Squamish-Lillooet Regional District
Electoral Area B, District of Lillooet & St'at'imc

Agricultural Plan

PART 1: BACKGROUND REPORT

September, 2014

Submitted by

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Cover photo: Farm in Texas Creek area (I. Smith, 2013)

Acknowledgements

The Squamish-Lillooet Regional District Electoral Area B, District of Lillooet & St'at'imc Agricultural Plan is a strategy and policy framework document, resulting from a regional planning initiative led by the Squamish-Lillooet Regional District (SLRD) in collaboration with:

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Squamish - Lillooet Regional District

Acronyms

AAC	SLRD Electoral Area B Agricultural Advisory Committee
AAFC	Agriculture and Agri-Food Canada
AGRI	BC Ministry of Agriculture
ALC	Agricultural Land Commission
ALR	Agricultural Land Reserve
ARDCorp	Agriculture Research and Development Corporation
BCAA	BC Assessment Authority
BCAC	BC Agriculture Council
BCCA	BC Cattleman's Association
BCCDC	BC Centre for Disease Control
BCEMB	BC Egg Marketing Board
BCMH	BC Ministry of Health
BCMMB	BC Milk Marketing Board
BC MPA	BC Milk Producers Association
BCMoE	BC Ministry of Environment
BCMSCD	BC Ministry of Community, Sport, and Cultural Development
BSE	Bovine Spongiform Encephalopathy
CFIA	Canadian Food Inspection Agency
CLI	Canadian Land Inventory
CSA	Community Supported Agriculture
DPA	Development Permit Area
DoL	District of Lillooet
FIRB	Farm Industry Review Board
FPPA	Farm Practices Protection (Right to Farm) Act
IAF	Investment Agriculture Foundation of BC
IHA	Interior Health Authority
LGA	Local Government Act
LTSA	Land Title and Survey Authority of BC
LUI	Land Use Inventory
MIR	Meat Inspection Regulation
OCP	Official Community Plan
PHSA	Provincial Health Services Authority
REF	Real Estate Foundation
SGS	St'at'imc Government Services
SLRD	Squamish Lillooet Regional District
SSFPA	Small Scale Food Processor Association
UBCM	Union of BC Municipalities
WDM	Water Demand Model
WWOOF	Willing Workers on Organic Farms

Introduction

Intent of the Agricultural Plan

This *Agricultural Plan* was developed thanks to the direction of the Squamish-Lillooet Regional District (SLRD) with the involvement and partnership of the District of Lillooet, and the St'at'imc Nation, as it pertains to an area encompassed within the Northern St'at'imc Territory. This *Agricultural Plan* is unique amongst agricultural plans in BC in the fact that it was developed with extensive input from local indigenous community members. The creation of this *Agricultural Plan* can be attributed to the high level of interest in stewarding the agricultural sector as expressed by the constituents of SLRD Electoral Area B. In turn, the SLRD provided support in the form of financial and human resources and the Investment Agriculture Foundation of BC (IAF) provided additional financial support.

Agricultural plans recognize agriculture as the highest and best use of agricultural land and focus on developing strategies to support a viable agricultural industry at the local level (Smith, 1998). These plans may be integrated into regional and local plans, and provide a forum for discussion concerning issues relevant to farming and the local food system. A food system is local when it allows farmers, processors, distributors, retailers, and their customers to interact face-to-face.

It is important to note that the Supreme Court of Canada has affirmed that Aboriginal Title continues to exist in British Columbia, that Aboriginal Title is an inherent right to the land itself, and includes the right to choose the uses to which the land is put. Aboriginal rights and title exist in BC and receive protection under Section 35(1) of the *Constitution Act* (1982). This *Agricultural Plan* will not limit government-to-government negotiations and settlements. Respecting the St'át'imc Vision and Principles by adhering to St'át'imc law and the Nxekmenlhkálha lti tmícwa (St'át'imc Land Use Plan), including the preliminary draft land use plan, are key steps necessary to accommodate St'át'imc Title and Rights.

A Definition of Agriculture

It can be difficult for any community to agree upon the terms used to describe food production at a local level. Definitions outlined by dictionaries, Statistics Canada, and the BC Assessment Authority (BCAA) help to provide a starting point for discussion.

"*Agriculture*" according to the Merriam Webster dictionary:

> *The science, art, or practice of cultivating the soil, producing crops, and raising livestock and in varying degrees the preparation and marketing of the resulting products.*

A "*census farm*" as described by Statistics Canada:

> *an agricultural operation that produces at least one of the following products intended for sale: crops (hay, field crops, tree fruits or nuts, berries or grapes, vegetables, seed); livestock (cattle, pigs, sheep, horses, game animals, other livestock); poultry (hens, chickens, turkeys, chicks, game birds, other poultry); animal products (milk or cream, eggs, wool, furs, meat); or other agricultural products (Christmas trees, greenhouse or nursery products, mushrooms, sod, honey, maple syrup products).*

In the Agricultural Census, an agricultural operation is defined as: *"a farm, ranch or other operation that produces agricultural products intended for sale."*

Farm status (or farm class) as determined by BCAA:

a) land used for a qualifying agricultural use;
b) land used for a purpose that contributes to a qualifying agricultural use;
c) land used for a farmer's dwelling;
d) land in an agricultural land reserve (ALR) that is used for a retired farmer's dwelling;
e) land used for the training and boarding of horses when operated in conjunction with horse rearing; and
f) in some cases, vacant land associated with a farm.

A combination of the above-mentioned definitions, the project Terms of Reference, and discussions with farmers and other stakeholders were used to ensure that a variety of levels and types of food production were captured in the *Agricultural Plan* to accurately reflect food production occurring in the Plan Area.

The Agricultural Plan Process

The SLRD Planning Department developed the *Agricultural Plan* collaboratively with the consulting team, and the *Agricultural Plan* Working Group.

At the outset of the *Agricultural Plan*, the goals of the process were to:

1. identify opportunities to strengthen farming and agricultural practices;
2. establish clear policies that serve to protect and promote agriculture, agricultural land through formal adoption as a sub-area plan of the Area B OCP; and,
3. contribute to local and regional food security and the community's long-term sustainability.

Specific objectives of the *Agricultural Plan* were to:

1. complete an inventory of lands, and water usage (under separate contract with the Ministry of Agriculture);
2. communicate with farmers to discover strengths, weaknesses, opportunities and threats affecting the agricultural industry and draw on the historic capacity and capabilities of the region;
3. engage St'at'imc Communities in the agricultural planning process;
4. conduct a market opportunities analysis for agricultural crops and products; and,
5. propose policy on a wide range of issues to be determined that may include:
    - criteria to evaluate the various forms of Agricultural Land Commission applications (ALR exclusions, non-farm uses, and ALR subdivisions);
    - ways to support agriculture;
    - land uses ancillary to agriculture that will be supported;
    - land uses to be discouraged;
    - ways to implement and monitor progress of the plan; and,
    - help those in the agricultural sector learn and implement best practices for agricultural business growth.

The *Agricultural Plan* process was initiated in April 2013 and included the following actions:

- Regular meetings with SLRD staff and the Working Group
- Public open houses to initiate the project
- General context review
- Survey of the farming and non-farming communities
- Survey of the St'at'imc community
- Preliminary market opportunities analysis
- Background summary report
- Technical workshop
- Drafting the *Agricultural Plan*
- Reviewing the draft with SLRD staff and the Working Group
- Public open house to present the draft *Agricultural Plan* to the public
- Finalizing the *Agricultural Plan* and preparation for its approval and formal adoption
- Creation and distribution of educational materials

Methodology – Stakeholder Consultation

A number of methods were used to identify the opportunities and challenges associated with farming and agricultural economic development in the Plan Area. These include open houses, Working Group meetings, a survey (distributed by mail and on the internet), and in-person interview-style conversations. Activities were aimed at connecting with all members of the food system, including farmers, processors, retailers, restaurateurs, educators, and consumers.

Through a variety of methods noted above, the Consulting Team and SLRD staff were able to engage a range of residents, community stakeholders and representatives, all of whom helped to:

- Identify barriers and opportunities for agriculture;
- Gain valuable insights and information from various representatives of the agricultural and food community, including farmers, chefs, grocers/retailers, value-added producers, non-profit organizations, and more;
- Engage participants in meaningful conversations on agricultural planning and initiatives; and
- Use all input and feedback to develop appropriate and relevant policy and implementation recommendations.

Figure 1. Components of the food system (source: J. de la Salle, 2014).

The public consultation process began in the spring of 2013 and continued throughout all stages of developing the *Agricultural Plan*, and will need to continue into the subsequent implementation stages (detailed under Part 2: Vision, Priorities, Recommended Actions and Implementation Strategy).

Engaging the St'at'imc

A concerted effort was made to communicate and build relationships with the St'at'imc. The St'at'imc Government Services (SGS) provided leadership for this process through their direct involvement on the *Agricultural Plan* Working Group.

Through dialogue with the Intergovernmental Advisor for St'at'imc Chiefs Council, the consulting team settled on a multi-faceted approach to engage the Northern St'at'imc communities located within SLRD Electoral Area B. This involved developing a separate survey for St'at'imc members, attending St'at'imc events, and conducting interviews and focus groups with key representatives from these communities. These individuals were mainly comprised of representatives of the Northern St'at'imc governments including some Chiefs and Council members, economic development officers, natural resource coordinators, and project managers working on agricultural and environmental initiatives.

The consulting team made efforts whenever possible to meet with St'at'imc members and leaders face-to-face within their community and at St'at'imc events. These meetings included a personal tour of Split Rock Environmental, attendance at the SEED symposium in June 2013, attendance at the Apricot Festival in 2013, and a presentation on the *Agricultural Plan* at the *Agriculture-Agroforestry Forum* at the Cayoosh Creek Band Office on December 11, 2013. Each engagement opportunity with the St'at'imc intended to assess their unique vision for agriculture in the region. This included their vision for agricultural development in the region as well as some of the challenges that community members associate with the expansion of agriculture.

Open Houses

Initial Open Houses were held on June 20th and 21st 2013 to launch the *Agriculture Plan*. Members of the *Agriculture Plan* Working Group and the consulting team were on hand to greet community members at the Lillooet Rec Centre on the afternoon of June 20th in conjunction with the St'at'imc SEED symposium, and had a table at the Farmers Market on Friday June 21st. The purposes of the open houses were to introduce the *Agriculture Plan*'s goals and timeline to the public and start connecting with farmers and community members. Surveys were distributed to gain feedback around a vision for agriculture and food security and to identify key challenges and opportunities for food producers and consumers in the region. Approximately 35 people came to the June 20th event, which had great crossover attendance from the SEEDS symposium, and another 60-70 people came by the information table at the Farmers Market on the 21st.

Figure 2. Graphic outcome of the Open Houses in June 2013 (*Drawing it Out, 2013*).

A final open house was held on June 3rd, 2014 to introduce the draft *Agricultural Plan* to the public. Approximately 25 people attended the event, which included an informational presentation and display of the six priority areas on the walls. Copies of the detailed recommended actions and flip chart paper were also posted alongside each priority area. Participants were given gold stars and red dots and were asked to place stars next to recommended actions that they supported and red dots next to those that they found to be problematic. They were asked to record any comments on the flip chart paper. A team of three consultants and one SLRD staff member attended to speak with participants and answer questions. In general, actions with the highest level of support (as indicated by the highest number of stars) corresponded well to those that have been attributed "high" priority. Very few red dots were placed. The feedback resulted in minor edits to the draft *Agricultural Plan*. Moving forward there will need to be more direct involvement in the plan's implementation by the District of Lillooet and St'at'imc to ensure that efforts are not being duplicated.

Figure 3. Agricultural Plan table at the Lillooet Farmers Market in June 2013 (*I. Smith, 2013*).

Technical Workshop

On November 6th 2013, twenty-six people from the District of Lillooet, SLRD Electoral Area B, and St'at'imc gathered to discuss opportunities for agricultural economic development in the region. Attendees included a mix of farmers, ranchers, St'at'imc members, and local government elected officials. Four guest speakers were featured: two joined the workshop virtually and two presented in person. After each guest speaker a small group discussion ensued to explore applicability of the issue to the District of Lillooet, SLRD Electoral Area B, and St'at'imc. A summary of speakers and their presentations, as well as key points raised during the discussion period, is included in Appendix II.

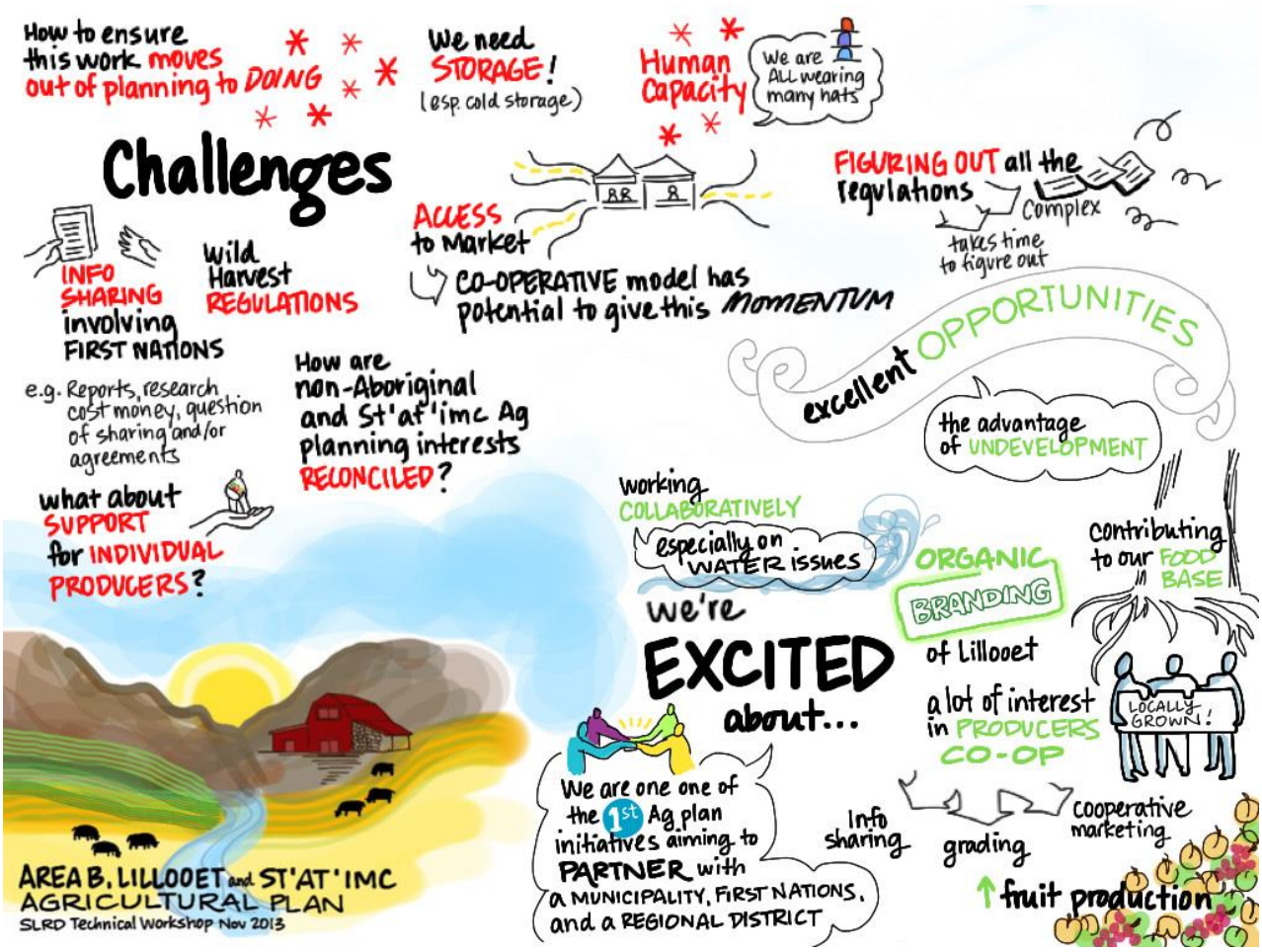

Figure 4. Graphic outcome of the Technical Workshop, November 2013 (*Drawing it Out, 2013*).

