range from gently undulating or sloping on the terrace surfaces to very steeply sloping on the terrace scarps and upper slopes of the fluvial fans.

The soils are dominantly coarse and very coarse textured, rapidly drained and have low water holding capacity. Subsoils are generally gravelly and stony although surface veneers (less than 40 cm thick) are often present which are relatively stone free and loamy sand, gravelly loamy sand or sandy loam in texture. The soils are generally neutral in reaction in the upper parts and becomeslightly to moderately alkaline in the subsoils. Nutrient holding abilities of the soils are low due to the coarse textures, therefore adequate crop fertilization determined by periodic soil sampling and analysis is suggested.

The Climate Capability for Agriculture rating for this part of the study area is mostly Class (1bE)

indicating that frost free periods exceed 150 days and growing degree days range between 1780 and 2060. The 'E' subclass suggests that extended periods of minimum winter temperatures below -15 C are highly probable. Irrigation is assumed for all agricultural production.

Climatically, a wide range of annual and perennial agricultural crops can be produced, including heat loving crops such as tomatoes and melons. Winter hardy tree fruits are also possible. Ground crops such as potatoes and carrots can also be produced where the surface sandy layer is of sufficient thickness so that the underlying gravelly and stony conditions do not interfere with mechanical harvesting. Winds causing dessication are common and windbreaks are beneficial for many crops.

There are about **8,650 ha** of dominantly Land Capability for Agriculture Class 1 to 3 (improved) lands scattered through this section of the project area. The predominant 'improvement' is the availability of irrigation although stone removal is also needed in some locations.

Climate Capability Classification[5]

Location	Growing Degree Days	Frost Free period (days)	Capability Classification
Section 1			
Lytton – Lillooet- Pavillion - Spences Bridge- Clapperton	2000 - 2400	160 - 180	1bE at lower elevations

4.3 Section 2 - Thompson River Valley

4.3.1 Thompson River Valley from Kamloops Lake to Spences Bridge

The arable portions of this part of the study area consist mainly of relatively large glaciofluvial and fluvial terraces and alluvial fans located at the lower elevations in the valley. Elevations range from about 300 m to 450 m and most slopes are less than 10 %. The soils are dominantly coarse textured and rapidly to well drained with relatively low water holding capacity. Subsoils are generally gravelly and stony while the surfaces (up to 50 cm thick) are mostly loamy sand or sandy loam with stone contents varying from essentially none to moderately stony. The soils are generally neutral in reaction in the upper parts and grade to slightly or moderately alkaline in the subsoils. Nutrient holding capacities are relatively low, therefore adequate fertilization determined by periodic soil sampling and analysis is suggested.

The Climate Capability for Agriculture rating for this part of the study area is mostly Class (1bE). Frost free periods exceed 150 days and growing degree days range between 1780 and 2060. Extended periods of minimum winter temperatures below -15 C are highly probable. At the lowest elevations, adjacent to the Thompson River, the climate capability rating is Class 1aF suggesting a somewhat shorter frost free period due to cold air pooling on the valley floor. Irrigation is required for all sustained agricultural production.

A wide range of crops, including those that thrive in hot conditions can be produced. Winter hardy tree fruits are also possible. Ground based crops such as potatoes, carrots, and ginseng can also be produced where the surface sandy layers are of sufficient thickness so that the underlying gravels and stones do not interfere with mechanical harvesting. Dessicating winds are common, therefore windbreaks are beneficial for many crops.

This section of the project area contains about **10,560 ha** of Land Capability for Agriculture Class 1 to 3 (improved) lands. Irrigation is the main improvement required to achieve these capability levels.

[5] The capability classification system is briefly explained in Appendix 2, along with many examples of cropping possibilities for each Capability Class. By looking up the climate capability classification rating in the appendix, the reader can determine the full range of cropping possibilities for the area.

Climate Capability Classification

Location	Growing Degree Days	Frost Free period (days)	Capability Classification
Section 2			
Savona – Spences Bridge	1900 – 2100	140 – 150	1bE at higher elevations to 1aF near the Thompson river

4.4 Section 3 - Upper Benches

4.4.1 Upper Benches in the Vicinity of Cache Creek and Ashcroft Including Semlin and Bonaparte River Valleys

The arable lands in this part of the study area consist mainly of gently to moderately sloping, relatively large alluvial fans interspersed with smaller areas of glaciofluvial terraces and glacial till (morainal) deposits. Also included are the floodplain and alluvial fans along the Bonaparte River. Elevations range between 450 and 600 m. The soils are dominantly moderately coarse to medium textured, usually stony in the subsoils, and well drained. Textures in the upper 50 cm are mostly sandy loam or loam with low stone contents. Water holding capacities are moderate to low. Some lower slopes and gentle depressions subject to seepage are strongly calcareous and, occasionally, moderately saline.

The gently undulating floodplain soils of the Bonaparte Valley are sandy loam or loam in the upper layers and grade to more sandy (and sometimes gravelly) conditions in the subsoil. The soils are imperfectly to moderately well drained and periodically (during freshet season) contain temporary watertables within 50 to 75 cm of the surface. Occasional, temporary flooding may also occur in the lowest lying areas during spring snow melt.

The Climate Capability for Agriculture Ratings are mostly Class (1aF) with some Class (1F) indicating somewhat shorter frost free periods than those areas at lower elevations near the Thompson River. Frost free periods range from 120 to 150 days with 1505 to 1780 growing degree days in most areas; the Class (1F) areas, usually consisting of frost pooling areas in low lying or depressional locations, have frost free periods of 90 to 120 days and growing degree days ranging between 1310 and 1505. As before, irrigation is required for satisfactory production of all agricultural crops.

A wide range of both annual and perennial crops, including some that thrive in hot conditions can be produced. Production of some hardy tree fruits is also possible in selected areas. Windbreaks to moderate dessicating winds are beneficial for most crops.

About **6, 820 ha** of Land Capability for Agriculture Class 1 to 3 (improved) lands occur in this section of the project area. The dominant 'improvement' is the availability of irrigation.

Climate Capability Classification

Location	Growing Degree Days	Frost Free period (days)	Capability Classification
Section 3			
Carquile - Cache Creek – Semlin Valley – Bonaparte River Valley	1500 – 1800	120 – 150	Generally 1aF with 1F in low lying areas
Loon Lake	1420	99	3GF

4.5 Section 4 - Deadman River Valley

4.5.1 Deadman River Valley and Upper Benches near its Confluence with Thompson River (including Walhachin)

The arable lands of this portion of the study consist mainly of the narrow floodplain and alluvial terraces and fans associated with Deadman Creek and the highest glaciofluvial terraces near its confluence with the Thompson River. Elevations range from about 400 m in the south to 600 m in the valley bottom at the northern extremity.

The soils associated with the floodplain and terraces of Deadman Creek are gently undulating, well to imperfectly drained and mostly sandy loam or loam in texture in the upper part. Subsoils vary from gravelly sand to gravel. Temporary groundwater tables occur in low-lying or depressional locations during the freshet period and occasional flooding may occur during exceptionally high runoff.
The soils developed on the glaciofluvial terraces at the southern end of the study area are gently undulating, rapidly drained and stony gravel or gravelly sand in the subsoil. Surfaces are mostly gravelly loamy sand or sandy loam and moderately to strongly stony.

The upper parts of the soils are generally neutral in reaction and become slightly to moderately alkaline in the subsoils in most areas. Supplemental fertilization is required for most crops: the amounts and kinds should be determined by periodic soil sampling and analysis.

Climate Capability for Agriculture is Class (1F) along Deadman Creek, improving to Class (1aF) on the terraces near its confluence with the Thompson River. Frost free periods along Deadman Creek vary from 90 to 120 days with 1310 to 1505 growing degree days. These improve to 120 to 150 days and 1505 to 1780 growing degree days, respectively, near the southern end.

Production of a range of annual and perennial crops is possible, including some winter hardy tree fruits near Walhachin. Crops very susceptible to temporary wet conditions may not be suitable on the low lying areas along Deadman Creek. Adequate irrigation is required for satisfactory production of all crops, particularily on the terraces near the Thompson Valley. In this area as well, production of ground crops such as potatoes and carrots may be limited by stony soil conditions which impede mechanical harvesting. Dessicating winds in exposed areas may require windbreaks for susceptible crops.

This section of the project area contains approximately **7, 760 ha** of Land Capability for Agriculture Class 1 to 3 (improved) lands. The dominant 'improvement' is the availability of irrigation although improvements by stone removal is also needed in some areas. As well, improved watertable control and flood protection in some areas near Deadman Creek are also required.

Climate Capability Classification

Location	Growing Degree Days	Frost Free period (days)	Capability Classification
Section 4			
Deadman River Valley –Walhachin	1300 – 1800	90 - 150	1F along Deadman River to 1aFG near Thompson River

4.6 Section 5 - South Thompson River Valley

4.6.1 South Thompson River Valley from Chase westward to Kamloops Lake, including areas near Kamloops Lake and on the lower reaches of Thompson River

This section of the study area consists mainly of sandy or silty alluvial terraces and fans along the South Thompson and Thompson rivers, and adjacent, higher lying silty laciolacustrine and sandy glaciofluvial terraces which are commonly

strongly eroded and gullied. Elevations range between about 350 and 450 m.

The soils developed in the alluvial deposits on the valley floor are gently undulating or sloping, mostly well drained and moderately coarse to medium in texture. Textures range from sandy loam to silt loam in the surface layers and generally become more sandy in the subsoils. Stones and gravels are uncommon. Limited small areas subject to seepage are imperfectly drained and somewhat saline.

The higher lying glaciolacustrine deposits support well drained, silty or fine sandy, stone free soils that are usually strongly alkaline in the subsoil. Topographies vary from gently to moderately undulating in the limited areas between gullies, to strongly or extemely sloping in the gullied areas. These soils are easily susceptible to erosion and require careful management.

Climate Capability for Agriculture ratings of most of the glaciolacustrine areas is Class (1b) indicating frost free periods greater than 150 days and growing degree days ranging from 1780 to 2060 days. Ratings for the valley floor are Class (1aF) due to cool air pooling which shortens the frost free period to between 120 and 150 days and lowers the growing degree days to between 1505 and 1780. Extended periods of winter temperatures below -15 C are highly probable. Precipitation gradually increases eastward from Pritchard, and early growing season irrigation may not be as critical for some crops as in areas further west.

Climate and soil conditions both provide the opportunity for the production of a wide range of agricultural crops. Production of winter hardy tree fruits is possible, especially in sloping areas above the valley floor. A substantial part of this section of the study area is occupied by the City of Kamloops and associated urbanization.