Three Surveys (Farmers, St'at'imc Members, Community Members)

The Consulting Team collaborated with SLRD Staff and the Working Group to develop three surveys on food matters and agricultural development opportunities. The three surveys were developed to best target the interests of:

- Farmers
- St'at'imc members
- Community members

Hard copies of the survey were distributed in person at the June 2013 open houses, made available at the Lillooet library, and were mailed to ranchers including self-addressed and stamped return envelopes to encourage completion rates. The surveys were also made available online to enable members of the interested public to provide input on a range of key issues outside of, or in addition to, formal meetings and public events.

The survey received 130 responses between early August and the end of October 2013, which was well above the expected response level of 100 completed surveys. A total of 42 farmers, 22 St'at'imc

members, and 66 Non-farming community members responded. Input received was used to develop the list of issues and priorities for the Market Opportunities Analysis and to refine the list of recommended actions. It is important to note that the survey participants do not represent a random sample due to the fact that they were able to self-select on their choice to fill out the survey (i.e. participation was voluntary), therefore results are not statistically significant. Full results from the public opinion survey can be found in Appendix I.

Stakeholder Interviews

Agricultural Stakeholder Interviews

The objectives for the stakeholder interviews were as follows:

- Identify relationship-building opportunities between larger agricultural operations and smaller farms in order to craft recommendations for the *Agricultural Plan*;
- Gain a better overview of the amount of funding and investment being leveraged towards agricultural projects in the District of Lillooet and SLRD Electoral Area B;
- Determine what plans for future value-added processing and distribution may exist; and
- Gain a clearer picture of the level of economic development occurring in the local agricultural sector.

Blue Goose Cattle Company was unavailable for the agricultural stakeholder interviews, but a copy of an article from the local Lillooet News is included in Appendix VI that provides some basic information about their recent ranch purchase in the area and future plans.

St'at'imc Stakeholder Interviews

There were twelve interviews conducted with key St'at'imc members aimed to identify appropriate roles for agriculture and food production in the Northern St'at'imc Territory. Because of the unique vision the St'at'imc has regarding traditional food harvesting, effort was made to reach community members whose interests extended beyond traditional agricultural production and into complimentary areas of agroforestry, natural products, community development, and cultural programming. These interviews attempted to gain in-depth insight into areas of complimentary practice with regional agricultural producers. In addition, the interviews attempted to highlight areas of consideration where increased agricultural production could raise concerns about St'at'imc Rights & Title, ecological sustainability, and cultural heritage.

In-person interviews were conducted with individuals representing:

- Sekw'el'wás community
- T'it'q'et community
- Ts'kw'aylaxw community
- Xwisten community
- Lillooet Tribal Council
- Xaxlip Community Forest
- Ucwalmicw Centre

- Splitrock Environmental
- St'at'imc Chiefs Council
- St'at'imc Government Services

Figure 5. Technical workshop, November 2013 (I. Smith, 2013)

General Context Review

Community Overview

The St'át'imc are the original inhabitants of the territory which extends north to Churn Creek and French Bar; northwest to the headwaters of Bridge River; north and east toward Hat Creek Valley; east to the Big Slide; south to the island on Harrison Lake and west of the Fraser River to the headwaters of Lillooet River, Ryan River and Black Tusk.

Within SLRD Electoral Area B there are several communities or neighbourhoods:

- T'ít'q'et (Lillooet)
- Tsalalh (Seton Portage) – Shalalth,
- Yalakom Valley,
- Xwisten (Bridge River/West Pavilion),
- Sekw'el'was (Cayoosh Creek),
- Texas Creek,
- Xaxl'ip (Fountain),
- Ts'kw'aylaxw (Pavilion), and
- the Duffey Lake Corridor.

These communities and the surrounding area encompass 3,461 square kilometres of land. SLRD Electoral Area B surrounds one incorporated municipality, the District of Lillooet, which functions as the main economic hub and service centre for the communities. Neighbouring jurisdictions include the Thompson Nicola Regional District to the north and the east, and the Cariboo Regional District to the north. The current population of the District of Lillooet and SLRD Area B region is approximately 2,700 and is expected to reach 5,000 by 2036 (BC Stats, 2012). Approximately 1,100 are living within Indian Reserves (IRs).

According to the Official Community Plan (OCP) for SLRD Electoral Area B, lands with agricultural potential are primarily located on the benches above the Fraser River and in the neighbourhoods of Texas Creek, Fountain, Pavilion Lake, West Pavilion, and the Yalakom Valley. The majority of these lands, with the exception of the Yalakom Valley, are designated as Agricultural Land Reserve (ALR). ALR lands are regulated by the Agricultural Land Commission (ALC). The mandate of the ALC is to preserve agricultural land and encourage the establishment and maintenance of farms. A map of ALR lands is provided in the Land Use Inventory Report, included in Appendix VII.

Geographic Context

The *Agricultural Plan* encompasses the area shown as the Plan Area in the Map (Figure 6) below. As a cross-jurisdictional plan, SLRD Electoral Area B, District of Lillooet, and St'at'imc agricultural lands are included in the Plan Area.

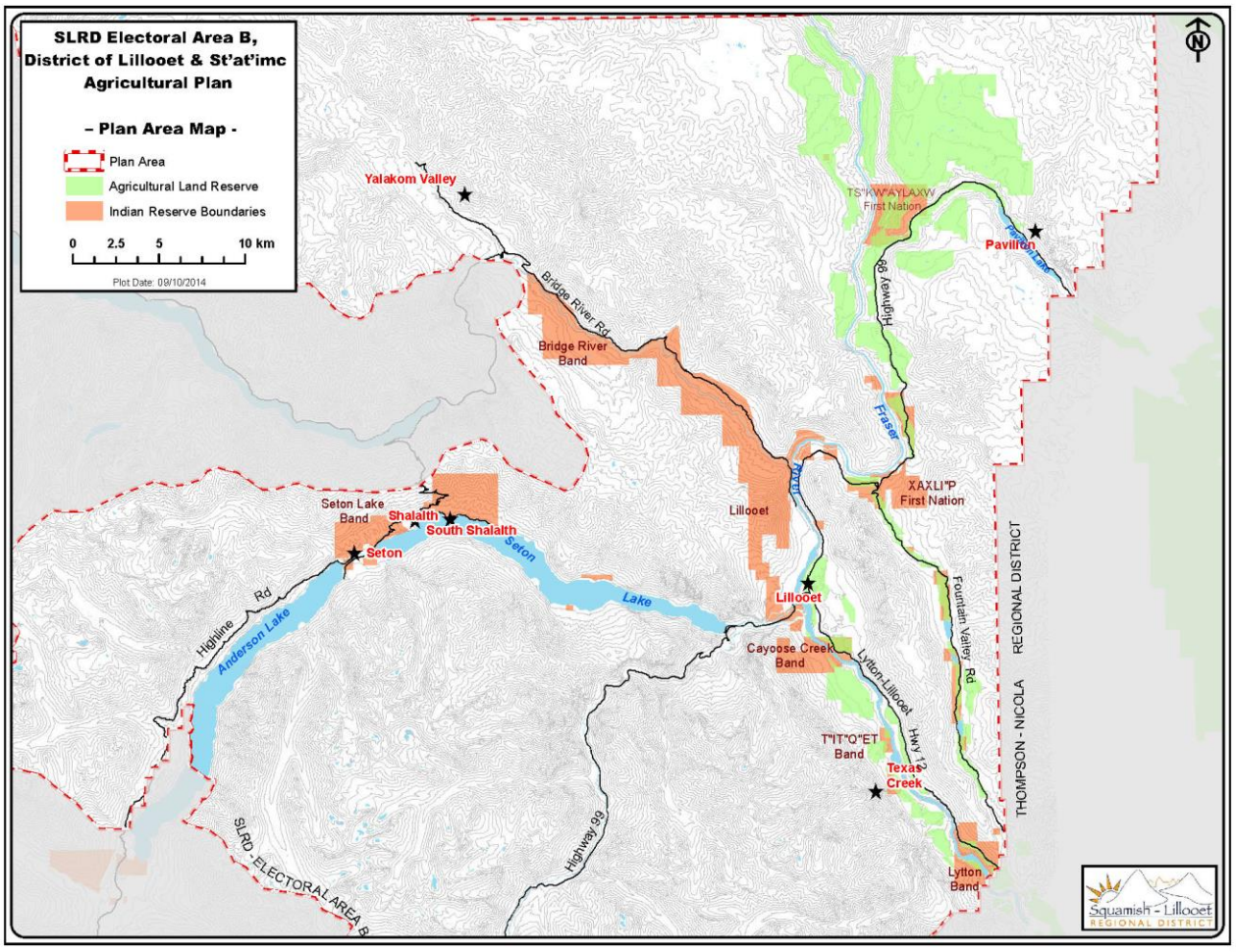

Figure 6. Plan Area Map

Planning Context

Community planning off-reserve occurs within a context of enabling provincial legislation such as the *Local Government Act* that provides for policy plans, regulations in zoning or land use bylaws, and processes such as development permits. Across the SLRD, the promotion of the local agricultural industry is supported through various high level policy documents and regional initiatives which acknowledge and address the importance of protecting agriculturally viable land, planning for local food security, and encouraging/facilitating local economic development opportunities. These high level policy documents and regional initiatives include: the SLRD Integrated Sustainability Plan (ISP), the SLRD

Regional Growth Strategy (RGS), the SLRD Energy Resilience Task Force, the District of Lillooet Official Community Plan and Zoning Bylaw, and the Electoral Area B Official Community Plan and Zoning Bylaw.

The manner in which agriculture is considered at the policy level through land use plans in the RGS and OCPs, and subsequently through land use regulations in the zoning bylaws, is indicative of a regional government's priorities in terms of supporting future agricultural activity. The RGS and OCPs provide a long term strategy for land use, development and servicing, and they contain development guidelines, which respond to broad community objectives and values. In contrast, a zoning bylaw provides detailed land use regulations according to specific land use categories called zones. Zoning Bylaws also address land use that impacts farmland by setting minimum parcel sizes, and the potential for subdivision of agricultural lands.

A number of local and regional plans and regulatory documents help to shape policy affecting agricultural activities in the SLRD Electoral Area B region. Table 1 includes a list of the documents that were reviewed and inform the content of this report.

Table 1. List of policy documents reviewed.

Document Title	Status	Year
St'at'imc Preliminary Draft Land Use Plan	Draft	2004
Lillooet Land Resource Management Plan (LRMP)	Draft	2004
Sustainable SLRD - Integrated Sustainability Plan	Adopted	2013
SLRD Energy Resilience Task Force Report		
SLRD Regional Growth Strategy Bylaw No. 1062	Adopted	2008, 2010
SLRD Area B OCP Bylaw No. 1073	Adopted	2008, 2010
District of Lillooet OCP Bylaw No 320	Adopted	2008, 2009
SLRD Areas A & B Zoning Bylaw No. 670	Adopted	1999, 2000
District of Lillooet Zoning Bylaw No 400	Adopted	2011

A discussion summarizing some of the specific items in the zoning and policies that may be applicable to the *Agricultural Plan* is provided in Appendix III.

Weather and Climate

The Coast Mountains prevent the flow of moist air into the Lillooet area and trap the movement of cold Arctic air from the Interior to the Coast. As a result, the climate is generally dry with periods of intense cold during winter months. Inversions and deep fog are common during the fall and winter.

At the Environment Canada weather station in Lillooet, total annual rainfall has been recorded as 297.1 mm with total annual snowfall at 32.4 cm. Unlike coastal regions, rainfall is fairly consistent year round, with slightly less rain during spring months (February to May) and slightly more rain and snow during November, December, and January. From an agricultural perspective, there is likely not enough rainfall in the summer, requiring irrigation systems to be kept in place. Other climatic characteristics based on climate normals data from 1981-2010 at the Lillooet weather station are included in Table 2.

Table 2. Weather characteristics in Lillooet (Environment Canada, 2014).

	Lillooet-Seton	Kamloops	Whistler	Spences Bridge
Station Elevation (m)	198.10	345.3	657.8	235.0
Longitude	121°55'27.000" W	120°26'31.000" W	122°57'17.400" W	121°18'52.800" W
Latitude	50°40'24.000" N	50°42'08.000" N	50°40'07.000" N	50°25'18.600" N
Days per year with minimum temperatures < than 0°C	118.8	119.2	147.1	117.2
Days per year with maximum temperatures > than 20°C	123.6	132	83.3	141
Days per year with maximum temperatures > than 0°C	328.6	330.7	335	329
Days per year of rain	97.3	83.3	142.2	68.7
Days per year of snow	10.9	27.4	63.5	11.7
Degree days greater than 10°C	1346.2	1338.9	659.6	1518.8
Degree days greater than 5°C	2387.8	2378.2	1492.7	2613.4

Figure 7. Dry mountain slopes near Texas Creek (A. Lawseth, 2013).

Climate Change

Farmers are accustomed to the weather influencing their activities and weather-dependent decisions are a part of farming life. Adapting to climate change, however, involves a more systematic assessment and response. Agriculture is highly vulnerable to changes in climatic conditions and even small shifts could have significant consequences for farm viability and food production. Despite the challenges of applying broad climate models, some general projections are anticipated in BC between now and 2050. Additional secondary effects are included in Table 3 below:

Table 3. Potential impacts of climate change on agriculture (adapted from CAIBC, 2012).

Climate Change Condition	Potential Agricultural Impacts
Changing hydrological regime, decrease in summer precipitation	Decrease in productivity and quality of crops and livestock under water stress, increased costs, reduction in water supply (at times of high demand), increase in management complexity
Increasing precipitation and variability of precipitation (especially in spring & fall)	Interruptions to planting, input applications and harvesting, increase in excessive moisture and site-specific flood risk, increase in pressure on drainage and water management, interruptions to pollination, decrease in light levels, increase in nutrient and input leaching, increase in management complexity
Changing crop suitability ranges	Inconsistent productivity, quality & therefore prices; increase in suitability for new varieties of forage and field vegetable crops, increase in suitability of new crops
Changes in pests and diseases	Increase in winter survival rates, increase in number of cycles in a year, introduction of new pests and diseases, increase in management costs, complexity, uncertainty, increase in delays or prevention of pollination
Increase in extreme weather events (storms, wind, extreme heat)	Decrease in productivity and quality, increase in building maintenance and damage costs, decrease in heating costs, increase in cooling and ventilation costs, interruptions to regional infrastructure and supply lines
Climate change impacts to other growing regions	Increase in feed or other input costs, increase in demand for food production/local food

Although there is general consensus regarding the impacts of climate change, how these might impact specific microclimates is uncertain - yet critical for agricultural producers concerned with the effects of climate change and precipitation within their specific locale. Modelling suggests that climate change in the SLRD will bring about an increase in Growing Degree Days (GDDs), a decrease in spring snowfall, a decrease in summer rains, and an increase in frost-free days (see Table 4 below).

Table 4. Climate Projections for the SLRD in the 2020s, 2050s, and 2080s (PCICS, 2012).

		2020 change from 1961-1990 baseline		2050 change from 1961-1990 baseline		2080 change from 1961-1990 baseline	
Characteristic	**Season**	**Range**	**Median**	**Range**	**Median**	**Range**	**Median**
Mean Temperature	Annual	+0.5°C to +1.4°C	+1.0°C	+1.1°C to +2.6°C	+1.7°C	+1.6°C to +4.2°C	+2.7°C
Precipitation	Annual	-0% to +7%	+4%	-1% to +11%	+6%	+3% to +16%	+8%
	Summer	-13% to +10%	-6%	-21% to +5%	-12%	-32% to -1%	-10%
	Winter	-2% to +8%	+3%	-4% to +14%	+6%	+2% to +24%	+10%
Snowfall	Winter	-20% to +0%	-6%	-25% to -2%	-15%	-43% to -6%	-20%
	Spring	-59% to -2%	-29%	-72% to -12%	-51%	-87% to -17%	-72%
Growing Degree Days	Annual	+61 to +221 degree days	+135 degree days	+159 to +423 degree days	+273 degree days	+252 to +745 degree days	+461 degree days
Frost-free days	Annual	+8 to +24 days	+15 days	+15 to +40 days	+27 days	+23 to +67 days	+42 days

Note: Growing degree days (GDDs) are a measure of heat accumulation to predict plant development rates. Pacific Climate Impacts Consortium (PCIC). www.plan2adapt.ca Accessed February 2014

Invasive Species

Invasive species, primarily plants, have known impacts to the agriculture and livestock industry. Loss of native grasslands and forest forbs to the spread of invasive plants has led to the loss of forage for both livestock and wildlife. Many invasive species also pose health threats to livestock and wildlife due to toxins or burrs causing physical injury.

The local not-for-profit group, Lillooet Regional Invasive Species Society (LRISS), is the lead on the inventory, management and awareness of invasive species in the Plan Area (and beyond, please refer to www.lriss.ca for a map). A Strategy for the LRISS interest area has been developed and can also be found on the website. The LRISS Strategy identifies a list of priority species as well as management tools used for treatment.

Figure 8. Beef cattle ranch in SLRD Area B (A. Lawseth, 2013)

Water Resources

The Fraser River is the major river system in the region. Smaller river systems include the Bridge, Seton, Yalakom, Cayoosh and Portage rivers. The St'át'imc Principles place protection of water quantity, quality and timing of flow, including watershed restoration, first and foremost. All domestic use watersheds and a 50 metre buffer on all streams and water bodies are given full protection through St'át'imc Water Protection Areas. Surface water use is allocated and regulated through a water licensing system administered under the *Water Act*. Most drinking water comes from surface sources. The *Drinking Water Protection Act* addresses source protection (LRMP, 2004). Much of the agricultural drinking water (for both humans and livestock) and irrigation water come from three aquifers in the area. Table 5 illustrates the characteristics of these three aquifers (BC Water Resources Atlas, 2013).

Table 5. Aquifers in the Lillooet and Seton Portage areas (BC Water Resources Atlas, 2013).

Aquifer ID#	Size (km2)	Subsurface materials	Demand level	Productivity level	Vulnerability level	Aquifer Classification
323: Seton Portage	1.8	Sand/gravel	Moderate	Moderate	Moderate	IIB
324: Lillooet	7.3	Sand/gravel	Low	Moderate	Low	IIIC
325: Lillooet	4.4	Sand/gravel	Moderate	Moderate	Moderate	IIB

Many domestic, irrigation, industrial, and commercial water wells exist in the region, as depicted in Figure 8.

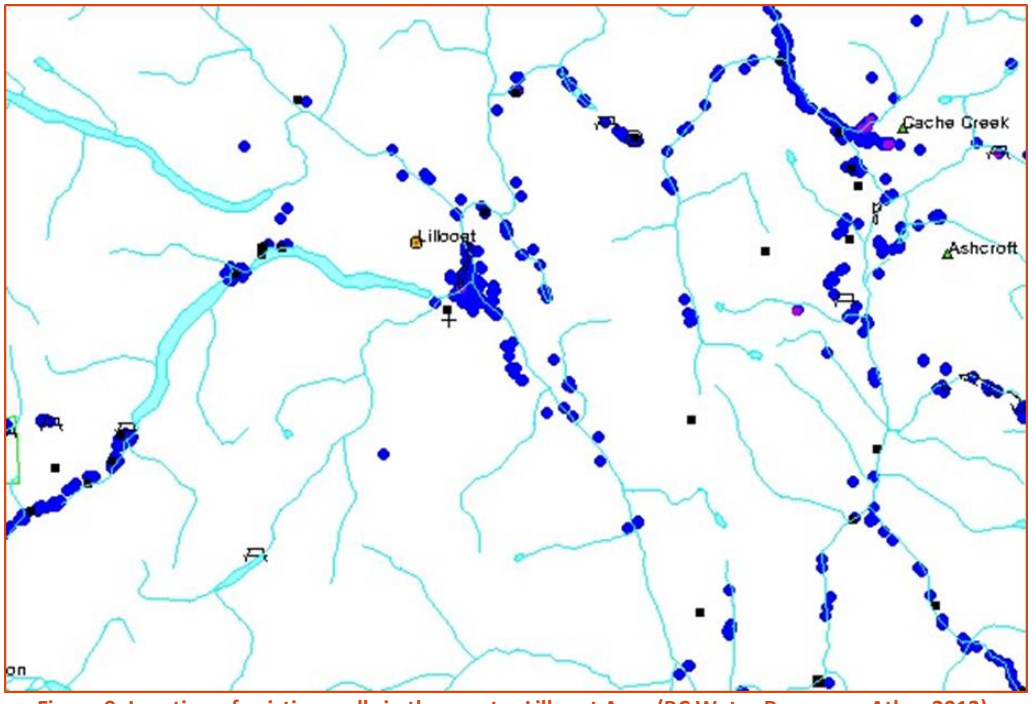

Figure 9. Location of existing wells in the greater Lillooet Area (BC Water Resources Atlas, 2013).

The region also includes several community watersheds around the District of Lillooet and along Anderson Lake:

- Fountain Creek Community Watershed
- Town Creek Community Watershed
- Omin Brook Community Watershed
- Spruce Creek Community Watershed

The *Water Sustainability Act* modernization process was completed in 2013. It remains unclear as to how the new policies and regulations will impact local farmers. However, the proposed legislation includes the following new approaches:

- Licensing ground water use (except for domestic);
- Allow temporary use restrictions to protect Critical Environmental Flows and fish habitat; and
- All agriculture water reserves to be created.

It is worth noting that agricultural activities in the region primarily use surface water for irrigation and other farming activities. This has exacerbated issues around allocation and licencing, which may or may not be addressed by the new Water Sustainability Act. Some feel that farms using groundwater are more efficient or conservation-minded because there is an increased and inherent awareness about the amount of water being used, as compared to the use of gravity-fed surface water systems.

The topic of water was top-of-mind for some members within the community at the time this *Agricultural Plan* was developed in part because of concurrent projects being led by other organizations in the area. The BC Ministry of Agriculture was collecting data for a Water Demand Model, and the District of Lillooet was in the process of installing a new water system and water meters.

Water Demand Model

At the time of writing, the Agriculture Water Demand Model Report for the Lillooet Region (AGRI, 2014) had been released to the community in draft form. The Agriculture Water Demand Model (WDM) was developed by the BC Ministry of Agriculture (AGRI) to provide current and future agricultural water demand by calculating water use on a property-by-property basis. Each property is then summed to obtain a total water demand for the entire basin or sub-basin. The model is based on a Geographic Information System (GIS) database that includes data on crop types, irrigation systems, soil texture and climate data in order to calculate demand. Climate data was used from 2003 to present information on one of the hottest driest years on record, while data from 1997 was used to represent a wet year.

The draft WDM calculated a total irrigated acreage in Lillooet of 1,349 hectares, predominantly in forage crops. Approximately 85% of the irrigated area is supplied by licensed surface water sources and 15% is irrigated with groundwater. The total annual irrigation demand was calculated at 12.8 million m^3 in 2003 and 7.8 million m^3 in 1997. The demand during a wet year was therefore only 60% of the demand during a hot dry year. Since the model generates a demand based on crop, climate and soil this doesn't necessarily represent what is applied by the producer. Soil moisture studies have indicated that farmers generally under apply irrigation when using certain types of irrigation systems (i.e. centre pivot).

Since the predominant crop type found was forage, handlines, wheelines, flood and pivot were the most common irrigation system used. The water demand could be reduced by improving these systems and converting to low pressure centre pivot on larger parcels, particularly those with field sizes larger than 10 ha. Additionally, better management such as irrigation scheduling techniques could also reduce water use. The draft WDM found that, with the use of good irrigation management practices, the water demand for 2003 could be reduced from 12.8 million m^3 to 9.5 million m^3 – a 35% reduction in demand.

Livestock water demand for the Lillooet region was estimated at 46,165 m^3 based on calculations using census data, daily animal drinking water requirements, and the barn or milking parlour water use.

The LUI conducted in 2013 found that 191 ha of additional agricultural land could be irrigated in Electoral Areas A and C. Without the use of water conservation strategies such as low-pressure pivot conversions, the water demand will increase by 10% to 14.2 million m^3 using 2003 data if this land were to be irrigated. Further information can be found in the Land Use Inventory Report in Appendix VII and the Agricultural Water Demand Model Report in Appendix VIII.

Agricultural Capability

A full description of soils and agricultural capability, including a map and description of soil types, is provided in Appendix V The general agricultural capability rating in the Lillooet area is prime (Classes 1 – 3) so long as irrigation water is available (Talisman Projects Inc., 1978). The main limitations in the region are lack of soil moisture. Suggested improvements generally refer to irrigation, removal of surface stones, installation of drainage where necessary, or addition of nutrients.

While soils vary from site to site, general recommendations for improvements to local soils for the purposes of agriculture include:

- Ground levelling (areas should be individually evaluated in regard to erodibility and machinery limitations);
- Applications of nutrients (fertilizers, manures, compost);
- Stone picking;
- Increasing organic matter content by adding animal manure, green manure, and/or compost; and
- Irrigating, often at frequent short intervals.

Neither topography nor stones are considered serious limitations for tree fruit or grape production.

Growing Degree Days

Growing degree days (GDD) are a weather-based indicator for assessing crop development. It is a measure of heat accumulation used to predict plant and pest development rates such as the date that a crop reaches maturity. Daily GDD values are added together from the beginning of the season, providing an indication of the energy available for plant growth. Growing degrees (GDs) are defined as the mean daily temperature (average of daily maximum and minimum temperatures) above a certain threshold base temperature accumulated on a daily basis over a period of time.

GDD units can be used to: assess the suitability of a region for production of a particular crop; estimate the growth-stages of crops, weeds or the life stages of insects; predict maturity and cutting dates of forage crops; estimate the heat stress on crops; and plan spacing of planting dates to produce separate harvest dates. Table 6 shows GDDs calculated for the Lillooet region using a base temperature of 10°C.

Table 6. Growing Degree Days (GDDs) for the Lillooet Area (Environment Canada, 2013).

	Lillooet
January	0
February	0
March	0
April	0
May	136.4
June	252.0
July	350.3
August	341.0
September	171.0
October	0
November	0
December	0
TOTAL	**1,250.7**

This corresponds well to data collected by Vielvoye from 2008-2011, during the research conducted for the *Climate and Feasibility Assessment of Growing Wine Grapes in the Lillooet-Lytton Area*. Their results indicated only one site with GDDs lower than 1,000. GDDs between 1,200 and 1,300 were found at 20 sites and GDDs over 1,300 were found at 57 sites. However, a little more than half (53%) of the sites with the highest GDDs (> 1,300) were located closer to Lytton than to Lillooet.

This range of GDDs (1,200 – 1,400) suits small and medium fruiting tomatoes (University of Minnesota, 2011) and some varieties of melons. These GDDs could easily be increased by using polyhouse and other minimal greenhouse technologies, thereby increasing the potential variety of crops produced in the area.

Figure 10. Grape vines at Texas Creek Winery (A. Lawseth, 2013).

A Snapshot of Agriculture in Lillooet

Note:
This profile was developed using information from the Agricultural Census data for years 2001 to 2011, and survey results. This information is expected to be indicative of the actual farming practices in Lillooet and SLRD Electoral Area B, however it is not expected to be exact. Statistics Canada notes that there have been significant refinements in the geographic assignment of agricultural operations and changes in Census Consolidated Subdivision boundaries between 2011 and 2006 making Census Consolidated Subdivisions for these two censuses not comparable. Concurrent to the development of this Agricultural Plan, the BC Ministry of Agriculture created an Agricultural Land Use Inventory (LUI) for the region. The LUI and its associated mapping provide detailed parcel-by-parcel information about land cover, land use, and irrigation practices when observed. The LUI results can serve as an additional "snapshot" of agriculture in the region and the results were cross-referenced with the census and survey analyses.