Section 5 contains about **29,070 ha** of Land Capability for Agriculture Class 1 to 3 (improved) lands with much as relatively large, contiguous areas. The major improvement required is the availability of irrigation.

Climate Capability Classification

Location	Growing Degree Days	Frost Free period (days)	Capability Classification
Section 5			
Kamloops Lake-Chase	1500- 2100	120 – 140	Generally 1b with 1aF near valley bottom

4.7 Section 6 - North Thompson River Valley to Little Fort

4.7.1 North Thompson River Valley from Kamloops north to Little Fort

This portion of the study area consists mainly of the floodplain and alluvial terraces of the North Thompson River and less commonly, the more gently sloping morainal and fluvial fan deposits along the valley margins. Elevations range from about 400 m in the south and 500 m in the north. The soils on the valley floor are moderately coarse to medium textured, usually stone-free, well to imperfectly drained and have gently undulating topographies. Surface textures are generally sandy loam, fine sandy loam or silt loam and grade to sandier subsoils. Temporary high water tables, related to the freshet season on the North Thompson River, occur in lower lying swales and, during high runoff periods, temporary flooding may occur in some locations.

The arable soils on the alluvial fans and morainal materials adjacent to, or on the valley walls are generally moderately or steeply sloping, well drained and often stony (especially in the subsoil). Surface textures vary from gravelly sandy loam or loam in the surface and grade to gravelly sand or gravel on the alluvial fan areas to gravelly loam where morainal materials dominate.

The soils are generally neutral in reaction in the upper layers; subsoils, especially those outside the floodplain areas, are often slightly to moderately alkaline. Fertilization requirements for good crop production should be determined by periodic soil sampling and analysis. Climate Capability for Agriculture of the valley bottom is mostly Class (1F) with a few favored areas rated as Class (1aF).

Frost free periods range from 90 to 120 days with growing degree days between 1310 and 1505. In a few favored areas (eg. near Little Fort), frost free periods extend to 150 days and 1780 growing degree days. The valley walls and adjacent sloping areas have mostly Class (1aF) climates since cool air pooling is not as prevalent here as in the valley bottom.

This portion of the study area is well suited for the production of most annual crops although temporary high watertables and potential flooding may either limit or preclude production of some crops during the freshet season. Hardy tree fruits and other perennial crops can be produced on most higher lying areas - stony conditions here may preclude in-ground crops such as potatoes, carrots and ginseng. Adequate irrigation is required although at the northern extremes it becomes somewhat less critical due to higher growing season precipitation.

There is about **13,000 ha** of Land Capability for Agriculture Class 1 to 3 (improved) lands in Section 6 of the project area. As in previous areas, irrigation is the dominant 'improvement' required, although dyking and watertable control is beneficial in limited areas as well.

Climate Capability Classification

Location	Growing Degree Days	Frost Free period (days)	Capability Classification
Section 6			
Kamloops – Little Fort	1300 - 1800	90 – 150	1F along valley bottom to 1aF in better sites.

4.8 Section 7 - North Thompson River Valley to Clearwater

4.8.1 North Thompson River Valley northward from Little Fort to Clearwater

This section of the study area is similar in landscape to the area further south, that is, mainly Thompson River floodplain and alluvial terraces on the valley floor with glaciofluvial terrace remnants, morainal deposits and alluvial fans along to lower valley sides. Elevations range from about 450 to 550 m. Soils in this area are more variable, however, with substantial areas of poorly drained, silty to clayey soils occuring on the valley floor in addition to well or imperfectly drained sandy soils. As well, rapidly drained sandy or gravelly soils on glaciofluvial terraces or alluvial fans occur at somewhat higher elevations adjacent to the valley floor. Flooding during the freshet season is likely in low lying parts of the valley bottom.

The reaction of the soils in this area generally ranges from near neutral in the south to moderately or slightly acid in the north, especially in the coarse textured soils. Periodic soil analysis is suggested for fertilizer management.

Climate Capability for Agriculture ranges from mostly Class (1F) in the southern part to intermixed Class (2F) and (1F) further north. ***Most cool season annual crops can be produced where poor soil drainage is not a limitation. Although growing season precipitation increases from south to north, supplemental irrigation is required on all the sandy and gravelly soils for good crop production.***

Extended cold winter temperatures are highly probable, therefore perrenial crops susceptible to these conditions are not suited. Dyking along parts of the North Thompson River is required to limit springtime flooding.

Section 7 contains about **2,740 ha** of Land Capability for Agriculture Class 1 to 3 (improved) lands. Irrigation is the dominant 'improvement' required to achieve the improved ratings although substantial areas require dyking and watertable control as well.

Climate Capability Classification

Location	Growing Degree Days	Frost Free period (days)	Capability Classification
Section 7			
Little Fort– Clearwater	1300 – 1500	80 – 1120	1F in most areas with 2F intermixed.

4.9 Section 8 - Lower Elevations of the Interior Plateau

4.9.1 Lower Elevations of the Interior Plateau, including the general vicinities of Knutsford, Barnhartvale, Stump Lake, Nicola Lake and Douglas Lake

These areas consist mainly of undulating, rolling or steeply sloping morainal deposits interspersed among higher lying, large, steeply sloping or hummocky rocky areas and narrow floodplain and glaciofluvial deposits along drainage channels. Elevations generally range from 600 to 900 m. Arable lands generally consist of discontinuous, undulating or rolling areas separated by steeply sloping and/or rocky landscapes or drainage channels. The soils are mainly well or moderately well drained, loamy in texture and variably stony. Subsoils are mostly gravelly loam or gravelly clay loam, compact, moderately to strongly calcareous and sometimes in lower slope positions, moderately saline. Much of the land surface has a thin eolian veneer of sandy to silty materials (usually less than 40 cm thick). Surface textures are generally sandy loam with varying gravel and stone contents depending on the thickness (or absence) of the veneer. The surface layer is generally dark brown or black in color and enriched with organic matter due to the ominant natural grassland vegetation. The soils on the floodplains of streams generally occupy narrow, sinuous locations along the stream margins and vary in texture from sandy loam to loamy sand, are variably gravelly and stony and well to poorly drained, depending on the elevation above the adjacent stream. The scattered areas of glaciofluvial deposits and alluvial fans are variably gravelly and stony, sandy in texture and well or rapidly drained.

The Climate Capability for Agriculture is generally Class (1F) or Class (1GF). Frost free periods vary between about 90 to 120 days while growing degree days range between 1300 and 1500. ***Most short season crops, and especially those that thrive in cool conditions, can be produced as can be most cereals and forages. Extended cold winter periods preclude perennial crops that are sensitive to these conditions, including most tree fruits.***

Natural precipitation may sometimes provide sufficient moisture during the early part of the growing season but supplemental irrigation is required after that to maintain good crop production.

Section 8, a large area, contains about **55,340 ha** of Land Capability for Agriculture Class 1 to 3 (improved) scattered among areas of lower capability. Irrigation is the main improvement required to achieve the improved ratings although stone removal is also required in some areas.

Climate Capability Classification Climate Capability Classification

Location	Growing Degree Days	Frost Free period (days)	Capability Classification
Section 8			
Nicola Lk. – Douglas Lk.- Stump Lk. – Trapp Lk. Knutsford	1300 - 1500	90 - 120	Generally 1F to 1FG.

4.10 Section 9 - Nicola Valley

4.10.1 Nicola Valley southward from Nicola Lake, including the Merritt Area and Lower Coldwater River Area

This section of the study area consists mainly of the relatively level, alluvial floodplain and terraces associated with the Nicola and Coldwater Rivers, gently sloping fluvial fans and areas of undulating glaciolacustrine deposits. At the outer margins, some arable areas of undulating or rolling morainal deposits rise from the valley. Elevations range between 550 and 650 m.

The soils developed on the alluvial terraces and floodplains are mainly moderately well or imperfectly drained, have sandy loam, loam or silt loam textures in the upper part and are generally stone-free. Subsoils are usually sandier than the surfaces and sometimes contain gravels. The soils are generally neutral to slightly alkaline in reaction.

Temporary watertables rise into the subsoils in low lying locations during the freshet season.

The adjacent higher lying areas of glaciolacustrine deposits have soils that are silty clay loam to silty clay in texture, moderately well to well drained and dense and compact in the subsoil. Surface layers are mostly neutral in reaction; subsoils become moderately alkaline and, sometimes, weakly saline. Loam or clay loam textures dominate where morainal deposits prevail. These variably stony soils are well drained with compact, moderately alkaline subsoils. Climate Capability for Agriculture ratings of mostly Class (1aF) or Class (1aFG) occur on the lower valley walls and non-floodplain areas above the valley floor. Frost-free periods range between 120 and 150 days while growing degree days vary between 1505 and 1780. The valley floor have Class (1F) ratings grading to Class (2F) in the upper Coldwater Valley due to cool air pooling which results in shorter frost free periods. Early growing season precipitation, particularily on the heavier textured soils which have high water holding capacity, may be sufficient for most crops but supplemental irrigation is required in all areas for good crop growth throughout the growing season.

Climate and soil conditions are generally well suited for a wide range of both annual and perennial crops, including some hardy tree fruits in protected locations above the valley bottom. Crops such as tomatoes and melons may be limited by inefficient heat units. Restrictions to ground crop development (eg. potatoes) is likely in the areas where soil textures are clayey and dense, and compact subsurface conditions exist. Those crops that are highly susceptible to temporary high water tables may not be well suited to the lowest lying parts of the Nicola and Coldwater River floodplains. The southern part of the Coldwater Valley is best suited for cool season crops because of diminished frost free periods and growing degree days.

There are about **8,430 ha** of Land Capability for Agriculture Class 1 to 3 (improved) lands in this section of the project area. Irrigation is the main improvement required to achieve the improved ratings although stone removal is also required in limited areas as is watertable control.

Climate Capability Classification

Location	Growing Degree Days	Frost Free period (days)	Capability Classification
Section 9			
Nicola Lake - Merritt	1500 – 1700	110 - 120	1F- 1aF
Merritt – Coldwater River Valley	1300 – 1500	100 – 120	1aF – 2F

4.11 Section 10 - Salmon River Valley

4.11.1 Salmon River Valley in the vicinity of Westwold

This portion of the study area consists mainly of large, gently sloping alluvial fan deposits of streams issuing from the adjacent plateau areas, relatively narrow floodplains and terraces adjacent to the Salmon River and discontinuous, somewhat higher lying glaciolacustrine deposits interspersed with gravelly terrace remnants. Elevations fall between 600 and 700m.