Since 2001, the total number of farms reporting to Statistics Canada has remained relatively constant, ranging from 43 to 48. The actual number of established farms selling products may actually be much higher, as smaller farms, or those who have properties that generate revenue from activities other than farming, may not be captured in the 43-48 farm range.

The Agricultural Land Use Inventory (LUI) captured a total of 39 farms in the Lillooet region. The LUI considered a property "Farmed" if:

- *Cultivated field crops: vegetation under cultivation for harvest or pasture including land temporarily set aside from farming and perennial crops that were not harvested or grazed in the current growing season*

- *Farm infrastructure: built structures associated with farming such as barns, stables, corrals, riding rings, and their associated yards*
- *Greenhouses: permanent enclosed glass or poly structures with or without climate control facilities for growing plants and vegetation under controlled environments*
- *Crop barns: permanent enclosed structures with non-translucent walls for growing crops such as mushrooms or bean sprouts*

Since the LUI is limited by what can be determined using a windshield survey and orthophotos some discrepancies are to be expected. Additionally, the LUI used a geographic range that differed from the Census Consolidated Subdivision.

Approximately 15,000 ha of land were reportedly being farmed in 2011 (see maps found in the Land Use Inventory Report in Appendix VII. This figure includes natural lands for pasture (over 9,500 ha) and does not represent actual land in crop production. In fact, less than 1,500 ha were reportedly in crops in 2011, which represents approximately 10% of the ALR in the region.

The LUI captured 1,835 ha of land actively farmed with 2,031 ha inactively farmed. This figure was 12% of the ALR. It was also found that 11,185 ha (51% of the ALR) was natural or semi-natural. Of the land that was actively farmed, 1.737 ha was used for farming only. These figures are similar to the amount of land that was reportedly in crops.

Land tenure is an indication of farm stability, with leased land representing less stability for the farm operator with regard to investments in infrastructure. Some farms have more than one type of tenure arrangement occurring at the same time. The amount of land being leased jumped significantly from 2001 to 2011 (See Table 7 below). This jump is due in part to better quality data on government lands operated under a license, permit or lease and may have also coincided with a rebound in the cattle industry from the BSE crisis and an increase in Crown land leasing for grazing.

Table 7. Land tenure arrangements for farms in SLRD Electoral Areas A & B.

Land Tenure	2001		2011	
	Farms	Hectares	Farms	Hectares
Owned	44	8,816	45	9,120
Leased from governments	6	916	13	5,694

Farm sizes in SLRD Electoral Area B and the District of Lillooet are either very big, or relatively small. Over half of farms reporting to the Census of Agriculture in 2011 were under 52 ha (57%) while 25% were larger than 230 ha. Those farmers who responded to the survey indicated an average farm size of 49 ha but the median was 15 ha, indicating many small farms are emerging. According to the survey, farms are cultivating an average of 18 ha each and the median amount of land in cultivation is 3.6 ha.

Crop production changes in some cases year to year, but trends may emerge in regions over time where commodity or sector development is taking hold. In the SLRD Electoral Area B there is an increasing trend in cattle production associated with an increase in alfalfa, likely as a result of a natural market rebound. By contrast, hay production is decreasing which may be due to the loss of one or two large farms or the conversion of those operations to alfalfa. There is an increase in the number of chicken

operations but not a significant change in overall numbers. This may be due to the rise in the number of small-scale poultry operations for farm-gate eggs.

According to the OCP for SLRD Electoral Area B (2011), ranching, haying, and gardening are the primary agricultural activities. Table 8 provides further detail on this crop production.

Table 8. Crop production in SLRD Electoral Areas A & B.

	2001		2006		2011	
Crop Type	Farms	Hectares/# of Animals	Farms	Hectares/# of Animals	Farms	Hectares/# of Animals
Alfalfa and alfalfa mixtures	21	971	21	2,254	32	3,134
Tame Hay and Fodder	6	996	5	375	2	X
Fruits, Berries & Nuts	11	10	6	7	10	15
Vegetables	6	6	3	8	7	5
Hens and Chickens	3	135	5	225	11	222
Cattle and Calves	13	2,112	19	2,820	23	2,785
Horses and Ponies	21	168	21	118	24	171

Table 9 shows the number of farms classified by industry for SLRD Electoral Area B. Data from the LUI has been included for comparison. There are some discrepancies, particularly with the number of beef cattle operations, but this could be due to land access limitations during the LUI process. All other categories show reasonably consistent numbers.

Table 9. Farms Classified by Industry (2011)

	2001	2006	2011	2013 (LUI)
Dairy cattle and milk production	0	1	0	1
Beef cattle ranching and farming, including feedlots	26	31	26	8
Hog and pig farming	0	0	0	0
Chicken egg production	2	4	2	2
Broiler and other meat-type chicken production	0	0	0	0
Turkey production	0	0	0	0
Poultry hatcheries	0	0	0	0
All Other poultry production	0	0	0	1 (duck)
Sheep farming	1	1	0	1
Goat farming	0	1	0	0
Apiculture	3	2	3	0
Horse and other equine production	19	20	22	24
Fur bearing animal and rabbit production	1	1	1	0
Animal combination farming	7	2	6	0
All other miscellaneous animal production (llama/alpaca)	4	2	2	2

Grain farming (wheat, soybeans, etc.)	0	0	0	1
Potato farming	17	14	11	0
Other vegetable (except potato) and melon farming	4	9	10	6
Fruit and tree nut farming – includes grapes	9	13	13	12 (5-grapes, 7-mixed fruit)
Mushroom production	0	0	0	0
Other food crops grown under cover	0	0	1	1
Nursery and tree production	7	5	9	0
Floriculture production	1	4	1	0
Hay farming	14	15	27	16
Fruit and vegetable combination farming	3	3	3	0
Maple syrup and products production	na	na	1	0
All other miscellaneous crop farming	3	0	2	1 (hops)

The number of farmers (or farm "operators") increased from 60 in 2001 to 80 in 2011, representing a 33% increase in 10 years. At the same time, the average age of farmers increased, from 52.2 years old in 2001 to 55.2 years old in 2011. This is on par with the average age of farmers in BC; however a lack of farmers under the age of 35 is lower than on average in the province.

Over half (52%) of the farmers who responded to the agricultural development opportunities survey (refer to Appendix I for further details) have been farming for 20-30 years and 78% are farming part-time. Very few farms have employees and those that do only have 1-2 paid employees. However, 83% of farmers aren't looking for labour outside of the family and 44% of those find labour through word of mouth. This corresponds well with Census of Agriculture data, which indicated 75% of farms spend less than 40 hours a week working on the farm.

Farm Practices

Two-thirds of farmers who conducted the survey say they use organic principles, but are not certified organic and 41% say they are GMO-free. This corresponds well with Census of Agriculture data, which indicate that less than 20% of farms are using chemical fertilizers and fewer than 10% are using herbicides or insecticides. However, less than 10% of farms are certified organic. More than 80% of farms in SLRD Electoral Area B report using irrigation water. Other Best Management Practices (BMPs) are reported in Table 10. Unfortunately the agricultural census doesn't include specific questions pertaining to invasive species.

Table 10. Farms in the SLRD Electoral Area A & B reporting Best Management Practices (Census of Agriculture) *N/A indicates that the BMP was not measured in 2001 and/or 2006.

Best Management Practices Number of Farms and % of Total Reporting	2001	2006	2011
Crop rotation	5 (10%)	10 (23%)	8 (17%)
In-field winter grazing or feeding	N/A	N/A	20 (42%)
Rotational grazing	N/A	18 (42%)	11 (23%)
Plowing down green crops	6 (14%)	4 (9%)	2 (4%)
Winter cover crops	0 (0%)	2 (5%)	2 (4%)
Nutrient management planning	N/A	N/A	10 (21%)
Windbreaks or shelterbelts (natural or planted)	4 (9%)	9 (21%)	9 (19%)
Buffer zones around water bodies	N/A	4 (9%)	5 (10%)
Total number of reporting farms	**44**	**43**	**48**

Figure 11. Small-scale poultry production (A. Lawseth, 2013).

Farm Valuation

Farms are worth more on paper now in the District of Lillooet and SLRD Electoral Area B region than they were a decade ago, but the cost of operating them is also going up. Total farm capital has increased dramatically in the region in the past 10 years (see Table 11 below), most likely due to a sharp increase in the value of land and buildings. The value of farm machinery, livestock, and poultry, has decreased. Total farm capital values over the last decade have grown dramatically:

- $24,327,342 in 2001
- $34,342,954 in 2006
- $109,353,033 in 2011

Table 11. Farm capital values in SLRD Electoral Area B.

	2001			2006			2011		
Farm Capital	# of farms reporting	Value $/farm in millions	Total value $ in millions	# of farms reporting	Value $/farm in millions	Total value $ in millions	# of farms reporting	Value $/farm in millions	Total value $ in millions
Land and buildings	44	0.43	18.6	43	0.66	28.3	48	2.11	101.4
Farm machinery & equipment	44	0.075	3.3	43	0.099	4.3	35	0.025	0.9
Livestock and poultry	28	0.086	2.4	31	0.056	1.8	37	0.056	2.1
Total farm capital	44	0.55	24.3	43	0.80	34.3	48	2.27	109.4

As shown in Table 12, farm expenses have risen in several categories, most notably fertilizers, fuel, electricity, phone, and internet.

Table 12. Farm expenses in the SLRD Electoral Areas A & B.

	2001 Cost per farm ($)	2006 Cost per farm ($)	2011 Cost per farm ($)
Fertilizer and lime	1,836	1,726	6,284
Chemicals	877	671	X
Seeds and plants	1,295	1,786	2,766
Feed, supplements and hay	12,623	5,720	3,885
Livestock and poultry	13,433	5,403	10,988
Veterinary and livestock health	1,043	2,584	2,312
Custom work, contract work and hired trucking	5,558	X	7,299
All fuel expenses	2,772	5,047	6,791
Repairs and maintenance to farm machinery, equipment and vehicles	1,785	7,622	5,032
Repairs and maintenance to farm buildings and fences	2,064	2,868	2,230
Rental and leasing of land and buildings	772	X	4,593
Electricity, telephone and internet	1,222	2,482	4,316
Farm interest expenses	8,717	4,630	8,834
All other expenses	3,844	8,104	12,935
Total farm business operating expenses	**29,819**	**39,080**	**54,395**

*Note: “x” indicates not enough farms reporting.

Despite increases in farm expenses, overall farm revenues are improving, as illustrated in Table 13 and 14. This again may be a result of recovery from BSE that affected beef cattle farmers, as well as a shift towards more lucrative commodities such as grapes.

Table 13. Gross farm receipts and gross margin.

	2001	2006	2011
Gross Farm Receipts	$1,237,283	$1,365,019	$2,865,187
Total Operating Expenses	$1,312,029	$1,680,434	$2,610,953
Gross Margin (%)	-5.70%	-18.8%	+9.7%

Table 14. Average revenue per farm and per hectare.

Year	# of Farms	Gross Receipts ($)	Average per Farm ($)	Total Farm Area (Hectares)	Average per Hectare ($)
2001	44	1,237,283	28,120	10,072	123
2006	43	1,365,019	31,745	15,123	90
2011	48	2,865,187	59,691	14,998	191

Based on the survey results, more than half of farmers (52%) reported generating less than $4,999 in annual gross farm revenue, indicating that the larger farms in the region are generating nearly 50% of the total farm revenue for the region.

Preliminary Market Opportunities Analysis

The purpose of this Market Opportunities Analysis (MOA) is to identify opportunities for the local food sector to thrive in SLRD Electoral Area B, the District of Lillooet, and the St'at'imc. The MOA was developed using: a review of existing literature and research; responses from the farming and non-farming surveys; results from one-on-one interviews with local key stakeholders in the agricultural community; feedback at open houses; an inventory of retailers (including restaurants), distributors, processors, and others involved in the production and sale of food products; and a high level calculation of annual food demand and associated potential revenue for Lillooet and area farmers. It is preliminary and does not include primary research around crop suitability, as this is very site-specific and would need to be evaluated on a case-by-case basis.

The MOA is structured using the following subsections:

- Capacity for market expansion
- Discussion of ten key issues
    1. Cost of land and inputs
    2. St'at'imc partnerships and initiatives
    3. Water
    4. Wildlife
    5. Economies of scale and crop diversification
    6. Labour
    7. Processing and value-added infrastructure
    8. Transportation and distribution
    9. Marketing and sales
    10. Consumer awareness and education

- Summary of key challenges
- Summary of key opportunities

Capacity for Market Expansion

According to 2011 census figures, median income of District of Lillooet and SLRD Area B residents is $31,373 (males) and $17,585 (females) for a combined average of $22,542 (BCStats, 2006). By comparison, the median income across BC is $24,867 (BCStats, 2006). The community is characterized by a large proportion of 45-64 year-olds (36% compared to 30% provincially) and a smaller proportion of young adults (only 21% are aged 25-44 compared to 26% provincially) (StatsCan, 2011).

Leading employment sectors are forestry (including wood product manufacturing), retail, and transportation. Educational services, hotels, restaurants, and health care also employ a large portion of the working population (StatsCan, 2011). Government, including St'at'imc, are also major employers.
Agriculture and the food sector do not figure prominently in regional employment figures. However, it can be difficult to tease out exact information about farming from employment industry data. For instance, the Community Information Database (CID, 2014) indicates that 20% of jobs within SLRD Area B fall under the category of "Agriculture, Forestry, Fishing, and Hunting", based on 2006 Census figures. Meanwhile, the District of Lillooet Community Factsheet lists "Farms" as employing 40 individuals, or 2.7% of residents based on 2001 Census figures (DoL, 2014).

The current population of the District of Lillooet and SLRD Electoral Area B region is approximately 2,700 and is expected to reach 5,000 by 2036 (BC Stats, 2012). To measure food self-sufficiency, the BC Ministry of Agriculture developed a model, which estimates that 0.524 ha of land (irrigated and non-irrigated) is required to produce an adequate and healthy diet for one person to live for one year (BC Ministry of Agriculture and Lands, 2006).

Although approximately 15,000 ha of ALR is located in the Lillooet area, the vast majority is not being irrigated on a regular basis. In order to be self-sufficient in food security, 1,572 ha of irrigated land would need to be under cultivation. To sustain a future population of 5,000 that number will need to grow to 2,620 ha. In 2006 only 1,750 ha of ALR land was being irrigated in the entire SLRD region including Electoral Areas A, B, C, and D combined (BC Ministry of Agriculture, SLRD Ag In Brief series). The Agricultural LUI and WDM found that 1,288 ha of land was being actively irrigated during the summer of 2013, indicating that there is much room for enhancement of food production in the current farmland base as long as irrigation water is available. The LUI results also provided an indication of the amount of underutilized ALR (either private lands or Crown land) that could be brought into production at a later date. Of the farmland surveyed (13,989 ha) only 1,012 ha was available for farming but not currently being used. Another 5,701 ha was listed as having potential for farming, but had limitations for farming such as slopes, drainage, soils, or size of parcel. For the analysis, it was assumed that removing built structures and fill piles, filling in water bodies or remediating slopes to create land with potential for farming would likely not occur. This analysis also did not include land within First Nations territory.