The soils on the alluvial fans are well drained, sandy to loamy in texture and more-or-less stone-free except at the fan apexes where variable stony conditions can occur. Subsoils are generally sandy and may contain gravels.

Soils on the floodplains and alluvial terraces are imperfectly to moderately well drained with loamy or silty textures and are generally stone-free. Temporary watertables in these soils may rise into the lower soil layers during periods when the adjacent river or streams contain high water volumes. The soils on the alluvial fans as well as those associated with the floodplains are mainly slightly to moderately acid in the upper parts and slightly acid or neutral in the subsoils.
The soils associated with the glaciolacustrine deposits are silty to clayey in texture, well or moderately well drained and stone-free. Surface layers are slightly acid. Subsoils are compact and dense with mostly neutral reactions.

Climate Capability for Agriculture ratings are mainly Class (1F) or (1FG) indicating frost free periods between 80 and 100 days while growing degree days range between 1300 and 1500. Although growing season precipitation is higher than in most of the other previously described sections, irrigation is still required for adequate crop production.

Soil conditions are generally suitable for a wide variety of crops. The relatively short frost free period and low growing degree days, however, limits cropping to cool season crops that mature rapidly and can withstand minor amounts of frost. Tree fruits are not generally suited nor are heat loving crops such as tomatoes, peppers and melons.

Section 10 contains about **2,990 ha** of Land Capability for Agriculture Class 1 to 3 (improved) lands. The availability of irrigation is the main improvement required to achieve the improved ratings.

Climate Capability Classification

Location	Growing Degree Days	Frost Free period (days)	Capability Classification
Section 10			
Westwold area	1300 - 1500	80 – 100	1FG – 1F

5 Agricultural Production Possibilities

5.1 Field Crops

Field crops[6] are produced generally on extensive areas as opposed to horticultural crops such as fruits and vegetables that are usually produced on smaller acreage. Potatoes and fresh corn are sometimes considered field crops, but for the purpose of this report they are considered vegetables.

Cereals such as wheat, oats, barley, rye, corn for silage, mixed grains, hay such as grasses (i.e. timothy, brome) and alfalfa (shallow or deep rooted) can be produced in most agricultural areas of the study area, exceptions occur when soils are subject to flooding as in part of section 3, 6,7.

Commercial forage and hay is responsible for much of the feed value for the livestock industry. Most grains and forage and fodder legumes and grasses produced in the study area are fed to cattle on the farm or ranch.

The 1995 Census of B.C. Agriculture Production reports some production of canola, dried field peas, fababeans, forage for seed and 1,166 acres of "other field crops" in the study area. Census data does not identify potential crops such as buckwheat, canary seed, flaxseed, mustard seed, soybeans, sunflowers, safflowers, sugar beets, lentils and triticale as part of the "other field crops".

5.1.1 Buckwheat

Buckwheat is a fast growing warm season, succulent, broad leafed annual that grows to a height of 2 to 4 feet. It is is highly frost sensitive, has a low water requirement, tolerates poor soil fertility and a wide range of soil pH. The crop matures in 75 to 90 days and requires about 1,180 growing degree days. Buckwheat is suited to Sections 1, 2, 3, 4, 5, 9 and 10.

It is ideal for use in crop rotations and is used in the production of pancake mix. Most buckwheat is exported to Japan where it is used to produce soba noodles. Other export destinations include the Netherlands, Germany and USA.

5.1.2 Cicer Milkvetch (Astragalus cicer L.)

This is a perennial legume with good grazing potential in both irrigated and dryland areas, is high yielding, bloat free, long lived, easy to grow, appealing to cattle, not appealing to pocket gophers and lacks serious disease or insect pests. This legume is scheduled for release from Agriculture and Agri-Food Canada (AAFC) at Lethbridge in 2000. It is suited for Sections 1, 2, non-seepage areas of Section 3, upper areas of Sections 4, 5, 8 and 9.

5.1.3 Fenugreek

Fenugreek is grown as livestock feed in Europe. In Canada it is said to produce excellent legume silage, yielding as much dry matter as two cuts of alfalfa and containing16 to 18 % protein. Cattle are said to become accustomed to it after 7 to 10 days. Fenugreek is an annual and could therefore be used in rapid crop rotations. Fenugreek is late maturing and should therefore be considered only in areas with a long growing season such as portions of Sections 1, 2, 3 and 5.

Fenugreek also possesses compounds that may be desirable for lactating dairy cattle, and contains compounds used in the manufacture of birth control

[6] A word of caution is in order for field crops and how they relate to small farm producers. Although certain parts of the study area have acceptable soil and climatic conditions for growing various field crops, and yields would certainly be acceptable, the profit margins per acre on most field crops are thin and the economics of producing most field crops directs their production to more extensive operations than those considered in this study. An important consideration in growing field crops is topography, where extensive amounts of flat or slightly rolling land is highly desireable. It is a matter that any producer in the study area should carefully examine before proceeding with a field crop. Farming these crops not only requires large acreages, but also requires expensive machinery, whose costs need to be spread out over many acres.

pills. It is also used as a spice and is used to produce artificial maple syrup flavour.

5.1.4 Fodder kale and canola

These are high protein forage crops identified by some researchers as worthy of more consideration. They provide forage well after frost, an advantage in areas with short growing seasons, such as those described in Sections 4 and 5.

5.1.5 Grass pea

Grass pea (Lathyrus sativus L.) or chickling vetch, is an annual creeping vine that is judged to have good potential as a ground cover alternative to summerfallow, helping to prevent wind and water erosion as well as adding nitrogen to the soil and as a future new pulse crop for low rainfall areas. Grass pea is used as a drought tolerant green manure crop. "AC Greenfix' produced at AAFC Swift Current has recently been released.

This legume has potential in Sections 1, 2, 3, and the terraces and southern portion of Section 4.

5.1.6 Industrial Hemp

Industrial hemp is an annual plant that can grow to five metres in height. Normal height under cultivation is between two to four metres. Male and female plants mature at different times although monoecious strains that mature at the same time are available. Fibre contains cellulose and lignin that is used as raw material in the cardage, textiles, paper and fibreboard industries. Oil extracted from seed can be used in paints, varnishes, cooking, burning and precision lubrication, as well as in cosmetics and medicinal uses[7].

Hemp grows best in a humid environment with temperatures between 14 ºC and 27 ºC but can endure greater temperature variations. It is usually planted when daytime temperatures average 10ºC. Seedlings are able to withstand – 8 ºC to - 10ºC while older plants tolerate frost of –5 ºC to - 6ºC for a short time. The plant grows best on well drained, neutral to slightly alkaline (pH 7.5 to 8) clay to silt loam with good moisture retention. Crop rotations with legume crops are suggested in production recommendations. Hemp seed matures in 100 to 130 days while fibre is usually harvested in 70 to 90 days after seeding.

Crops such as hemp, spelt, canola, peppermint and spearmint are better suited to the dry geographic areas described in Sections 3 and 5 as opposed to those in Sections 1 and 2 because the soils in Sections 1 and 2 have a very coarse texture.

Health Canada very tightly controls industrial hemp production. Only approved varieties may be planted. Pedigree seed may be required. Plantings of less than 10 acres are considered research plots. Larger acreage or a co-operative with more acreage could combine acreage to exceed the 10 acre minimum requirement. Cost to obtain all the approved papers is estimated at $300.

The BC Industrial Hemp Growers Association was formed recently. Its members are very optimistic about the outlook for hemp despite a general decline in demand for hemp products worldwide and the bankruptcy of the largest Canadian contractor (Consolidated Growers and Processors Inc. of Winnipeg) for industrial hemp in Manitoba.

5.1.7 Grass and shrub seed production

Native grasses are not generally considered to be as productive as improved European imports of fescues, orchard grass, timothy etc. but are said to outperform the new grasses in marginal climate areas. Several native wheatgrasses have been selected at prairie stations of AAFC for forage purposes.

Native grass seed selections and shrubs are used in reclamation, riparian, right of way and other projects. Examples of native grasses include: bluebunch wheatgrass (Agropyron spicatum); blue wildrye (Elymus glaucus) ; junegrass (Koeleria macrantha); bluejoint (also known as western wheatgrass) (Pascopyrum smithii ; pinegrass (Calamagrostis rubescens); northern wheatgrass (Agropyron dasystachyum); various types of brome, various fesques. Shrubs may include some of the following Mallow Ninebark (Physocarpus malvaceus) ; chokecherry (Prunus virginiana); common rabbit brush (Chrysothamnus nauseosus) ; big sagebrush (Artemisia tridendata); snowbush (Ceanothus velutinus); redstem ceanothus (Ceanothus sanquineus).

[7] Perhaps the most in-depth, publicly available report on industrial hemp in BC is A Vision for the Future: Industrial Hemp in the Okanagan-Boundary Region, Larry J. Olson and Associates, Science Council of BC, December 1998. A fact sheet on industrial hemp from BCMAFF (authored by Kamloops-based Al Oliver) is available on its web site.

Other grasses used for reclamation, riparian, right-of-way and other projects may include crested wheatgrass (Agropyron cristatum) known as the Fairway type and (Agropyron desertorum) called the standard type, Smooth bromegrass (Bromus inermis); Kentucky bluegrass (Poa pratensis) ; species and others.

Most described study area Sections are suited to grass and shrub seed production with the exception of those with high water tables during part of the year, such as portions of Sections 3, 6, and 7.

5.1.8 Peppermint and Spearmint

The end product of mint culture is oil production. The oil is extracted from the leaves by steam distillation. Peppermint oil is used to flavour chewing gum, candy, toothpaste and medicine. Spearmint oil is used to flavour similar products but is mostly used to flavour toothpaste and chewing gum.

Both types of mint can be grown on poorly drained or mineral soils. A soil pH range of 6.5 to 7.5 is preferred.

Soils must be well drained, light textured, friable and high in organic matter. Mint needs 15 hours of bright summer days for good growth and clear sunny weather as the crop approaches harvest. Mint is a shallow rooted crop with a high demand for water although well managed irrigation can produce a root system to the 60 cm depth. Peppermint and spearmint is suited to the same areas as industrial hemp.

It is cut and windrowed much like alfalfa for harvest. Specialized equipment to facilitate drying is available. Specialized equipment needed to grow and distil the mint is expensive and generally have few other uses on the farm.

Major mint producing states are Washington State (Yakima Valley) and Oregon State (Willamette valley, but also in eastern Oregon). Both peppermint and spearmint and other types of mint are also produced in Wisconsin, Michigan, Indiana, Montana and Idaho. A US Government marketing order established in 1980 controls oil marketing and sales in the Pacific Northwest including western Wyoming and Utah. Information about mint production for oil extraction is carefully guarded and protected in the United States.