In 2006, the average household (2.4 persons) in British Columbia consumed $8,000 in food per year (Harasymchuk and Rolston, 2012). There are 1,068 households in the Lillooet region and they spend over $8.5 million annually on food. At the same time, the total value of farm production in the region (farm gate receipts) was only $2.86 million (StatsCan, 2012). Even after factoring in the wholesale farm gate value of food vs. retail pricing paid by consumers in grocery stores, there is ample room in the

market for growth and expansion. If we assume a retail markup of 200% in pricing, the economic figures still suggest that the local food market is only 67% filled by local food production. It should be noted that these numbers are conservative as they represent rough estimates only and do not account for local food that is being exported out of the region. Therefore the actual proportion of local food supply meeting local demand could be much lower than 67%.

Discussion of Key Economic Opportunity Issues

The top challenges, as identified by farmers during the survey and shown in Figure 11, include water quantity (irrigation/livestock watering), cost of land and taxes, cost of transportation & distribution, and a small local market.

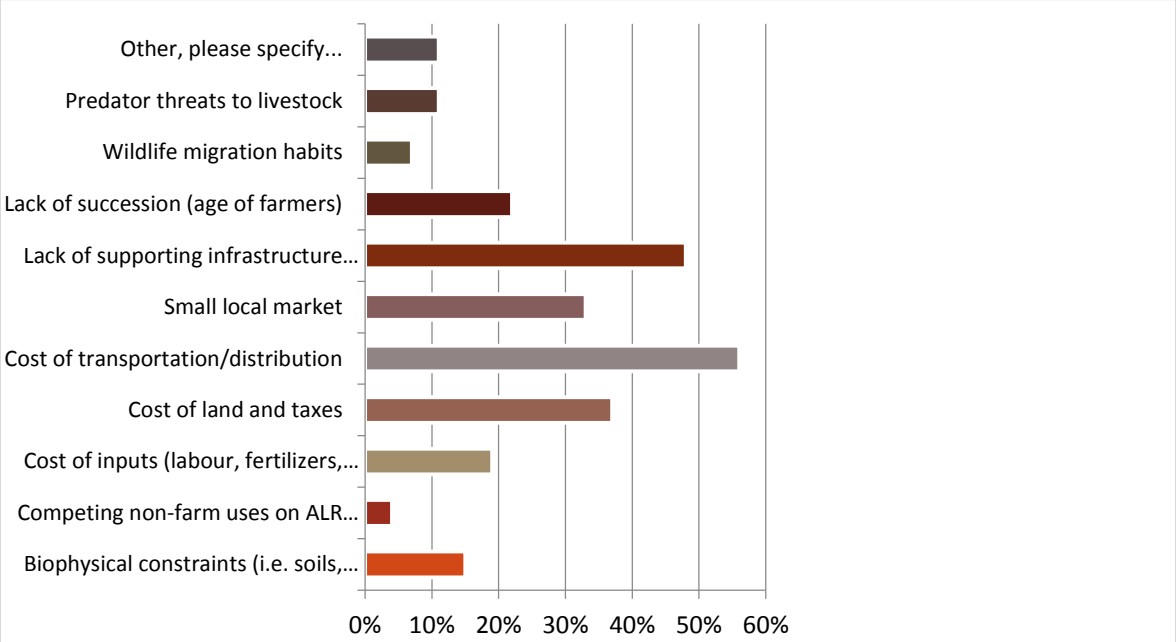

Figure 12. List of issues identified by local producers (Agricultural Plan survey, 2013).

1. Cost of Land and Inputs

Through the survey and one-on-one interviews, farmers responded overwhelmingly that the cost of land, taxes, and inputs are some of the top concerns facing agriculture in area encompassed by the *Agricultural Plan*. Local farmers are concerned that lower priced, imported food may be bringing down the price of locally grown food, which directly affects farmers' sales revenues. Local food producers are having difficulty competing with large agri-businesses.

The cost of land can be a barrier to those who are interested in starting a new farm. However, if farms were economically viable (through the introduction of value-added processing, for example) this barrier may be partially offset. Results from the Agricultural Land Use Inventory (LUI) conducted in 2013

indicate that properties in the ALR that are used for farming have an average assessed value of $20,867 per hectare, whereas properties in the ALR but unavailable for farming have an average assessed value of $157,320 per hectare. This would indicate that the cost of ALR properties available for farming may be high, but is much lower than those where farming isn't occurring or can't occur. Land in the ALR is taxed at a lower rate than farmland outside the ALR. However, not all farms are granted "Farm Status" by the BCAA. Farmers should be encouraged to take advantage of this reduction in taxes if they are not already doing so. In order to be eligible, minimum farm income requirements are calculated as follows: $10,000 on land less than 0.8 hectares (1.98 acres); $2,500 on land between 0.8 hectares (1.98 acres) and 4 hectares (10 acres); on land larger than 4 hectares (10 acres), $2,500 plus five per cent of the actual value of any farm land in excess of 4 hectares; and $10,000, in order to qualify unused land where the area in production by the owner makes up at least 25 per cent of the portion of the parcel outside the ALR. Some sales of qualifying agricultural products must occur every year.

Additionally, those who were interviewed and those who responded to surveys gave anecdotal evidence that it can be difficult to access smaller parcels of land in the region, with large parcels being valued out of range of most new farmers. These individuals felt that regional zoning and ALR restrictions have made it challenging to subdivide these large farm parcels into more affordable properties. It should be noted, however, that the best available research indicates that smaller parcels are actually less likely to be used for agriculture than larger parcels. The Agricultural LUI of SLRD Area B surveyed 276 parcels within the ALR for a total of 8,393 hectares. The LUI results support the notion that larger ALR parcels are more likely to be actively farmed. In fact, the average size of parcels being used only for grazing was 145 hectares/parcel and for farming was 45 hectares/parcel. On the other hand, ALR land being used for residential purposes only was 10 hectares/parcel, and ALR being used for industrial use only was 15 hectares/parcel. Therefore it is possible that creating smaller parcels of ALR will only serve to reduce the diversity of agricultural activities in the region. The Agricultural LUI also noted that only 12% of the ALR land is actively being farmed, suggesting much of the ALR remains available for farming.

It may be useful to develop a database of locally available farmland that is for sale and/or for lease so that new farmers can easily find land. Farmers in the Lillooet area may not have sufficient financial resources to afford adequate farm labour, equipment, and other farm inputs (seeds, feed, and soil amendments) to enhance production levels. It was also conveyed that most farmers need private investors or financial assistance in order to scale up their production and at least one family member must usually work off the farm to support the farming venture.

It was recommended that partnerships with financial institutions, such as the Interior Credit Union could be beneficial to inform farmers on possible loan options. Additionally, partnerships with the St'at'imc community for labour opportunities may open up other granting and funding opportunities. New viticulture operations have been successful at securing private investments and this may also be the case for other farms that are able to present a strong business case. This is discussed further below.

2. St'at'imc Partnerships and Initiatives

Several projects being spearheaded by the St'at'imc present opportunities for partnerships with the agricultural community. Traditional food harvesting methods, such as berry picking, fishing, and hunting, are important priorities for the St'at'imc. Traditional foods include Saskatoon berries, soap berries, wild strawberries, huckleberries, cow parsnip, deer, moose, fish, mushrooms, coltfoot, and cacti. Medicinal

plants also present an opportunity for the community to expand market opportunities. Split Rock Environmental is one example of a St'at'imc business that has leveraged traditional harvesting and medicines into a successful small business operation.

Many St'at'imc members suggested appropriate agricultural activities would include vegetable production, organic farming, and native plant propagation. By contrast there was less support for the introduction of dairy farming to the area. The need to closely monitor water resources for irrigation and potential impacts on wildlife were noted as high priorities.

The St'át'imc have an inseparable connection to their land and long history within their community. Community and economic development (CED) should both benefit and involve the members of the St'at'imc community. CED for the St'át'imc is generally supported by the following principles:

- community participation in planning;
- diversification of economic activities;
- benefit of local jobs and capacity building;
- form of local control and ownership; and,
- adherence to cultural and environmental values.

With a large youth population, the St'át'imc are open to exploring community-driven opportunities or partnerships in CED based on St'át'imc priorities, for the benefit of both current and future generations. Recognition that improvement in St'at'imc diet will go a long way to addressing many of the health issues facing St'at'imc members is important. Agriculture expansion and St'at'imc involvement is an opportunity to address overall community well-being.

The potential of a St'át'imc joint venture similar to style and full-service amenities of Nk'Mip Cellars in Osoyoos was raised during the Economic Opportunity Assessment report (2008) and remains a viable option.

3. Water

Overall, Lillooet has a warm and dry climate relative to coastal BC. However, there is growing concern about the impact that both climate change and population growth will have on the quality and availability of water for irrigation and livestock. As part of the consultation process, farmers were asked to identify any specific biophysical constraints on their farms. Aside from steep slopes and stony soils in some locations, many farmers responded that they are faced with seasonal water scarcity challenges and a lot of unknown extreme weather variability due to climate change.

Almost every summer during the height of the growing season, Lillooet and the surrounding region experiences some level of water restrictions. In the past, ranchers have not had secure water licenses over range water sources. There is initiative being taken by the provincial government to rectify this, through the Cascades Natural Resources District. However, some ranchers still feel a lack of security regarding their operations when it comes to water. To increase the amount of land being brought into production, adequate water must be available for irrigation and livestock watering. However, there are concerns that water may not be as accessible in the future and there is a general lack of knowledge surrounding agricultural water sources, consumption rates, and whether or not water conservation practices are being employed by farmers.

Farmers understand that climate change is expected to increase weather variability - in particular changes to precipitation patterns, timing of spring thaws and snow melts, and growing degree days. They understand that water shortages are likely to worsen, resulting in competition for limited water supplies. At the same time there is also an increasing awareness of the ecological needs for water within each river system and an understanding that a minimum amount of water is critical to the needs of fish and other wildlife.

The community may benefit from an in-depth research report on the use of water by farmers in the area. Dissemination of information and resources for on-farm water conservation practices could be facilitated by agricultural organizations. Water allocation planning, which includes information and analysis of seasonal water flows, licensed use, and ecological requirements, is needed. This could include an inventory of available water (e.g., quantity and flow information) for agricultural and industrial development, domestic use, storage, conservation purposes, and fish and wildlife.

4. Wildlife

In the Territory and culture of the St'at'imc, wildlife plays a pivotal role. In particular, the spiritual species include grizzlies, mule deer, and salmon. The protection of their habitat and ecosystem health is paramount. Grizzlies play an especially large role in how the web of life in St'át'imc Territory functions, and they require large areas of land to meet their needs. Maintaining their habitat can help ensure the conservation of many other native species. The areas noted as Grizzly Protection Areas in the St'at'imc Land Use Plan fall primarily outside the ALR.

Mule deer are also a species of special management concern in St'át'imc Territory, because of their cultural importance to the St'át'imc, their sensitivity to landscape changes in their winter ranges, and the vulnerability of their migration routes and fawning areas. The St'at'imc Land Use Plan restricts cattle grazing, chemical pesticide and herbicide use, and clear-cutting within the Deer Protection Area. The St'at'imc Deer Protection Area coincides with some of the ALR in the SLRD Electoral Area B, primarily near the communities of Pavilion, Fountain, and Cayoosh Creek.

Fish species of cultural importance include four species of pacific salmon (Sockeye, Chinook, Coho and Pink), steelhead, bull trout, white sturgeon, rainbow trout, kokanee, gwen7is, white fish, suckers, dolly varden, brown trout and brook trout. St'at'imc fish protection areas are designed to protect fish streams and the high intensity of St'át'imc cultural uses associated with these and adjacent areas. The first 50 metres on either side of all fish streams is a full protection area that coincides with St'át'imc Water Protection Areas. In addition, based on St'át'imc traditional use information, a cultural fish protection area extending one kilometre on either side of all fish streams has been established.

The Best Management Practices that are supported by the Ministry of Agriculture through ARDCorp include a suite of agricultural activities aimed at minimizing the impact of farming on wildlife habitat. Many farmers and non-farmers are interested in protecting the habitat of species found in the Lillooet area by promoting best management practices through conservation-based farming.
At the same time, the prevalence of deer, bears, cougars and coyotes have been a predation issue for crops and livestock. This issue has been raised by farmers in other regions of the province.
In 2004 the IAF and ARDCorp funded research to explore wildlife and agriculture issues through the Wildlife Program Development initiative. The work involved the implementation of pilot wildlife damage

compensation projects funded by the Business Risk Management Branch of the BC Ministry of Agriculture. Five pilot projects were conducted involving compensation for losses of forage to wild ungulates and waterfowl; and for losses of livestock to wild predators. Two major evaluation reports were produced: the BC Wildlife Damage Compensation Pilot Projects: Evaluation Report; and the Wild Predator Loss Control and Compensation Project Evaluation.

The project supported a wide range of program development initiatives and opportunities aimed at addressing wildlife agriculture conflicts including:

- BC Agriculture Wildlife Advisory Committee
- Agriculture Wildlife Program
- Provincial Agriculture Zone Wildlife Program
- Landowner Enfranchisement projects

For a full account of all the pilot projects funded through this initiative please refer to the Appendix of the BCAC Wildlife Program Development Report (2004). The BC Ministry of Environment works with the agricultural industry to respond to calls regarding conflicts between livestock and wildlife. This is spearheaded by a Steering Committee that meets irregularly and includes representatives from Ministry of Forests, Lands, and Natural Resource Operations (FLNRO), Ministry of Agriculture, Ministry of Environment, representatives from the ranching industry, and the BC Wildlife Federation (Mike Badry, pers. comm.). The BC Cattleman's Association has done some work to assist ranchers in minimizing the impacts of predation on cattle and have developed Wild Predator Loss Best Management Practices for livestock.

5. Economies of Scale and Product Diversification

Seasonal production volumes and lower economies of scale are major factors affecting the competitiveness of local food producers, particularly for fresh fruit and vegetables not subject to supply management regulations. The relatively small size of produce farms, and minimal markets for local meat sales (due to MIR restrictions), reduces the opportunity for higher returns based on economies of scale that influence overhead costs (administrative and inputs). Furthermore, the lack of crop specialization means that many farmers are producing a little bit

Viticulture

Several studies, such as the *Climate and feasibility assessment of growing wine grapes in the Lillooet-Lytton area* by the BC Grapegrowers' Association, highlight the potential of viticulture in the area, and a large amount of investment capital has recently been delivered to the Lillooet area in the hopes of developing a new wine region in BC.