Some trials in Alberta and Saskatchewan indicate that the stolons require winter protection in some years. Experimental plantings in Vernon and Armstrong in the early 1990's demonstrated that it is possible to produce high quality peppermint oil in these areas.

5.1.9 Spelt

Spelt is a type of wheat used as a source of flour for bakery products. It is marketed primarily as an organic health food. The plant can generally be grown in all areas where wheat is produced.

It is a winter annual, subject to winterkill if exposed. Not resistant to leaf rust, powdery mildew or loose or stinking smut and bunt, it has the same insect pests as wheat. A new variety of winter spelt (Champ) having good resistance to leaf rust and wheat streak mosaic virus but only moderately resistant to powdery mildew, has been developed at the Ohio Agriculture Research and Development Centre. There is a Spelt producers group in the North Okanagan.

5.1.10 Sweet white Lupines (Lupinus species)

Selections of lupines that are free from toxic alkaloids have been developed and could be used as a substitute for soybean meal. Sweet white lupine is high in protein (32 – 38 %). The seed can be fed to turkeys, calves, lambs, swine. Lupinosis can develop in cattle when they graze lupine stubble. Lupine meal is not suited for dairy cattle or swine. A speciality market has been developed for lupine flour, lupine pasta and hulls for dietary fibre for human consumption in the USA. Lupines are a cool season crop and are relatively tolerant to spring frosts up to -9ºC.
Temperatures greater than +29ºC during flowering may cause the plant to abort its flowers. Lupine requires about 115 days to mature and well drained soil, such as coarse to medium coarse textured soils.

5.1.11 Triticale

Triticales are wheat - rye hybrid crosses grown primarily for animal feed as either grain or forage crop. Triticale is not generally used as a substitute for wheat in baking if wheat is available although blending of triticale with wheat does sometimes

occur. Triticlale is adapted to drought and cold; has a wide range of disease resistance and is adapted to a wide range of soils including acid soils; has the ability to produce high biomass and regeneration under relatively cool conditions and is useful as a grain crop or forage crop for non gastric animals. Spring triticale in Alberta has a 6 to 15% yield advantage over wheat. Triticale has a somewhat longer growing season compared to wheat.

Triticale is suited to Sections 1,2 and portions of Sections 3, 5, 8, and 9.

It is used as a cover crop to control soil erosion in South Africa and in mine reclamation sites in Czechoslovakia.

5.1.12 Winter Hardy Orchard Grass

These perennials provide forage in areas with a short growing season. Hardiness is a consideration as is the nutritional value of the grass. Several suitable selections are available.

Winter hardy orchard grass is suited to Sections 1, 2, 8, 9, and 10.

5.1.13 Yellow and Oriental Mustard

These are short seasoned crops that mature in about 90 to 95 days and are appropriate for well drained soils. Seedlings are somewhat frost tolerant. Oriental mustard is fairly drought tolerant. These mustards are well suited to Sections 1, 2, 3 and the upper portion of Section 4.

Yellow mustard is predominantly used in the preparation of hot dog mustard and also as a binding agent in processed meats and Oriental mustard is predominantly used in hot mustards and condiments.

5.2 Fruits and Nuts

Fruit and nut crops are the sixth most valuable agricultural commodity in British Columbia. Statistics Canada (1996) reports that the study area contains approximately 248 acres of commercial tree fruits and nut bushes and 36 acres of various berries and grapes. Predominant tree fruits reported are apples (150 acres) followed by apricots (14 acres), sweet cherries (13 acres) and sour cherries (15 acres). In Appendix 3 is a table showing the commercially grown crops in the study area and some of their acreages for 1986, 1991, and 1996.

Berry crops are predominately strawberries (16 acres), raspberries (9 acres) grapes (3 acres) and other berries. General crop requirements for all fruit crops include well to moderately well drained soils, adequate fertility and irrigation.

Most fruit crops can be produced on soils with pH's between 5.5 and 8, but blueberries require a soil with a pH that is lower than 7.0. Sites protected from severe winter cold and winds are most suitable for fruit and nut crops.

Winter hardiness of all fruit crops is of concern in the study area although Sections 1, 2, 3, 4, and 5 and a portion of Section 9 would appear to be the best suited.

Geographic areas best suited to the production of hardy berry crops include portions of Sections 1, 2, 3, 4, and 5 and selected areas in Section 9.

There are many hardy fruit varieties available from central British Columbia, the Prairie Provinces, Quebec, and colder areas in the United States. Many of these fruits are untested in the study area but should be suited to some areas.

BC Berry, Grape, Kiwi, Nut and Tree Fruit Production and Values (1998)

Commodity	Ranking by Commodity 5 yr. Average sales (1993-97)	Total Sales in 1998 Quantity '000 lb.	Total Sales in 1998 Value $ '000
Blackberries	9	123	159
Blueberries	3	34,164	23,154
Cranberries	2	50,500	28,395
Currants, Black	10	100	82
Currants, Red	12	43	47
Grapes	4	21,669	15,586
Hazelnuts	7	1,156	766
Kiwifruit	8	555	328
Loganberries	13	10	19
Raspberries	5	28,522	12,358
Strawberries	6	8,840	8,740
Other Berries	N/a	502	404
Tree Fruits	1	476,004	54,716
Total BC		622,188	144,754
Source:			

5.2.1 Blackberries

Blackberries and raspberries require similar soil conditions. All blackberries harvested in the province are sold as fresh fruit. Provincially, they are the 73rd most valuable crop. There are many blackberry varieties, some are thornless. Blackberry hybrids vary in hardiness but require mild winter temperatures and are therefore not generally suited to the same areas as other berry crops. Selected microclimates in the study area may permit some commercial production.

5.2.2 Blueberries, both highbush and mid bush

Blueberries are the 20th most valuable crop in the province, fresh fruit sales in 1998 totalled 16,764,000 lbs., valued at $12,714,000.

They require soils that are at least moderately well drained and hold adequate moisture during the summer months. Growing season watertables 30 to 60 cm beneath the soil surface is best. A drainage system combined with raised beds will permit the production of blueberries where the water table fluctuates to within 30 cm of the surface. Blueberries can be grown in areas of high or moderate suitability for McIntosh apples and areas where strawberries and raspberries can be grown, provided soil acidity is adjusted (if required) to a pH range of between 5.0 and 7.0 and suitable varieties are selected.

Census data indicates that blueberries are not commercially produced in the Thompson–Nicola and Squamish–Lillooet Regional Districts.

Recent discoveries that blueberries have the highest antioxidant level of over 40 fresh fruits and vegetables are expected to increase demand for this fruit. Hardy varieties are available.

5.2.3 Currents, both black and red

Black currents are the 72 nd most valuable crop in BC. In 1998, 2,000lbs. of black currants, valued at $1.85 per lb., and 13,000 pounds of red currants, valued at $1.85 per pound, were sold from farm and roadside stands; an additional 30,000 lbs. of red currents valued at $1.03 per pound were sold as fresh fruit to the wholesale trade.

Both types of currents are better suited to heavier textured soils than to light textured soils but will grow on a wide range of soils.

Black current juice is making a positive impact on the market as people become more familiar with this product. Hardy varieties of both types of currents are available.

5.2.4 Grapes

A total of only 3 acres of grapes are reported in production in the study area. Grapes were at one

time produced in limited quantities in the Lillooet – Lytton area and in parts of the Thompson–Nicola area (near Ashcroft) and in Salmon Arm. Old varieties for the fresh market have been grown in Salmon Arm since 1905. Cold winters in the Ashcroft area and poor site selection, cold winters and wind damage has hindered expansion in the Lillooet–Lytton area.

There is currently one winery in the study area. This winery makes wine from fruit other than grapes.

There are many grape varieties that are hardy under the climate conditions in Minnesota and North Dakota, although most are not available in Canada. Some that are available and are reportedly hardy in Saskatchewan but have not been evaluated in this area include Alpha, Beta, Valiant, Dakota, Svelter and Hungarian. Of these Beta and Valiant are the most hardy and are reportedly grown in central British Columbia for jam, juice and jelly production. Production of these hardy grape varieties is generally suited to Sections 1 and 2 and selected areas of Section 3, 5 and 9.

Grapes are a heat loving crop, sensitive to climatic and soil conditions. Areas with a short growing season and/or a high frequency of low winter temperatures are not suited to most grape varieties but may be suited to exceptionally hardy selections. Minimum climatic requirements for traditional grape production generally include (1) a frost free season that is greater than 150 days (but hardy varieties suited to shorter growing seasons are available); (2) sites that accumulate more than 945 growing degree days; (3) frequency of occurrence of -1 ºC by October 10 is less than 50 percent; (4) traditional varieties require that the probability of having extreme minimum mid winter temperatures less than –25 ºC is 10 percent or less but hardy less traditional varieties are available that tolerate much colder temperatures.

Grapes grow best on soils which (1) are well drained (either naturally or artificially); (2) do not have a water table within 2 m of the surface; (3) have no restrictions to root development within the surface one metre; (4) are mineral soils; (5) have a soil pH between 6 and 7 (some will tolerate higher pH; (6) are not saline; and (7) have zero to moderate levels of free carbonates in the surface one metre

5.2.5 Gooseberries

Gooseberries have similar requirements as currents. Statistics for gooseberry production are not available. Hardy varieties are available.

5.2.6 Nuts

Hazelnuts are the 61st most valuable crop in BC.

Filberts (hazelnuts) may be grown in various parts of the study area and have similar soil requirements to those of grapes and tree fruits. Hazelnuts are the major type of nuts produced in BC. Approximately 24,000lbs. valued at $1.25/lb. was sold via roadside sales in 1998. Hardy varieties are available and are suited to the same geographic areas as hardy berry crops.

5.2.7 Raspberries

Raspberries are the 13th most valuable commodity in BC. Fresh fruit sales in 1998 totalled 1,222,000 lbs., valued at $1,435,000 ($1.17/lb.) while processed raspberries totalled 27,300 lbs. and were valued at $10,920,000.

Raspberries are deep rooted and sensitive to "wet feet" and therefore require at least 100 cm of unrestricted rooting depth. Hardy raspberries and fall fruiting (primocane) raspberries are available.

5.2.8 Strawberries

Provincially strawberries are the 26th most valuable commodity. Statistics Canada reports that approximately 16 acres of strawberries in production in the study area in 1995. Province-wide, fresh, wholesale plus roadside sales in 1998 totalled 3,940,000 lbs. valued at $5,360,000 ($1.36/lb.).

Strawberries are shallow rooted crops and require moderately well- to well-drained soils with at least 50 cm of unrestricted rooting depth. Protected areas and areas with good snow accumulations may help to protect against severe winter damage. There are other production techniques that assist in winter protection and promote earliness. Varieties hardy for the study area are available.

5.2.9 Tree Fruits

Tree fruits are the province's 7th most valuable crop. Census data for the study area records 150

acres of apples planted plus, 14 acres apricots, 13 acres sweet cherries and 15 acres of sour cherries. Tree density per acre in the study area is substantially lower when compared to the Okanagan–Similkameen reporting area.
Fruit tree production in the study area was significant at one time.

Areas with a short growing season and/or a high frequency of low winter temperatures and/or spring frosts that occur after the trees begin to grow and blossom are not suited to tree fruits. Tree fruit varieties commonly produced in the Okanagan–Similkameen region have limited suitability in the study area due to its cold winters.
Hardy apple, apricot, sour cherry, plum and pear trees are available from Prairie provinces and central British Columbia. Many of these are suited to fresh markets but may need to be promoted if the consumer is not familiar with the varietal names. Some are not suited to a fresh market, but are suited to on-farm processing into a wide range of products that provide added-value.

Cultivars of apples, sour cherries, plums and pears have been evaluated and grown at Beaverlodge, Alberta and at the Crop Diversification Centre North in Edmonton and may be suited for the study area.

Soils that are sandy to silty in texture, free from water to at least 100 cm, have slopes of 20% or less, are non-saline, have a pH less than 8.5 and contain less than 50% coarse fragments are generally suited for hardy apples and most other tree fruits.

Geographic areas suited to hardy fruit tree production include Sections 1 and 2 and portions of Sections 3, 5 and 9.

There is study area potential for production and processing of sour cherries into jam, pie filling and syrup. Sour cherry varieties are grown in climate zones that have only 120 frost free days and where winter temperatures reach as low as – 40C. The use of hardy rootstocks and other production techniques are used to promote hardiness.

5.2.10 Saskatoons

Saskatoons are native to the Yukon, Northwest Territories, Canadian Prairies, Interior of British Columbia, and the northern plains of the USA. There is interest in utilizing saskatoons as a commercial fruit crop, approximately 500 hectares are planted in Saskatchewan and Manitoba. Most of the profitable acreage of saskatoons is planted near urban centres. In Manitoba, saskatoon berry production is the second largest commercial fruit crop, second only to strawberries.

Saskatoons will grow over a wide range of soils but appear to grow best in soils that are well drained, are sandy loam or similar soil type, and have a suitable climate.

Commercial production of Saskatoon berries was reported in British Columbia in 1995 and 1996. BC Farm Statistics for 1997 reports 502,000 lbs. of "other berries" sold on the farm and roadside stands and valued these at $928,7000 ($1.37/lb).

5.2.11 Chokecherries

Chokecherries are another of the native fruit crops under intensive study and consideration for commercial production on the prairies. Many clones have been evaluated and the top clones out of 20 under investigation have been released for planting in Saskatchewan and Manitoba.

5.2.12 Hardy Kiwifruit

Hardy kiwifruit usually requires a 150 day or longer frost free season. When fully dormant hardy kiwi are reported to tolerate temperatures as low as -25º C, however, temperatures this low must be reached slowly. Areas with late spring frost should be avoided. Hardy kiwifruit prefer soils with a pH of 5 to 6 but will grow on soils with a pH of 7 but may show signs of nitrogen deficiency. Soils must be well drained, but irrigation water must be provided.

It requires a trellis because they are climbing vines. Vines of kiwifruit produce either male or female flowers. Vines of both sexes are required to produce a crop. Its fruit is generally fuzzless and the size of a large grape. The Cordifolia variety ripens earlier than the Anansasnja variety; other varieties are available.

5.3 Vegetables

Vegetables are the province's 5th most valuable agricultural commodity exceeded only in value by dairy products (1), poultry and eggs (2), floriculture and nursery (3), cattle and calves (4), and are followed by fruit (6), grains, oil seeds and seeds (7), hogs (8), forest products (9) and miscellaneous products (10), such as furs, wool, honey and lambs.

There are more than 60 types of vegetables grown commercially in British Columbia and more than a third are commercially produced in the study area. Eighty percent of the province's field grown vegetables are produced in the Fraser Valley.

Vegetables are successful over a wide range of climate conditions and on a wide range of soils provided suitable varieties are chosen and soils are well prepared and maintained, and are at least moderately well drained (i.e. the watertable is at least 50 cm below the soil surface).

Vegetable crops such as potatoes, carrots, turnips, onions, garlic, parsnips and other root crops are preferably produced in sites where stones offer slight to no hindrance to cultivation and harvest. Root vegetables are better suited to soils that have a water table at least 75 cm below the soil surface. Root crops are better suited to soils in Sections 3, 5, and 6.

Successful production of annual, non-leafy vegetable crops such as beans, lentils, peas, pumpkin, various melons, cabbage, broccoli, tomatoes and peppers is possible on soils containing up to 50 percent coarse fragments (greater than 2 mm). Heat loving crops such as corn, garlic, melons, peppers and tomatoes are best suited to Sections 1, 2, 3, 5 and 9.

Annual leafy vegetables with lower heat requirements such as lettuce, celery, leeks, spinach, Swiss chard, radish, celery and other salad greens, as well as carrots, cauliflower, pickling cucumbers, beets and pumpkins are rather tolerant to shallow water tables during the growing season and can be produced on organic or mineral soil deposits. These crops are better suited to cooler climates, which are found in portions of Sections 3, 4, 5, 6, 7, 8, 9 and 10.

Asparagus is a deep-rooted crop that is best produced on deep, well drained, loamy or sandy soils. It is also more tolerant of soils with a pH range between 7 to 8. Soils and climate are better suited to asparagus in Section 5.

The use of plastic tunnels to advance the season is common in other areas for the production of various melons (such as cantaloupe, watermelon, honey melon, pumpkin, marrow, squash, eggplant).

Vegetable production of speciality products such as baby vegetables for the ready to use markets (e.g. baby carrots, corn, beets, cherry and roma tomatoes, leeks, squash, spinach eggplants), exotic greens (curly cress, pink cress, dandelion greens, various types of lettuce such as Escarole, Frizee, Red/Green Oak leaf, red/green romaine, red/green leaf) may provide added opportunities.

Despite British Columbia's diverse population mix, the standard vegetables appear to be the predominant ones produced in the province, with the exception of some non-traditional vegetables, such as daikon radish, bok choy and escarole. Total sales in 1998 rank field vegetables by value in the following order.

BC Field Vegetable Production Ranked by Value (1998)

Rank	Commodity	Total sales		
		Acres	Quantity '000 lb.	Value $'000
1	Potatoes	5,703	121,670	22,256
2	Carrots , bunched	190	4,095	1,739
	, topped	488	17,088	4,198
3	Corn	2,758	27,815	5,435
4	Lettuce, head	380	10,121	2,829
	, leaf types	373	6,036	1,339
5	Broccoli	1,265	7,564	3,001
6	Cabbage		16,282	2,889

Rank	Commodity	Acres	Total sales Quantity '000 lb.	Value $'000
7	Squash, marrow and pumpkin	597	14,935	2,697
8	Onions, bunched	114	2,341	1,064
	, fall seeded	13	275	94
	, spring seeded	315	11,040	2,270
	, silverskins	9	160	128
9	Peas, shelled	2,065	10,140	2,434
10	Brussels sprouts	564	6,318	2,227
11	Cucumbers, slicing	133	1,887	1,887
	, pickling	185	2,760	2,760
12	Other Vegetables	458	10,182	1,973
13	Beans	1,297	8,598	1,951
14	Chinese vegetables	159	4,786	1,880
15	Cauliflower	550	3,902	1,522
16	Peppers	311	3,005	1,380
17	Tomatoes	203	3,654	1,179
18	Rutabagas	139	4,960	1,119
19	Spinach	148	1,924	1,112
20	Parsley	58	559	968
22	Asparagus	307	641	940
23	Beets, bunched	45	425	177
	, topped	112	2,250	717
24	Garlic	70	320	566
25	Melons	109	1,360	560
26	Rhubarb	95	1,520	555
27	Zucchini	91	1,159	516
28	Parsnip	32	812	500
29	Peas, pod	90	345	270
	, shelled	2,065	10,140	2,434
30	Celery	32	910	216
31	Radishes	90	578	201
	Total B.C. Field vegetables	20,163	312,417	74,916

5.3.1 Greenhouse Production

BC greenhouse (hothouse) production of crops is expanding. Greenhouses can produce 15 to 20 times more product per unit area than field grown crops. Production is dependent on the availability of bright sunshine during the winter months plus economical power (three-phase power and natural gas or another source of heat).

The location of greenhouses is not soil dependant, however, greenhouses should not be located in areas that are subject to flooding such as portions of Sections 3, 6, and 7 and should be located in areas where there is a maximum amount of natural light during the winter months.

Approximately 80% of the province's floriculture (including potted plants, foliage plants, bedding plants and flowers) and 80% of the provincial greenhouse vegetable production (tomatoes, sweet bell peppers, hot peppers, long English cucumbers, butter lettuce, herbs, spices, eggplant, sugar peas and melons) are located in the Lower Mainland. Expanded production of greenhouse tomatoes, peppers and cucumbers in the study area is feasible in co-operation with the Interior Vegetable Marketing Agency Co-operative. Provincially, the total value of greenhouse vegetable production in 1998 was $96 million of which greenhouse (hothouse) cucumbers were valued at $13.8 million; greenhouse tomatoes were valued at $44 million and other crops (mostly sweet and hot peppers but also includes crops other than lettuce) were valued at $35 million.

There is a growing market for locally produced greenhouse crops including, roses, geraniums, chrysanthemums, poinsettia, freesia, gerber, azaleas and other houseplants and garden plants.

Greenhouse Production Sales ($, 000) Compared to 75 other BC Agricultural Commodities

Rank	Commodity	1993	1994	1995	1996	1997	1993-97 Ave. Sales
4	Floriculture	122,116	128,310	140,122	178,760	174,932	142,327
16	Sweet Pepper	17,104	20,540	27,218	24,686	29,919	22,387
18	Tomatoes	13,537	16,804	17,340	27,440	28,896	18,780
23	Cucumbers	9,888	9,933	10,573	11,283	13,536	10,240
45	Lettuce	2,074	1,401	2,025	1,922	1,923	1,856

5.4 Other Production Possibilities

5.4.1 Mushrooms

Mushrooms are the provinces 10th most valuable crop (1998 total sales value $ 50,618,000 consisting of the sales of 35,300,000 pounds to the fresh market at $1.06/lb. and sales of 16,500,000 lb. at $0.80/lb. to the processing market). 1993-97 average sales value was $ 34,488,000.