The studies outline some key beneficial features of the area for grape production and initial field trials are promising. To date, two main players (Fort Berens and Texas Creek Ranch) have entered into grape production in the Lillooet area.

The Fort Berens winery was started up in the spring of 2009 and now includes 20 acres of planted grapes and an additional 20 acres that will be brought into production in the future. The producers came to the Lillooet area from the Netherlands and were attracted to the area based on a combination of climate and land prices, which were lower than the Okanagan. A lot of research went into the location choice, including water sources and weather data. Consultants were hired to conduct a site suitability assessment and help to get the operation established. High investment capital was required, with business partners from outside of BC investing over $4 million. The building and equipment represented the highest costs. A loan for a portion of the investment was obtained from Farm Credit Canada.

Texas Creek Ranch is an experimental grape vineyard, with about 3 acres of grafts from the current vineyard to be planted in the upcoming year. Challenges include finding nutrient inputs, such as manure, in the region that is of consistent quality. Texas creek ranch required an investment level of $1.5 million before production and planting on a commercial scale. Basic expenses were $25,000/acre, which doesn't include raising vines to production age (5 years).

of a lot of things, rather than a lot of one or two things. For instance, Fountainhead Carrots is one of the only farms in the region growing and marketing a single product. While diversity of crops at the farm level is important for Integrated Pest Management and overall farm sustainability, the lack of farm specialization (focussing on two or three products per year) means that lower returns are garnered relative to the high input costs previously discussed. Genetic diversity in crops can also be maintained through planting multiple varieties of a single crop; thereby obtaining ease of use in planting and management, while maintaining ecological principles.

Some communities (e.g. Denman Island) have discussed holding an annual "crop cooperation meeting" for farmers that would take place during the planting and planning stages of their farming season. The objective is for farmers to choose which crops they wish to grow that year, specifically for the local market. Thereby, one year a farm may focus on carrots, cabbages, and mixed greens while the following year they may focus on peas, beans, and potatoes. This strategy ensures crop rotation on an annual basis without flooding local farmers markets and retailers with too much of any one locally-grown crop.

There is an opportunity to increase the commercialization of the local produce industry. At one point Lillooet was known as the tomato capital, but this has been abandoned. The capacity to grow field tomatoes based on local climate conditions remains high. Historically there was a producer of melons, squash, and root crops who sold directly to Choices market. However it is believed that a lack of local labour resources led to the failure of that operation.

Many community members noted a desire to purchase local dairy products. While the dairy quota system would be restrictive to farms wishing to sell fluid milk locally, the provincial Class D Producer Vendor Licence offered through the BC Milk Marketing Board under Amending Order 16 allows dairy farmers to process their raw milk into cheese for sale. This has been successful on Salt Spring Island, northern Vancouver Island, the Shuswap, and the Okanagan, and could be successful in the Lillooet area. During the one-on-one interviews, it was suggested that there is an overall willingness to collaborate and share information within the agricultural community and that the local retail market is generally underserved.

6. Labour

Communities in the region have long based their economy on natural resources. Historically jobs have centered around gold rushes, railroad construction, mineral exploration and mining, hydro dam construction, highway projects, forestry, fishing, tourism, farming and ranching. Downturns have resulted in unemployment, wage disparities, rapid shifts in population, and lost opportunities for associated businesses (LRMP, 2004). Despite these challenges, people are attracted to the area by its beauty and quality of rural life. While the agriculture sector employs 12% of the population, survey results suggest that the vast majority of farmers (78%) have additional work outside the farm. Very few farms have employees and those that do usually only have 1-2 paid employees.

The labour issue is a bit of a "chicken and egg" problem for local farmers. Many acknowledge that additional labour resources are required in order for operations to scale up production; however most farms cannot afford to hire labour, even seasonally, at current profit margins. Therefore, 83% of farmers who responded to the survey said that they aren't looking for labour outside of family help. When labour is sought, it can be difficult to find help. The population in the region is aging, with many in

retirement, and many members of the younger generation are leaving the region for higher paying work opportunities.

Many St'at'imc members are either underemployed or unemployed. Half (50%) of St'at'imc members who provided input to the *Agricultural Plan* were not currently working. However 36% also said they were not interested in working in agriculture. Only roughly a quarter (27%) expressed an interest in full time seasonal farm work.

Several stakeholders also mentioned the lure of the oil and gas sector in northern BC and felt that many people in the 25-55 year age range were leaving Lillooet on short-term work opportunities out of the region. When compared to international competitors in the agricultural industry, many Lillooet producers are at a disadvantage. There are no (or few) low wage job seekers in the region, and those who do appear are often transient (such as those involved in the WWOOFing program) and/or uninterested in making long-term work commitments for positions with low wages and few benefits.

7. Processing and Value-Added Infrastructure

The lack of access to local food processing infrastructure is a challenge for producers in the region. There is enormous potential for value added local products that address changing trends in the food industry and offer increased economic returns over the sale of unprocessed and/or conventional food products. These include:

- Canned goods
- Sauces, marinades, jams
- Baked goods
- Frozen goods
- Cheese products (utilizing BC's Cottage Industry Program)
- Meat and eggs

Cattle Industry

Since 2003 the cattle sector was hit by successive impacts affecting its competitiveness that include: BSE outbreak; higher grain prices which significantly impact the cow/calf industry; currency exchange rates; US requirements with respect to 'country of origin' labeling, which in turn causes packing plants to avoid Canadian products due to the extra administrative load associated with tracking; increased costs for both fuel and fertilizer; and increased energy costs.

The last ten years have been more down than up for the cattle industry, however the last two years have seen a partial recovery of the market. However the industry has only just barely come back to 2002 levels. In the meantime, input costs have increased with inflation. The BCCA believes the industry is recovering and is headed towards 3-10 years of improved profitability (Kevin Reed, pers. comm.). Confidence has been regained in the market and international opportunities are opening up, especially in Asia. Current droughts in other jurisdictions, such as central and western USA, means there is a narrowing of supply throughout the world. BC beef has the reputation of being very high quality.

Lillooet and the surrounding region is one of the more rugged terrains cattle use for grazing in BC, but ranchers in the area have developed a unique skill set to utilize this terrain effectively. The land and forage (grass) require specific management practices to create high yields. There are also impacts locally from wildlife predators and the logging industry, which has developed roadways through grazing areas.

The MIR has had a large impact on cattle production in the Lillooet region. Producers speak of the need to now send their cows further and further afield for finishing and slaughter. Some question the traceability of the product in this larger system, and whether or not the product that is sold under their name is actually originating from their ranch. Many smaller producers, those with less than 100 head of cattle, have had to sell their operations because the profit margin simply became too small.

The BCAC sees opportunities in agroforestry, trail rides (agritourism), and the development of niche products such as "natural" beef, as ways to increase profit margins of Lillooet and area ranchers. BC cattle producers' advantages also include excellent cattle with good genetics, climate, land availability and market access.

The Provincial Meat Inspection Regulation (MIR) has resulted in a reduction of locally-available abattoirs for beef and poultry producers. The MIR sets out construction, inspection and other requirements for provincially licensed slaughter facilities in BC. The regulation came into force in 2004, compliance became mandatory in September of 2007, and significant changes to licence classes were made in April 2010. The language of the regulation allows for innovative approaches, such as mobile slaughter facilities, that can provide services to several rural communities. However, many small scale producers criticized the move as restricting their ability to slaughter their animals in areas not served by provincially-licensed facilities. This creates high costs associated with meat processing for farmers in more remote communities. Currently, in order to process livestock, or have eggs graded for sale, farmers must ship their livestock and eggs to outside facilities, which is cost prohibitive. Farmers also have the ability to apply for Class E licenses, which allow them to slaughter their own animals on site for farm gate sales.

The production volume of local food in the Lillooet area may not be large enough to support conventional processing facilities, but cooperative or other alternative models may be viable. Producers who were interviewed mentioned that there is a general demand for niche products inside and outside of the Lillooet and SLRD Area B region. Large consumer markets such as Whistler, Vancouver, and Kamloops are relatively nearby and can be accessed without too much difficulty.

It should be noted that the ALC's regulation permits the processing of farm products in the ALR provided 50% of processing is directly from the farm operation. Furthermore, processing facilities on ALR land that are not associated with a farm, or have off farm inputs greater than 50%, require an application be submitted to the ALC.

While many local farmers (85% based on survey results) indicate that they produce canned preserves or pickles, only 20% produce baked goods, or bath and/or beauty products. This apparent divergence between what is being produced and what is being purchased are potential areas for growth in value-added products in the region.

There are also opportunities for the St'at'imc to become increasing involved in value-added production. Based on the survey and interviews, 85% of St'at'imc members eat traditional foods and 73% are active in harvesting traditional foods. However, the majority (62%) say that they are not involved with the creation of value-added products. Of those who are, the products created include salves, pine baskets, jewelry, and birch canoes. Artist paintings, tattoos, and piercings were other culturally-relevant creative endeavours that were mentioned.

Community investment in the following resources may leverage the ability of producers to create value-added products:

- **Cold storage facilities**: In order to extend the life of produce once cultivated, cold storage is necessary. This type of storage is required both as a transportation mechanism (refrigerated truck) for distribution and as a seasonal storage option. For instance, fresh fruits and vegetables could be frozen and sold locally year-round.
- **Food Hub, Commissary, or Commercial Kitchen:** The Hub would provide an opportunity for farmers to rent space and equipment to create canned, pickled, baked, smoked, or other value-added products. This Hub could also provide a centre for food collection and drop-off and an extension of the farmers market.

- **Wine cellars and micro-breweries**: The demand for alcoholic beverages is fairly consistent over time. Developing a local network of cellars and microbreweries to capture a portion of the alcohol market would likely be successful. Bitterbine Hops are interested in becoming a central processor, distributor and marketer of hops. Fort Berens winery is putting in 10,000 ft^2 processing facility, warehouse, and expanded tasting room (going to 12,000 cases).

8. Transportation and Distribution

Not only do farmers need to ship livestock outside of the community to be processed, inputs, such as specialized animal feed and bulk soil amendments, are also required to be brought in from outside the region. In such cases, farmers must travel long distances, taking them away from the farm, or pay high prices for an external distributor. As most agricultural inputs, equipment, and servicing come from outside the community, prices locally are much higher because they've internalized transportation and shipping costs.

Fountainview Farms

Fountainview Farms grows organic carrots on over 100 acres of land just outside of Lillooet. The carrots rotate on approximately 20 acres every year, with fallow crops and nitrogen fixers on the remainder of the land.

Fountainview Farms has set up a successful distribution model in the region. The carrots can be found in the Lower Mainland, Williams Lake, and the Kootenays. Fountainview has established a positive relationship with Pro-Organics Distribution to provide extensive distribution services.

The farm has cold storage on site, which allows for supply to be available to the distributor from the end of August until April every year. This may provide a model for other local producers to create working relationships with distributors within and outside the region to get products to market efficiently and affordably.

Support systems and infrastructure for collecting, storing, processing, and distributing food to major retail markets have long been established and operate efficiently at the provincial and national levels (Sysco and Overwaitea are examples). Despite support from local retailers, producers may have difficulty accessing this distribution system because:

- Many producers are too small to meet production requirements of larger scale retail outlets;
- Many producers in rural and outlying areas cannot efficiently transport products to a distribution point or center; and
- There may be information gaps around labeling, quality control, traceability, and food safety.

Additionally, having to distribute farm products to retailers and local restaurants individually can be problematic for farmers by taking them away from their farms and increasing costs dramatically for vehicles and fuel. Local restaurateurs and retailers are often unable to travel from farm to farm picking up agricultural products, usually due to time constraints. Similarly, residents are also unable or unwilling to visit each farm to buy their products at the farm gate, opting instead to buy products in the grocery stores at times when convenient for them. Grocery stores and food markets provide a key opportunity for increased local food sales aside from Direct Farm Marketing. These retailers include:

- Buy Low Foods
- Lillooet Foods
- Country Store
- Jones' Market

Transporting farm products into and out of the Lillooet area can be challenging. Extreme weather conditions cause road closures in some areas, particularly on Highway 99, between Pemberton and Lillooet. It was also noted that Canada Post has limited hours for the current pace of business.

Some opportunities were identified through the public engagement sessions to address the challenges with transportation and distribution. These include:

- **Refrigerated Transportation**: Improving access to large grocery stores (Foodland, etc.) by purchasing and managing a cold storage truck (this could be done cooperatively amongst a number of farms). Alternatively, several trucks deliver food products to Lillooet make return trips to Kamloops, Vancouver, and other communities empty. This represents a potentially untapped market.

- **Bulk Input Buying**: Farmers could coordinate input purchases to bring in a truck to deliver bulk farm inputs regularly to save collectively on travel costs.

- **Institutional Purchasing**: Organizations that buy and sell prepared food can be targeted. While this is already happening to some degree, it could be improved upon. Farm-to-School programs, a local food purchasing policy for hospitals and care centres, and showcasing local products to chefs and restaurants are just some ideas. Additionally, local retailers have identified their desire to purchase directly from local farmers. Contract growing opportunities may exist in the region where farmers can grow products specifically to meet retail needs.

- **Direct Market Business Plans**: Farmers financially benefit most from direct farm sales (farmers' markets, farm gate, internet sales, Community Supported Agriculture (CSAs)) as direct sales typically reduce time and energy spent on distribution and help farmers retain a larger portion of revenues. An example of a Direct Farm Marketing Business Plan can be found here: http://www.agf.gov.bc.ca/busmgmt/bus_guides/direct_guide.htm

9. Marketing and Sales

Farmers in this region experience a limited customer base and some have experienced difficulty in selling to retail outlets, such as large grocery chains, because they either need to produce more than they are capable of or they need to be able to offer a consistent supply, which they cannot guarantee. Some restaurants have also been difficult to sell to as they require specific timing on delivery of products and demand a range of products, which may not be available.

During the survey, residents said they often find it difficult to find local farm products at local stores and there are not enough growers at the farmers market. Farmers also expressed difficulties attending the farmers market because they are very time-consuming and take them away from the farm at peak production times of the year. As a result, only 33% of farmers who responded to the survey sell at the farmers market.

Farmers were asked to explain where they market their products through the survey. Of the farmer respondents, most grow products for their own use (80%), while 71% sell products locally. Only 20% (11 respondents) indicated they sell their agricultural products beyond the Lillooet area, mainly in Greater Vancouver, Squamish, Whistler, and Pemberton. This represents an opportunity for increasing revenues by selling outside the local Lillooet market.