Almost all mushrooms are produced in the Lower Mainland. The BC Mushroom Marketing Board regulates all mushroom production in British Columbia including the production and sale of the traditionally cultivated button mushrooms (Agaricus bisporus) as well as specialty mushrooms, such as enoki, maitake, pompon, shimeji, wine cap, oyster and shiitake. A license from the Marketing Board is needed to produce and sell mushrooms and levies are paid on volume of product that is sold.

Mushrooms are currently produced commercially outside the Lower Fraser Valley but not in the study area. Mushroom production is not dependent upon agricultural lands. Producers require three-phase power and/or natural gas, meaning that they usually must be located near a large population centre.

Compost for mushroom production (Agaricus bisporus) is purchased from specialised producers in the Lower Fraser Valley, a tranportation cost issue for any Interior grower. This removes the requirement to produce compost on-site and the odour concerns that may accompany mushroom compost production. Spawn is a mixture of mushroom spores and cereal used to inoculate mushroom compost for mushroom production. It has no odour and could be produced on-site, or could be purchased from specialty producers. Spent mushroom compost is sold for use as a soil conditioner.

5.4.2 Nursery Crop Production

Nursery crops are the 6th most valuable crop in BC, 1998 value of $92,300,000 and 1993-97 average sales value of $70,256,000.

British Columbia is the second largest producer of nursery stock in Canada. The nursery crop industry is comprised of retail and wholesale producers of a wide selection of plants including annual and perennial plants (e.g. trees, shrubs, forest seedling, heracious perennials), water plants, dried plants, plant material distributors and brokers and landscape nurseries which produce may different types of crops.

Crops may be grown in fields or in pots placed on fields, or in combinations of field and pots, and greenhouses and hoop houses. In-ground nursery crops generally tolerate a wide selection of soil textures and slopes and are suited for a wide range of locations. Above ground nursery crops in containers require winter protection through sawdust mulch or temporary hoop houses.

Nurseries that use greenhouses require three phase power and/or natural gas. There is a growing interest in native plant material referred to as native botanicals for use in landscaping, reclamation projects and for medicinal purposes.

5.4.3 Commercial Dried Flowers

Dried flower (everlasting flowers) production is a new industry driven by changing interior design trends that has resulted in increased consumer demand. Dried flower production offers a value added opportunity for producers that want to process their crop and market it to wholesalers,

florists, interior designers, real estate companies, bouquets, pot pourri and other retail markets. Each type of flower has its own special drying requirements and time will be needed to research markets and drying techniques.

The most popular dried flowers in this industry in Saskatchewan are annual statice, larkspur, strawflower, Gypsophila, yellow statice and German statice. In Alberta, annual statice, strawflowers, larkspur, peonies, Gypsophila, German statice, yellow statice, sea lavender statice, Xeranthemum annum are popular items. Information about the BC dried flower industry is lacking.

5.4.4 Honey Bee Production

Honey ranks 35th in value in a list of 75 commodities, 1997 value of $5,406,000 and 1993-97 average sales value of $4,216,000. There were 2,200 registered beekeepers in BC in 1997 who operated between 45-50,000 hives, and 300 commercial honey producers who produced the majority of the provincial honey.

Honey bees produce honey, bee pollen, royal jelly, bee wax and propolis and are essential for crop pollination. Honeybees are overwintered in protected and warm sites and are then transported to other areas when they are needed for pollination and the production of honey.

5.4.5 Aquaculture

The aquaculture industry is the fourth largest Agri – food industry in British Columbia, exceeded in value only by dairy, floriculture, nursery and poultry. The farm gate value of the entire industry in 1998 was $238 million up from $186 million in 1997.

Trout farms and other aquaculture operations operate all around the province, with the major concentrations on Vancouver Island, lower Fraser Valley and the Thompson River/Okanagan Lake area. The total provincial number of commercial freshwater finfish aquaculture grow-out and U-Catch-Em operations that were licenced in 1999 was 105, up from 99 in 1998.

The provincial government regulates aquaculture and a license is required to become a commercial aquaculture operation. A license is not required to raise species for one's own personal use.

Aquaculture operations take the form of commercial trout or Artic char production or aquatic plant production, or fish farms with fee fishing for tourists (U-Catch-Em). On-farm processing of fish or fish products (e.g. production of smoked fish products) diversifies the business.

5.4.6 Herbs and Spices

Herbs and spices are plants that are used for a variety of purposes including landscape, culinary, cosmetic, medicinal, industrial, decorative and aromatic purposes. Canadian production of herbs and spices is centred in Manitoba, Saskatchewan and Alberta although some herb production occurs in British Columbia.

Producers of herbs and spices must know the scientific name of the plants they want to produce. Common names are used in this text to simplify the discussion, but proper scientific (Latin) names consisting of the genus and species must be used to ensure that the correct plant is used. Listings of common herbs and their Latin names can be obtained from various web sites through the Internet.
The British Columbia Herb Growers Association web site (www.bcherbgrowers.com), American Botanical Council (www.herbalgram.org), Canadian Herb Society, International Herb Society (www.iherb.org), Saskatchewan Herb & Spice Association and many other sources of information are very useful.

Herb and spice production in Canada includes, but is not limited to angelica, anise, borage, caraway, coriander, cumin, dill, echinacea, evening primrose, fenugreek, feverfew, ginseng, goldenseal, milk thistle, mint, stevia, St. Johns' wort, valerian and yarrow. Members of the British Columbia Herb Growers Association produce more than forty- four different herbs including angelica, astragalus, basil, black cohosh, blood root, catnip, chamomile, echinacea, feverfew, garlic, ginko, ginseng, goldenseal, lavender, lemon balm, mugwort, rose, sea buckthorn, St. John's wort, wormwood and others.

Most of the common herbs are sold as fresh product. Some greenhouse production is used for

year round supply. Constant quality and consistent quantity and limited shelf space is of concern to herb producers. Herb and spice production is more labour intensive than cereal crops and requires significant amounts of time to market the crop.

Spices are usually crops whose seed is used, but other parts of the plant such as flowers, bark and root may also be used. Spices are usually used as food or to flavour beverages. Examples of spice crops are caraway, coriander, dill, mustard, cumin, fenugreek, rosemary, sage, summer savory, thyme.

Herbs are usually produced on a smaller scale. Flowers leaves, stems and roots may be grown and processed for culinary, cosmetic, industrial, medicinal, landscaping, decorative and fragrance purposes.

Culinary uses of herbs may be as fresh herbs, or as processed herbs as dried or powdered products. Herbs such as anise, basil, borage, chives, dill, fennel, garlic, oregano, rosemary or tyme are used in cooking. Herbs such as lemon balm, anise hyssop are also used as teas.

Aromatic herbs are usually used for the production of essential oils. Examples include dill, caraway, coriander, spearmint, peppermint, Scotch mint, horse radish, garlic, monarda, fennel, fenugreek, summer savory, sage, tarragon, chives, anise-hyssop, parsley, basal and others.

The essential oil industry in Canada is considered by many to be in its infancy. The long term success of most of these aromatic herbs in Canada and British Columbia is still to be determined. Extraction of essential oils from herbs, hemp seed, and the production of extracts from various fruits and other products require expensive equipment and a continuous supply of raw material.

Medicinal or neutraceutical herbs are those used for the extraction of compounds that have medicinal or nutritional properties. Nutriceuticals may come to consumers as foods, pills, and powders. "Functional foods" or "pharmafoods" are terms used to describe products that have physiological benefits or that decrease the incidence of chronic diseases. Examples include fibre in wheat bran, oat bran, barley, lentil, dried common beans, peas. Canola oil, flaxseed, soybean, chicory, Jerusalem artichoke, barrage, evening primrose and sea buckthorn are examples of products and plants that are said to provide health benefits.

5.4.7 Medicinal plants

There are over 130 different medicinal plants including plants such as ginseng, echinacea, sea buckthorn, , golden seal, St. John's Wrote, feverfew, ginkgo, stevia, plantain, sage, tyme, catnip, chamomile, dandelion, lemon balm, mugwort, garlic, rhubarb root and others, as well as mint (over 100 different types) and native plant material such as tall Oregon grape; horsetail; milk weed, nettles, dandelion; yarrow and many others. There are over 20 medicinal plants grown for commerce in Canada. Of these ginseng, evening primrose, comfrey and echinacea (3 species) are in over-supply.

Most medicinal plants are suited to well drained soils with neutral soil pH and a few are suited to soils with a pH as low as 4. Most medicinal plants are perennials that are hardy to plant hardiness zones 3 and 4 as described by Plant Hardiness Zones in Canada map, 1991 updated 1998.09.12. Plant hardiness zones in the study area range from zone 3 to zone 6.

Shade structures are required for ginseng and a few other medicinal plants. Most medicinal plants grow well in full sun.

The global market for garlic as a nutritional supplement exceeds $ 100 million. The increasing public awareness of the seasoning and health benefits of garlic are expected to continue the increasing demand for garlic as well as other medicinal plants.

Ginseng, goldenseal and echinacea species are primarily valued for their roots and require 3 to 4 years before the roots are harvested (echinacea flowers are harvested in the 2nd and 3rd year as well).

These crops therefore would preferably be grown on sites with little or no gravel or stones in the soil that would interfere with harvest. Unlike ginseng, echinacea and goldenseal can be replanted in the same site after harvest.

Markets for medicinal herbs are an international market with demands that fluctuate wildly as buyers' worldwide try to secure yearly supplies.

Local buyers have not generally received the volume or quality they need for their markets from local producers. A good business plan and market research and marketing skills are required for the successful production and sale of medicinal herbs. Buyers of medicinal herbs and roots may want these to be produced by organic methods. Pesticides needed to control pests in these crops have not yet been registered.

5.4.8 Ginseng

BC's acreage in ginseng increased from approximately 1,200 acres in 1993 to 2,600 acres in 1997. Production during that time went from 534,000 lb. to 1.2 million lbs. The value per pound also changed from $42/lb in 1993 to $18/lb in 1997 and $14/lb in 1998. Total crop value in 1998 was $22,400,000.

Ginseng is a hardy crop and can be grown in most areas provided there is about 25 cm of relatively coarse fragment free surface soil and the watertable is at least 60 cm below the surface.

5.4.9 Sea Buckthorn

This is a hardy shrub and is adapted to sites with gravelly or stony soils, but not to areas that are wet.

It is a relatively new crop and its oil, found in the seed and the fruit, is used in the cosmetics industry. The leaves are suitable as feed for livestock. It is also used as a shelterbelt plant.

Sea Buckthorn has low moisture requirements and adapts to a wide range of soils but does not like "wet feet". Its seeds need to be mechanically harvested.

5.4.10 Stevia

Stevia rebaundiana is one of 300 species of Stevia plants. The leaves of this particular species contain glycosides that are 10 to 15 times sweeter than sugar.

Stevia has the potential to replace all of the artificial sweeteners on the market today, has no calories, does not raise blood sugar levels, is fluoride compatible but does not cause tooth decay and is stable when used in cooking. Stevia is used as asweetener in Japan where more than 700 tons of this sweetener are consumed annually.

Stevia could be grown as an annual transplant in warm to hot areas of the study area with light textured soils (Sections 1, 2, 3, 5, and 9). The extraction of the glycocides from Stevia is a patented process.

Royal Sweet apparently holds the patent and despite extensive research in Canada the company has not yet pursued commercialization of this crop.

5.4.11 Christmas Tree Production

The major Christmas tree types produced in British Columbia are Douglas fir, Grand fir, Noble fir, Scotch pine, White pine, Concular fir and various spruces. They are are produced in all areas of the province. Provincially there were 592 Christmas Tree farms recorded in the 1995 census and they had 23,358 acres in production. Only 285 farms reported sales, selling 282,203 trees.

Most trees were produced in the Lower Mainland (123,800), the Kootenay area (93,537) and the Vancouver Island area (47,790). The Columbia–Shuswap Regional District produced 6,682 Christmas trees. There were three christmas tree farms in the Squamish–Lillooet regional District and nine in the Thompson–Nicola Regional District in 1995. Collectively they sold an unknown number of trees.

Christmas tree production within the study area is possible on most agricultural lands except wetlands or organic soils. Proper seed selection is an important part of Christmas tree production - the seed selected should delay the onset of terminal growth early in the growing season and thereby avoid damage from late spring frosts. Selected areas of Sections 3, 4, 5, 8, 9 and 10 are best suited Xmas tree production.

Appendix 1 – Canada Land Inventory (CLI) Soil Capability for Agriculture Rating System

The Canada Land Inventory (CLI) Soil Capability for Agriculture is an interpretive seven class classification system that groups soils into seven classes based on potentials and limitations for agriculture. The classification indicates the type and extent of soils and climatic parameters which affect the range of crops that can be grown and/or the levels of management inputs required.

In southern British Columbia both irrigated and dryland ratings have been applied to land areas because of the overriding aspect of severe precipitation deficiencies during the growing season. The irrigated rating is used for delineating the capability ratings on the accompanying maps.

The 'Soil Capability for Agriculture' ratings also incorporate the 'Climatic Capability for Agriculture' ratings with the latter forming the basis for the soil capability ratings. For example, areas with Class 3 climatic ratings but with soils that have less severe limitations would be rated Class 3 soil capability. Conversely, areas with Class 3 soil limitations but no climatic limitations would also be rated Class 3 soil capability.

In the case of the current study it is assumed that irrigation is available for crop production, thereby removing the overriding and limiting restriction of very low growing season precipitation.

Definitions of Canada Land Inventory Soil Capability for Agriculture Classes

Class 1 Soils in this class have no significant limitations in use for regionally adapted crops. The soils are deep, well to imperfectly drained, hold moisture well and in the native state are well supplied with nutrients.

Class 2 Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practises. The soils are deep and hold moisture well; the limitations are moderate and the soils can be managed and cropped with little difficulty.

Class 3 Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practises. The limitations are more severe than for Class 2 soils. They affect one or more of the following practises: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation.

Class 4 Soils in this class have severe limitations that restrict the range of crops or require special conservation practises or both. The limitations seriously affect one or more of the following practises: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation.

Class 5 Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops and improvement practises are feasible. The limitations are so severe that the soils are not capable for sustained annual field crop production, but are capable of producing perennial forage crops and may be improved by use of farm machinery.

Class 6 Soils in this class are capable only of producing perennial forage crops and improvement practises are not feasible. The soils provide some sustained

grazing for farm animals, but improvement by use of farm machinery is impractical.

Class 7 Soils in this class have no capability for arable culture or permanent pasture.

Appendix 2 – Study Area Climatic Conditions

Climate in the study area is diverse as is illustrated in the following tables by the length of the Frost Free Season (FFS) the Growing Degree Days (GDD), extreme temperatures and the amount of rainfall during the growing season. These parameters are significant because they influence the kinds of crops that can be produced. The length of the frost free season is the period between the last killing frost (0º C) in the spring and the first killing frost (0º C) in the fall. The first date is reasonably the date when frost sensitive crops such as tomatoes and peppers may be planted. Many crops are tolerant of frost at 0ºC and are able to withstand –2.0ºC, thus lengthening the time between killing frosts. . Earlier planting of frost tolerant plants such as peas, lettuce, radish and other cool season crops may take place when nighttime temperatures are above -2ºC. This principle is a guideline only and a crude benchmark for determining what threshold temperatures to consider between the location of weather stations.

The length of the frost free season is not the only limitation to successful crop production. Many crops grow vigorously *only* when the average daily air temperature reaches 5 ºC. The suitability of many crops to an area is thus also calculated on the basis of growing degree days (commonly called heat units), using 5 ºC as a base temperature. A day when the average daily temperature reaches 8ºC is said to have accumulated 3 growing degree days. Days when the average daily temperature does not reach 5 ºC have no growing degree days. The accumulation of growing degree days over the length of the growing season (April 1 to October 31) provides another benchmark figure that is useful in determining the kinds of crops that can be produced in an area. The length of the average frost free season together with the average number of growing degree days provides a guideline for the range of crops suited to an area.

Extreme minimum winter temperatures sometimes limit the cropping options for perennial crops such as strawberries, raspberries, grapes, fruit trees and vegetables such as asparagus.

Occasionally a very favored site, called a microclimate, provides additional growing degree days and a longer frost free season. Such sites may provide additional favorable climate conditions to permit the production of crops that require more heat or a longer growing season.

The location of weather stations greatly influences the climate events that are recorded at a given site. These stations are usually located on flat sites and provide general weather information that may not always well represent the kind of temperatures that may occur on undulating sites. Variations in climate occur over short distances due to topography, elevation, slope (such as air drainage on a slope), aspect (south facing is warmest; north facing is coldest), proximity to large water bodies, human settlements or large rock bluffs, or a combinations of some of these factors.

Considering all of these factors in detail is not possible in a report of this nature. This report therefore presents information summaries from weather station data and from Climate Capability for Agriculture Maps (Bridge River 92 J/NE; Ashcroft 92 I/SW; Kamloops 92 I/NE; Shuswap Lake 82 L/NW; Revelstoke 82 L/NE; Pemberton 92 J/SE; Lytton 92 I/SW; Merritt 92 I/SE; Vernon L/SW). Weather Station climate information is taken from Canadian Climate Normals 1951-1980 (Volume 2, 3, 4, 6).

Climate Characteristics of Selected Weather Stations

Location	Frost free season (days)	Last spring frost	First fall frost	Extreme (^{0}C) temperature		Growing degree days above 5 ^{0}C	Rain (mm) Arpr. 1 to Oct. 31
				Min.	Max.		
Ashcroft 305	159	May 2	Oct. 9	n/a	n/a	n/a	n/a
Ashcroft 366	165	April 21	Oct. 9	-34.4	41.7	2354	121
Ashcroft M	143	May 7	Sept. 28	-38.3	40.0	2059	130
Barriere	118	May 24	Sept. 20	-42.8	40.0	1862	242
Darfield	125	May 21	Sept. 24	-41.1	38.5	1841	247
Falkland (Salmon valley)	120	May 20	Sept. 18	-37.2	38.9	1787	221
Heffley Creek	110	May 28	Sept. 16	-40.6	36.7	1545	198
Kelowna A	116	May 26	Sept. 20	-36.1	38.6	1800	175
Kelowna CDA	150	May 8	Oct. 6	-32.2	37.2	1944	173
Kamloops	166	April 25	Oct. 9	-38.3	41.7	2321	135
Kamloops A	149	May 4	Oct. 1	-37.2	40.6	2216	144
Kamloops CDA	153	May 2	Oct. 3	-37.2	42.2	1674	122
Kamloops (Mission Flats)	139	May 12	Sept. 12	n/a	n/a	n/a	n/a
Loon Lake	99	June 8	Sept. 16	-42.8	37.2	1418	210
Lytton (258 m)	186	April 20	Oct. 24	-26.7	41.1	2531	156
Lytton (175 m)	n/a	n/a	n/a	-31.7	42.2	2443	140
Merritt	118	May 22	Sept. 8	n/a	n/a	n/a	n/a
Merritt (Craigmont M)	104	June 3	Sept. 16	-42.8	39.4	1592	138
Merritt STP	122	May 23	Sept.23	-42.8	38.9	1772	128
Oliver STP	163	Apr. 27	Oct. 8	-28.9	43.9	2514	156
Osoyoos	180	Apr. 18	Oct. 16	-25.6	39.5	2458	165
Pemberton (BCFS)	150	May 2	Sept. 30	-30.0	39.4	1817	423
Pemberton (Meadow)	139	May 5	Sept. 22	-40.0	37.8	1733	317
Salmon Arm	152	May 4	Oct. 4	-35.0	41.1	1933	271
Salmon Arm 2	136	May 13	Sept. 27	-36.7	40.0	1919	259
Vavenby	116	May 23	Sept. 17	-46.1	41.1	1670	255
Westwold	89	June 6	Sept. 4	-45.6	39.4	1568	184
Others							
Lethbridge A	124	May 17	Sept. 19	-42.8	39.4	1776	269
Medicine Hat	129	May 15	Sept. 22	-46.1	42.2	1942	236
Regina A	109	May 24	Sept. 11	-50.0	43.3	1677	287
Morden CDA	126	May 19	Sept 23	-41.1	43.9	1908	401