Lillooet has excellent access to Vancouver, Sea-to-Sky, and Interior markets through, road, and air transportation. While growing for sale outside of the region is not an overarching goal of the Agricultural Plan, the potential should not be underestimated. A significant increase in exports could likely accompany a significant increase in profit margins, thereby spurring local food production.

Many opportunities for marketing farm products exist, including:

- **In-Store Advertising**: Advertising support in the store where their products are offered. Pictures of the farmers and their families could be presented along with information about each farm. Dedicated sections in local grocery stores (10 to 12 feet of shelf-space) could be set aside for local farm products. This area could be called "Lillooet Fresh" or similar.

- **Online and Social Media**: Apps, websites, tweets, and Facebook posts relating to local food and agriculture all add to the extension of awareness and understanding of the Lillooet and SLRD Area B food system.

- **Development of a Farmers' Institute or Farmers' Cooperative:** This organization would have a different mandate than producer associations. The group could oversee a branding exercise for local foods, create a mentoring program to support new and existing farmers in the area, and improve information and knowledge transfer between farmers.

- **Branding for Local Food**: The potential exists to utilize students for marketing and graphic design support. Educational institutions or local organizations could also offer marketing courses for farmers to help support them in their efforts.

- **Agritourism**: An Agritourism Strategy could be developed for the region. Some agritourism options that were discussed included U-Pick promotions, trail rides and hikes, wine tastings, farm crawls, and more.

According to Lillooet retailers, the biggest local product sales are:

- Honey
- Water and ice
- Fountainview carrots
- Garlic
- Airport Gardens produce (tomatoes, squash, etc.)

Some retailers have expressed frustration at the lack of diversity or variety of local produce, lamenting the overabundance of kale, chard, and other leafy greens and a lack what actually sells well in the store (tomatoes, green onions, melons, and other fruit). There is an opportunity for greater communication between growers and retailers in the area. Growers can sit down with retailers and find out how much they sell and let them know how much they may be able to provide.

10. Consumer Awareness and Education

Increasing consumer awareness of the benefits of eating local foods in turn raises the demand for fresh and processed local food products. During discussions with farmers, many felt that education around local food and the need to support local farmers is paramount to strengthening the local economy.

Conversely, members of the community indicated awareness of several aspects of eating locally (healthy, fresh, supports the local economy), but that they would like to be able to shop for local products at the main retail stores. There were also concerns expressed around the cost of local food and a lack of awareness around what is available.

Some suggestions for educating and supporting the local community include:

- **Buy Local**: In conjunction with a local foods branding exercise, an education campaign could be developed with a Buy Local focus. This education campaign could target children through the School District and the Chamber of Commerce could be included in the program.

- **Nutritionist Partnerships**: A program could be developed to teach people how to cook and eat seasonally with community nutritionists providing support on using different foods. Programs such as North Okanagan Community Kitchens could be used as a model.

- **School Partnerships**: Farmers and other community members could work with local schools to develop educational programs on agriculture and growing food. Partnerships between farms and schools can receive support from many local businesses and organizations. It may serve as a useful pilot program for other interested farmers and schools. Currently there is a garden at George M. School. Tours of Split Rock Environmental could also be organized.

Summary of Opportunities and Challenges

Issue	Challenges	Opportunities
1. Cost of land and inputs	• Difficult to find small properties to farm as zoning does not allow for subdivision to farmable-sized parcels of land, which raises the cost of the land and affects profitability. • It can be difficult to find land to lease. Much of the land is tied up in grass or forests, or it is being left fallow for a reason. • Cattle are being pushed into more marginal land as residential and commercial development, as well as the production of crops such as grapes and hops increases in the lowlands.	• Land is relatively affordable in comparison to the Lower Mainland, Vancouver Island, or Okanagan. • Lack of diseases and pests as compared to other regions. • Sizes of ALR/farmland parcels are large enough to accommodate a diversity of crops. • Farmers could take more advantage of "Farm Tax Status" to increase tax savings. • Crown land leasing should be discussed with MFLNRO and other government agencies.
2. St'at'imc partnerships and initiatives	• Relationships between St'at'imc, SLRD, District of Lillooet, and farming & ranching community are still evolving. • SGS programs through *Training and Employment* require direct job placements and this is not always possible. • Several initiatives exist among various communities (gardens, education) but there is a lack of high level coordination or vision for the future of economic development of St'at'imc food or natural products.	• There is an array of potential partnerships with the St'at'imc for farming and value-added product development that remains relatively untapped. • Split Rock Environmental provides a unique model and employment opportunity for St'at'imc members interested in horticulture.
3. Water	• Weather in the region can be extreme with droughts in the summer and very low temperatures in the wintertime. • Water licensing and water quantities for summer irrigation are challenging. • Conflicts between water users (residential vs. agricultural).	• Initiatives such as AGRI's Land Use Inventory and Water Balance Model will provide additional data towards local knowledge. • Okanagan Basin Water Board and research done in partnership with First Nations is a good model. • Emerging low-drip irrigation and other technologies could assist farmers in water conservation. • Opportunities for on-farm water storage.
4. Wildlife	• Key wildlife (grizzlies, mule deer, salmon) and their habitat seen as a priority over other land uses by the St'at'imc. • Predators and wildlife are a major concern, particularly for livestock operations that require ranging in forested areas. • Species at risk habitat values.	• Communication opportunity between farmers and St'at'imc about the roles of land for both wildlife habitat and food production to avoid conflicts. • Existing projects funded through IAF since 2004 show ways to reduce crop & livestock losses to predation.
5. Economies of scale and crop diversification	• There is no economy of scale in many of the smaller-scale operations, resulting in slim profit margins, so it is difficult to afford equipment or other infrastructure	• The availability of local products could be expanded upon through contract growing. • The climate in the region is good for tomatoes, melons, grapes, etc.

	required to increase production. • There is frustration among retailers with the lack of availability of crops that sell well.	• There are agroforestry opportunities and possible cooperation between forestry and agricultural resource sectors. • The establishment of new vineyards and the potential growth of the wine industry show promise.
Issue	**Challenges**	**Opportunities**
6. Labour	• The population in the region is aging, so it can be difficult to access labour resources. • Many of the younger generation are leaving the region for higher paying work opportunities.	• A portion of the community, and St'at'imc in particular, are unemployed or underemployed and may be interested in working in agriculture. • Value-added food processing jobs can increase wages.
7. Processing and value-added infrastructure	• In order to process livestock, or have eggs graded for sale, farmers must ship their livestock and eggs to outside facilities, which is cost prohibitive. • MIR restrictions have had severe negative impacts to the local ranching industry.	• Opportunities for St'at'imc members to become involved in the production of value-added natural products. • Cold storage, food hubs/commissaries, and wine-tasting and microbreweries all exhibit strong market potential.
8. Transportation and distribution	• The Lillooet area is isolated, which makes access to inputs and the customer market difficult. • The cost of distributing products and bringing in inputs from outside of the community such as equipment, services, fertilizer, and seeds can be prohibitive for small growers.	• There are trucks that are returning back to the Lower Mainland from Lillooet to warehouse facilities that could accommodate some produce returning from the region. • Retailers can purchase directly from farmers in the region and send these products back to the Lower Mainland on trucks doing their return trip.
9. Marketing and sales	• There is a somewhat lack of a unifying identity within the agricultural community, with a divide between ranchers and small scale vegetable operators and emerging grape growers. • There is no local/regional branding for local/regional products.	• The Lillooet region has a lot of marketing opportunities in terms of the landscape and aesthetics. The remoteness of the region is appealing and could be promoted more effectively as an agricultural region. • There is a demand for specialty niche agricultural products that are natural or organic. These can generate a higher return and could be expanded. • There is a proximity to markets such as Whistler, Vancouver, and Kamloops.
10. Consumer awareness and education	• Members who are relatively new to the community don't always know where to go or who to ask for local products. • Local products are not always featured or highlighted at retailers. • There is a general lack of education around the local food system in the schools.	• The District of Lillooet and the SLRD could play a role in promoting the agricultural potential of the region to attract more growers. They could also provide information to potential farmers about the biophysical and economic development capacity of the area. • Community supports "buying local". • Partnerships between farmers, school districts, Interior Health Authority, and/or nutritionists could help bridge the awareness and education gap within the community.

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Appendix I: Survey Results

The Consulting Team collaborated with SLRD Staff and the Working Group to develop three surveys on food matters and agricultural development opportunities. The three surveys were developed to best target the interests of

- Farmers
- St'at'imc members
- Community members

Hard copies of the survey were distributed in person at the June 2013 open houses, made available at the Lillooet library, and were mailed to ranchers including self-addressed and stamped return envelopes to encourage completions rates. The surveys were also made available online to enable members of the interested public to provide input on a range of key issues outside of, or in addition to, formal meetings and public events.

The survey received nearly 200 responses between early August and the end of October 2013. Input received was used to develop the list of issues and priorities, determine opportunities and challenges, and refine the list of recommended actions. It is important to note that the survey participants do not represent a random sample due to the fact that they were able to self-select on their choice to fill out the survey (i.e. participation was voluntary), therefore results are not statistically significant. Full results from the public opinion survey can be found in the Public Consultation Summary Report (see Appendix).

Highlights of survey results:

Farmers:

- 52% of the farmers have been farming for 20-30 years (15/29)
- Vast majority of food produced is just for personal use
- Largest number of responses:
    - Apples (24 responses)
    - Garlic (23 responses)
    - Peas (23 responses)
    - Value-added: 50% (9/18) produce canned preserves/pickles
- Marketing:
    - Easiest to sell: dried fruit (2), beef (4), fresh fruit (4), hay (5), garlic (5)
    - Hard to sell: beef/meat products (4), fruit (5)
    - 86% of products are produced for own use (24/28)
    - 71% for trade or barter (20/28)
    - 71% for sale in Lillooet and Area B (20/28)
    - 43% in the Greater SLRD (12/28)
- Farmers markets:
    - 48% do not sell at farmers markets (13/27)
    - 33% sell at Lillooet farmers market (9/27)
    - Why not: 42% said it's too much work
- Production methods:
    - 67% use organic principles, but are not certified (18/27)
    - 56% say their products are naturally grown (15/27)
    - 41% say they are GMO-free (11/27)

- Average farm size: 120 acres (28 responses – ranged from 0.5 acre to 929 acres), median is 38
- Average acres cultivated: 44 acres (26 responses – ranged from 0.5 acre to 350 acres), median is 9
- 78% of farmers farm part-time
- 78% have work outside of farming
- Very few farms have employees and those that do only have 1-2 paid employees
- 83% of farmers aren't looking for labour outside of family
- 44% find labour through word of mouth
- Top 3 challenges:
    - Cost of land and taxes (37% - 10/27)
    - Cost of transportation and distribution (56% - 15/27)
    - Lack of supporting infrastructure (48% - 13/27)
- Top 3 benefits:
    - Biophysical characteristics (77% - 20/26)
    - Land is relatively affordable (38% - 10/26)
    - Local farmers are supportive of one another (42% - 11/26)
    - Lack of diseases and pests (62% - 16/26)
- Biophysical constraints:
    - High irrigation needs (59% - 13/22)
    - Steep slopes (59% - 13/22)
    - Stones (50% - 11/22)
    - Shallow soils (45% - 10/22)
- Agritourism activities:
    - Sell products at the farm gate (42% - 10/24)
    - Do not participate in agritourism (42% - 10/24)
    - Participate in farmers market (33% - 8/24)
    - Not much interest in agritourism efforts (about 1/3 of respondents) beyond the farm gate sales (55%) and farmers markets (45%)
- Succession planning:
    - 40% want to pass farm on to children (10/25)
    - 24% do not have a plan (6/25)
- 60% have experienced water quality/quantity complaints (6/10). Other complaints have been minimal.
- 52% of farmers are producing less than $4,999 in annual gross farm revenue (13/25)
- 68% say they need more local processing, storage, and distribution options (17/25)
- What support do people want from local government?
    - Support for local processing and distribution – better road maintenance
    - Support agritourism
    - Fewer water restrictions
    - Agricultural education and workshops for both farmers and consumers
- Vision for agriculture:
    - Profitable
    - Expansion
    - Diversity
    - Optimistic outlook for the future
    - Focus on sustainable production methods

Community Members:

- 64% are gardeners (29/45), 56% are concerned citizens (25/45)
- 93% of respondents have a garden at home (41/44)
- 98% grow tree fruits (39/40), 90% grow vegetables (36/40), 80% grow herbs/flowers (32/40)
- 36% do not want to start an income generating farm (16/44)
- Vision for agriculture:
    - Decreased water restrictions
    - Focus on organic and sustainable production methods
    - GMO free
    - Local processing opportunities
    - Local restaurants that showcase local food
    - Diverse small-scale agriculture
- Current state:
    - Disconnected
    - Underappreciated
    - Not realizing fullest potential
- Desired state:
    - Organic
    - Supportive local market
    - Job opportunities
    - Young farmers
- Top 3 challenges:
    - Cost of land and taxes (42% - 18/43)
    - Cost of transportation/distribution (49% - 21/43)
    - Lack of supporting infrastructure(processing, cold storage) (44% - 19/43)
- Top 3 benefits:
    - Biophysical characteristics (85% - 35/41)
    - Size of ALR/farmland parcels are large enough to accommodate a diversity of crops (41% - 17/41)
    - Land is relatively affordable (54% - 22/41)
- 57% say they always support buying local (31/54)
- Local products that are purchased:
    - Baked goods – 68% (34/50)
    - Canned preserves and pickles – 46% (23/50)
    - Wine, beer, spirits – 44% (22/50)
    - Vegetables – 46% (23/50)
- Crops community members would like to see grown locally:
    - Nuts – 56% (29/52)
    - Dairy (cow) – 56% (29/52)
    - Poultry – 58% (30/52)
- Support needed from local government:
    - Reduce water restrictions and make water affordable
    - Support for local processing
    - Farmland protection
    - Start-up funding

St'at'imc:

- 60% live on-reserve (9/15)
- 40% are parents (6/15)
- 53% do not have a garden (8/15)
- 73% are active in harvesting traditional foods (11/15)
    - Berries (Saskatoon berries, soap berries, wild strawberries, huckleberries), cow parsnip, hunting (deer, moose, fish), mushrooms, medicinal plants, coltfoot, cacti
- 85% eat traditional foods (11/13)
- 62% do not make value-added products (8/13), 38% do (5/13)
    - Pine baskets, salves, birch canoes, jewelry, artist paintings, tattoos, piercings
- Employment:
    - 50% are currently not working (7/14)
    - 36% are not interested in working on a farm (4/11)
    - 27% would be interested in working full-time seasonally (3/11)
- Current state:
    - Non-intensive
    - Organic
    - Connected
- Desired state:
    - Economically driven
    - First Nations involvement
    - Job opportunities
- What agricultural activities are appropriate for the region:
    - Vegetable production (92% - 11/12)
    - Organic farming (92% - 11/12)
    - Native plant propagation (83% - 10/12)
    - Little support for dairy production and agritourism
- What agricultural issues need to be addressed in the region:
    - Use or control of water for irrigation (92% - 11/12)
    - Job opportunities (100% - 12/12)
    - Potential impacts on wildlife (83% - 10/12)

Demographics:

- 46% District of Lillooet
- 12% Area B: Texas Creek
- 23% some college courses
- 24% household income over $80,000 (12/49)
- 44% say they spend $400/month on food
- 60% do not have children
- 66% female (55/83)

Appendix II: Notes from the Technical Workshop on November 6th, 2013

Sculpting a regional agricultural identity: Marketing and branding for success
Sandy Blue, Maple Ridge Economic Development Office, True North Fraser
Pitt Meadows, Maple Ridge, and Mission partnered with BC Jobs Plan to develop a regional partnership to develop an agricultural marketing strategy and agrifood hub amongst the communities. The True North Fraser concept evolved over an 18 month timeline. Province helped with resources and expertise.
Presentation link: http://uplandconsulting.ca/wp-content/uploads/Blue.pdf

Small group discussion – how could an initiative like this work in Lillooet?