Probability of Frost Free Period

Location	Shortest frost free period (days)	Probability of frost free period equal to or less than indicated period (days) 10% 1 in 10	25% 1 in 4	33% 1 in 3	50% 1 in 2	66% 2 in 3	75% 3 in 4	90% 9 in 10	Longest frost free period (days)
Ashcroft	145	145	149	151	155	166	174	179	180
Ashcroft M	106	117	129	146	149	150	153	162	169
Barriere	68	74	109	112	121	179	186	197	199
Darfield	68	95	115	120	125	136	139	141	162
Falkland (Salmon valley)	68	102	113	115	118	131	136	141	144
Heffley Creek	63	80	96	102	110	116	121	142	145
Kamloops	129	143	150	153	162	174	180	192	211
Kamloops A	116	130	142	147	150	152	158	169	186
Kamloops CDA	114	120	144	147	157	161	166	171	180
Kamloops (Mission Flats)	113	123	133	135	148	151	157	162	163
Loon Lake	48	48	77	89	108	113	115	131	132
Lytton	155	163	179	181	189	193	194	203	212
Lytton 2	158	166	180	184	196	206	210	227	228
Merritt	74	94	106	115	122	126	128	142	164
Merritt (Craigmont M)	16	16	94	101	109	116	138	141	141
Merritt STP	89	89	113	118	123	127	131	153	155
Pemberton (BCFS)	125	125	137	142	150	159	161	171	171
Pemberton (Meadow)	65	115	124	127	146	163	166	185	206
Salmon Arm	113	120	140	141	150	156	164	176	193
Salmon Arm 2	94	113	120	122	140	145	147	163	170
Vavenby	67	83	107	109	114	122	126	135	154
Westwold	51	68	79	83	91	102	104	116	139

Climate Capability for Agriculture maps were developed as part of the Canada Land Inventory system of classification. These maps reflect the topography, proximity to the Pacific Ocean and to the interior of the continent and measure site specific data.. Using physical parameters, particularly topographical shape, the land surface was divided into units of similar climates. Some general assumptions must be understood when interpreting this classification. Some of these are:

1. The separation of the land surfaces into map units is on the basis of physical and biological similarities.

2. Each unit is defined on the basis of all available information on that unit. Past and present climtological and weather data, botanical material and all physical parameters relating to the topography, and any available research material or experience were all included.

3. In the event of insufficient information, generalizations and extrapolations were made on the basis of experience with similar factors and situations in adjacent areas.

4. The range of crops which can be grown determines the climate class. The wider the range of crops, the higher the class.

5. The degree of limitation determines the class designation. The subclass is the factor which causes the limitation. Hence, there may be many different land units with the same class, but the limitation(s) may be quite different.

Climate Capability Class	Climate Characteristics
1d	FFP exceeds 150 days. The range of GDD accumulated above 5 ºC exceeds 2225. Probability of –15 º C or lower for more than 5 days is 0
Range of crops	Examples are apples, cherries, peaches, plums, prunes, pears, raspberries, strawberries, grapes, asparagus, white and green beans, sweet corn, cucumbers, melons, peppers, potatoes, tomatoes, carrots, beets, radish, peas, onions, leeks, spinach, lettuce, cauliflower, cabbage, broccoli, turnips, Brussels sprouts, Swiss chard, bulbs, cereal grains, forage crops. Additional crop options suited to the Interior include blackberries, blueberries, buckwheat, chokecherries, filberts, saskatoon, flax, spelt, various herbs including stevia, hemp, hardy kiwi, hops, lupine, lentils, mustard, triticale, peppermint and spearmint, various nursery crops.
1c	FFP exceeds150 days. The range of GDD accumulated above 5 ºC is 2060 to 2225. There is a 10% chance of winter minimums less than –15 º C.
Range of crops	Examples are apples, cherries, peaches, plums, prunes, pears, raspberries, strawberries, blackberries, grapes, various herbs asparagus, white and green beans, sugar beets, sweet corn, cucumbers, melons, peppers, potatoes, tomatoes, carrots, beets, radish, peas, onions, leeks, spinach, lettuce, cauliflower, cabbage, broccoli, turnips, Brussels sprouts, Swiss chard, cereal grains and forage crops. Additional crop options suited to the Interior include blackberries, blueberries, buckwheat, chokecherries, filberts, Saskatoon, flax, spelt, various herbs including stevia, hemp, hardy kiwi, hops, lupine, lentils, several types of mustard, triticale, peppermint and spearmint, various nursery crops.
1b	FFP is greater than 150 days. The range of GDD accumulated above 5 ºC is 1780 to 2059. There is a high probability of minimum temperatures below –15 º C for long periods of time.
Climate Capability Class	Climate Characteristics
Range of crops	Examples are hardy tree fruits, raspberries, strawberries, asparagus, white and green beans, sweet corn, cucumbers, melons, peppers, potatoes, tomatoes, carrots, beets, radish, peas, onions, leeks, spinach, lettuce, cauliflower, cabbage, broccoli, turnips, Brussels sprouts, Swiss chard, cereal grains and forage crops. Additional crop options suited to the Interior include blackberries, blueberries, buckwheat, chokecherries, filberts, saskatoon, flax, spelt, various herbs including stevia, hemp, hops, lupine, lentils, several types of mustard, triticale, peppermint and spearmint, various nursery crops.
1a	FFP is 120 to 150 days. The range of GDD accumulated above 5 ºC is 1505 to 1779
Range of crops	Examples are hardy apples, raspberries, strawberries, asparagus, white and green beans, sweet corn, cucumbers, potatoes, tomatoes, carrots, beets, radish, peas, onions, leeks, spinach, lettuce, cauliflower, cabbage, broccoli, turnips, Brussels sprouts, Swiss chard, cereal grains and forage crops. Additional crop options suited to the Interior include blueberries, buckwheat, chokecherries, filberts, saskatoon, flax, spelt, various herbs, hemp, hops, lupine, lentils, several types of mustard, triticale, peppermint and spearmint, various nursery crops.
1	FFP is 90 to 119 days. The range of GDD accumulated above 5ºC is 1310 to 1504
Range of crops	Examples are raspberries, strawberries, asparagus, white and green beans, sweet corn, cucumbers, potatoes, tomatoes, carrots, beets, radish, peas, onions, leeks, spinach, lettuce, cauliflower, cabbage, broccoli, turnips, Brussels sprouts, Swiss chard, bulbs, cereal grains and forage crops. Additional crop options suited to the Interior include blueberries, buckwheat, chokecherries, filberts, saskatoon, flax, spelt, various herbs, hemp, hops, lupine, lentils, several types of mustard, triticale, peppermint and spearmint, various nursery crops.
2	FFP is 75 to 89 days. The range of GDD accumulated above 5ºC is 1170 to 1309.
Range of crops	Examples are raspberries, strawberries, asparagus, potatoes, carrots, beets, radish, peas, leeks, spinach, lettuce, cauliflower, cabbage, broccoli, turnips, Brussels sprouts, Swiss chard, bulbs, cereal grains forage crops. Additional crop options suited to the Interior include chokecherries, saskatoon, flax, spelt, various herbs,

	lupine, lentils, several types of mustard, , triticale, , various nursery crops.

Climate Capability Class	Climate Characteristics
3	FFP is 60 to 74 days. The range of GDD accumulated above 5ºC is 1030 to 1169
Range of crops	Examples are raspberries, strawberries, potatoes, carrots, beets, radish, peas, spinach, lettuce, cauliflower, cabbage, some cereal grains, forage crops..
4	FFP is 50 to 59 days. The range of GDD accumulated above 5ºC is 1030 to 1169
Range of crops	Examples are hardy varieties of radish, peas, spinach, lettuce, cabbage, forage crops and periodically some cereal crops.
5	FFP is 30 to 49 days. The range of GDD accumulated above 5ºC is 780 to 1029.
Range of crops	Only some forage crops and native grasses are produced.
6	FFP is less than 30 The range of GDD accumulated above 5ºC is 670 to 779
Range of crops	Limited to native browse (grazing) species of plants.
7	FFP is highly variable and less than 30 days. GDD accumulated above 5ºC is less than 670
Range of crops	No potential for agricultural crops.
Subclasses	Subclasses denote the nature of the climatic limitation that affects the capacity of the land to support agriculture.
A	Drought or aridity occurs between May 1 and September 30 that results in moisture deficits, which limit plant growth.
E	Extreme temperature occurring during the winter season, which injure or kill dormant or near dormant fruit trees. Either cropping history or minimum temperatures of less than –35 ºC can be used as an indicator for this subclass.
F	Minimum temperatures near freezing will adversely affect plant growth during the growing season.
G	Insufficient GDD during the growing season.

Appendix 3 - Commercially Grown Crops

The following table is drawn from the 1986, 1991 and 1996 Censuses and shows the commercially grown crops in the study area and some of their acreages.

Commercially Grown Crops (acreage in brackets)

	1996	1991	1986
Berries and grapes for sale	Grapes (3), raspberries (6), strawberries (11), other berries (6)	Blueberries, grapes, raspberries, strawberries, other berries	Blueberries, grapes, raspberries, strawberries, other berries
Field crops grown	Pasture, hay, wheat, oats, barley, corn, rye, alfalfa, field peas, dry beans, canola	Pasture, hay, wheat, oats, barley, corn, rye, alfalfa, soybean, alfalfa for seed, forage for seed	Pasture, hay, wheat, oats, barley, corn, rye
Tree fruits grown for sale	Apples (150), apricots (14), peaches 6), pears (6), plums & prunes (13), sweet cherries (15), sour cherries (2), other tree fruit and nuts(4)	Apples (119), apricots (7), peaches (11), pears (15), plums & prunes (3), sweet cherries (10), sour cherries (1), other tree fruit and nuts(3)	Apples (121), apricots (3), peaches (12), pears (5), plums & prunes (10), sweet cherries (12)
Vegetables for sale	Asparagus, beets (4), broccoli, Brussels sprouts, cabbage (9), carrots (14), cauliflower, Chinese cabbage, cucumbers (12), dry onions (32), green peas (6), green onions (2),lettuce (4), peppers (7), potatoes (207) ,radish (3), rhubarb (1) rutabaga (3), ,spinach (2), squash, zucchini, pumpkins (22), sweet corn (136), tomatoes (33), wax beans (4), other vegetables (24)	Asparagus (1), beets, broccoli, Brussels sprouts, cabbage, carrots (4), cauliflower, Chinese cabbage, cucumbers (12), dry onions (19), green peas, green onions, lettuce (1), peppers (6), potatoes (111) ,radish (4), rhubarb, rutabaga (3), ,spinach, squash, zucchini, pumpkins (8), sweet corn (113), tomatoes (39), wax beans (3) other vegetables (12)	Asparagus, beets, beans, broccoli (2), Brussels sprouts, cantaloupe & melons (9), cabbage, carrots, cauliflower (2) cucumbers, dry onions, green onions (1), lettuce, parsnip, peppers, potatoes (90) , rhubarb, rutabaga (4), ,spinach (1), squash, zucchini, pumpkins, sweet corn (172), tomatoes, other vegetables