- Very inspiring concept of working regionally on a brand
- Could be based out of the economic development office
- Lillooet and area is at a preliminary stage when compared to agriculture in the lower mainland
- The Lillooet "Rugged" branding was a good exercise and agricultural branding could be based off of that
- Resource capacity is an issues (human and funding)
- Need a critical mass of producers and products
- Need champions who are willing to work on a volunteer-basis (we have this somewhat, Lillooet Food Matters etc.)
- Could be hard and expensive to get started or could be done with simplicity in mind
- Lots of passers-by in Lillooet, tourists going to Pemberton or Kamloops, it would be good to finally capitalize on these people
- Lillooet and surrounding area could be branded as a good place to start a farm (climate is great, land relatively affordable)
- Blue Goose and other players are coming to the area, outside money is arriving and we can't stop it but we can direct it to good use
- There are empty trucks leaving Lillooet all the time, these could be used to transport local products to Pemberton, Kamloops, other markets
- Marketing and branding will open up opportunities and create jobs in the agricultural and food production industries

Water, agriculture, and climate change: Economic implications
Nelson Jatel, Okanagan Basin Water Board
Nelson discussed the work that the OBWB has done on the issue of water scarcity and agriculture and what it means for the future of urban and rural planning in BC.
Presentation link: http://uplandconsulting.ca/wp-content/uploads/Jatel.pdf

Small group discussion – what will the water and climate change impacts be on agriculture in the Lillooet region, and how can we adapt/mitigate?

- Water data is so important to the future of agriculture in the area
- Connections and partnerships are already in place, we just need to patch into them
- List of questions could be developed to provide to students who are looking for research project ideas
- From the St'at'imc perspective, water conservation is a jurisdictional issue. Don't want provincial or local government making water decisions on St'at'imc Territory

- The agricultural committee could develop a list of specific challenges and obstacles as a way of "prioritizing the problems" - this will be achieved in the Ag Plan to some extent
- Interesting that in the Okanagan most water is used in hay/grass production and not vineyards, could have implications for the future of water use in Lillooet if crop production shifts towards grapes
- The Water Balance Model being done by the Ministry of Agriculture will provide answers to a lot of questions but may also bring up additional questions

Successful examples of First Nations agricultural business endeavours
Joel Liman, First Nations and Agriculture Expert
Joel provided an overview of some successful First Nations enterprises involving food and agriculture, including but not limited to Split Rock Nurseries, Nk Mip Cellars, and Siska Traditions.
Presentation link: http://uplandconsulting.ca/wp-content/uploads/Liman.pdf

Small group discussion – what opportunities for St'at'imc agri-business partnerships and opportunities exist in the region? Who are some of the key players needed to be mobilized to move forward?

- There is a FoodSafe kitchen at Split Rock but not enough FoodSafe certified staff to use it
- Don't have a storefront at Split Rock, sell mainly at farmers markets. A storefront would be a good opportunity
- There is a difference between agriculture and traditional food gathering
- Regulations around sales of traditional foods and medicines are challenging
- The St'at'imc Government Services Education & Training initiatives is working with a 20 year framework in mind
- SGS Education and Training has to be tied to employment opportunities
- Labour market study was done 2 years ago
- Industry won't talk partnerships if we don't have skilled workers to offer
- Ideas: microfiber, working farm schools, sugar beets
- Developing processes for potential partnerships
- There is a pilot project underway for an environmental technician and monitoring training program (12 students involved)
- Working with Investment Agriculture Foundation to do a 5 year pilot project
- There are existing St'at'imc land use plans and water use plans
- Wild harvest areas are identified
- There are 17 water projects underway (small hydro)
- The plans are from 2004 and need updating
- Looking at ways to protect native plants and medicines
- There are signs of cattle destroying native grasses in the Fountain area, these are issues that cross the agriculture – First Nations divide
- There are health issues (like diabetes) that band members are dealing with, so there is an opportunity to tie in community gardens, fresh local foods, with a health program for band members
- A socio-economic report was completed in 2009

Small scale food processing: resources, opportunities, and success stories
Candice Appleby, Executive Director, Small Scale Food Processors Association (*virtually*)

Candice discussed some of the workshops and courses that SSFPA offers as well as some examples of successful value-added endeavours that have developed as a result.
Presentation link: http://uplandconsulting.ca/wp-content/uploads/Appleby.pdf

Small group discussion: what types of value-added opportunities exist in the Lillooet region? What would be relatively easy to process and what would be more difficult? What are some of the challenges?
A wealth of information and resources exists on those websites, very happy to learn about it

- Looking forward to exploring the website in more detail
- Interested to hear about small-scale abattoirs, have any emerged from the SSFPA program
- There is one being operated by the Grand Forks Agricultural Society – a mobile abattoir – they are processing pork, beef, poultry
- Okanagan poultry slaughterhouse
- Kootenays – there are 2 mobile slaughterhouses operating
- The waste disposal associated with the carcasses is an issue; it needs to be disposed of at a special licensed facility.
- The SSFPA website could be used to further market Lillooet products. So far there are no local products listed on the website
- It is a user-based site so just needs input from local farmers

Appendix III: Discussion of Land Use Policies and Regulations

The agricultural industry in BC is regulated by numerous government policies at federal, provincial and municipal levels. The regulations relate to environmental protection, health and safety, imports/exports and land use. Local, regional and provincial regulations were discussed to some extent at the open houses and through the survey. Challenges that were identified include:

Meat Processing Regulations:
Adopted in 2004, the Meat Inspection Regulation (MIR) sets out construction, inspection and other requirements for provincially licensed slaughter facilities in BC. Compliance with the MIR became mandatory in September of 2007, and significant changes to licence classes were made in April 2010.

Navigating Supply Management Systems:
There is significant room in the regional market for increased egg and dairy production (both organic and non-organic). While supply management systems (e.g. quota) hinder the ability to easily enter the market, there are methods and strategies to overcome some of these challenges; all of which have been tested successfully in other communities. In particular, non-dairy (goat, sheep) milk and cheese could be produced at a larger scale and dairy cheese could be produced under special licensing.

Housing Limits on ALR Land:
There were many concerns expressed around the limits to housing in the ALR. Many felt that ALC policies and regulations limit potential cooperative farming ventures, resulting in a significant barrier to farming in the region. Some also felt that limited housing opportunities in the ALR restrict farmers' ability to earn rental income to support their farming endeavours. However, it was unclear whether opinions were based on accurate data, suggesting clarity around housing allowances for ALR properties would be beneficial for the farming community at large. Currently, under ALC regulations, a local government may permit a secondary suite within a single family dwelling and an additional manufactured home for immediate family or for farm help.

Health and Safety Permits:
The threat of food-borne illnesses has received increased attention in recent years. Growers must keep records detailing their production practices, and Health & Safety permits from Interior Health are often required to sell prepared foods at Farmers Markets. Some farmers felt these requirements were onerous and prevented them from easily selling value-added or prepared foods at the markets.

Crown land Tenure Agreements:
There is some support amongst the farming community to explore Crown land tenure agreements and business arrangements in order to overcome limitations to fee simple ownership of ALR land. The high cost of land prevents outright ownership for some, while the limitations surrounding leasing reduce the types of tenure agreements possible. Many expressed frustration with the *Land Title Act*, which essentially limits leases to five years, after which the lessee can be granted title on the property. Without longer term leasing, licensing, or other renting arrangements there is minimal motivation for farmers to invest in crops, livestock, or equipment that will only become profitable in the long term.

Federal Policies and Regulations

Agriculture is included in federal policy through trade agreements, food safety and inspection, food labelling, and the promotion of quality of life through healthy eating.

Agriculture and Agri-Food Canada focuses on domestic and international trade, farm income stabilization, research and development, and the regulation of animals and plants. It provides information, research and technology, and policies and programs towards the security of the food system, health of the environment and innovation for growth. Partners include the Canadian Dairy Commission, Canadian Food Inspection Agency, Canadian Grain Commission, Farm Credit Canada, and the Farm Products Council of Canada (AAFC, 2010)

The Canadian Food Inspection Agency regulates food products, packaging and labelling. It is responsible for testing food products, setting requirements on traded goods, and protecting plants from pests and diseases (CFIA, 2010).

Fisheries and Oceans Canada is responsible for protecting aquatic ecosystems and administers the *Fisheries Act*. Fisheries and Oceans Canada strives to work with commercial, recreational and First Nations fisheries to support sustainable aquaculture (DFO, 2010).

Health Canada regulates agriculture indirectly by tracking outbreaks and diseases and overseeing environmental health programs. The Public Health Agency of Canada, together with Health Canada and the Canadian Food Inspection Agency, work cooperatively with health authorities to protect the public from food contamination outbreaks (HC, 2010).

Provincial Policies and Regulations

The Province of BC shares a mandate with the federal government to promote agriculture and health. Detailed descriptions of various provincial agencies and associated legislation involving farming and agriculture are provided below. They include the Ministry of Agriculture, the Agricultural Land Commission, and the Ministry of Community, Sports, and Cultural Development. In addition, several other areas of jurisdiction include food-related authority and a brief description of each is provided.

Ministry of Agriculture

The Ministry of Agriculture is responsible for providing a balanced approach that promotes economic and social development objectives with those of environmental sustainability for agriculture, aquaculture and food sectors in BC. In addition, the Ministry funds the Agricultural Land Commission and the BC Farm Industry Review Board (MAL, 2010). A wide variety of legislation affecting agricultural land, farm workers, and farm activities is administered by the Ministry of Agriculture, including:

- *Agri-Food Choice and Quality Act*
- *Agricultural Produce Grading Act*
- *Agrologists Act*
- *Animal Disease Control Act*
- *Bee Act*
- *British Columbia Wine Act*
- *Farm Income Insurance Act*

- *Farm Practices Protection (Right to Farm) Act*
- *Farming and Fishing Industries Development Act*
- *Fish Inspection Act*
- *Fisheries Act*
- *Food Products Standards Act*
- *Fur Farm Act*
- *Game Farm Act*
- *Greenbelt Act*
- *Insurance for Crops Act*
- *Land Act*
- *Land Reserve Commission Act*
- *Land Title and Survey Authority Act*
- *Livestock Act*
- *Local Government Act* (sections 916-919 only)
- *Milk Industry Act* (ss. 1-11, s.12 in respect of tank milk receivers licenses, ss. 13-43)
- *Natural Products Marketing (BC) Act*
- *Plant Protection Act*
- *Seed Potato Act*
- *Veterinarians Act*
- *Water Utility Act*
- *Weed Control Act*

Key Players in Food Health and Safety

The BC Ministry of Health Services (MHS) administers the *Public Health Act* and *Food Safety Act* and establishes standards and procedures aimed at protecting public health. The *Food Safety Act* was established in 2002 to consolidate food safety aspects of the *Milk Industry Act, Meat Inspection Act*, and *Health Act* under one statute administered by MHS (BCMHS, 2010).

Regional Health Authorities administer the Food Premises Regulation under the Health Act and licence, inspect, and respond to complaints regarding food facilities under their jurisdiction. Interior Health is responsible for the inspection and enforcement of food safety regulations. In addition to the *Food Premises Regulation*, VCH administers the FOODSAFE training program (which teaches safe food handling procedures to those in the food services industry) and the Food Security Program.

The BC Centre for Disease Control (BCCDC) operates its Food Protection Services Division under the Provincial Health Services Authority (PHSA). The PHSA addresses public health concerns regarding food and food protection by providing scientific expertise to the Regional Health Authorities and to the BCMHS (BCMHS, 2010). The BCCDC is responsible for the inspection and licensing of provincial dairies and abattoirs and for providing food safety guidelines, training and information, and laboratory services to Public Health Inspectors.

In 2006, the Federal government provided BC with $2.64 million to enhance and promote food safety systems in the food processing industry (BCCDC, 2010). The partnership included:

- BC Centre of Disease Control
- Regional Health Authorities
- Small Scale Food Processing Association
- BC Food Processors Association
- Food processing industry
- BC Ministry of Agriculture and Lands

The Provincial Meat Inspection Regulation

Adopted in 2004, the Meat Inspection Regulation (MIR) sets out construction, inspection and other requirements for provincially licensed slaughter facilities in BC. Compliance with the MIR became mandatory in September of 2007, and significant changes to licence classes were made in April 2010.

Prior to the 2010 amendments, the MIR included three class levels of licensing for meat sold in the province:
Class A: facilities providing slaughter and cut-and-wrap services;
Class B: facilities only providing slaughter services; and
Class C: facilities operating without inspection until upgrades to full licencing are completed. This was introduced as a temporary measure in 2007 and has since been phased out.

Amendments to the regulation in April 2010 introduced a graduated licensing system that includes two licences (Class D and Class E) designed to support local livestock and meat production in B.C.'s more remote and rural communities.

Class D: allows on-farm slaughter of 1-25 animal units annually for direct sale to consumers or retail sales to secondary food establishments (e.g., restaurants and meat shops) within the boundaries of the regional district where the meat was produced. Class D licence holders may slaughter their own or other peoples' animals. Class D licences are only available in 10 provincially designated regional districts (designated areas).

Class E**:** allows on-farm slaughter of 1-10 animal units annually for direct sale to consumers. Sales are restricted to the regional district in which the meat was produced, and operators are only permitted to slaughter their own animals. One animal unit means: combined weight, when measured alive, of 1,000 lbs (454 kg) of meat (e.g., beef, poultry, bison, etc.).

Applications for Class D and E are reviewed on a case-by-case basis. Class D & E facilities must complete the SlaughterSafe training program, a food safety plan, and a site assessment with the local health authority. SlaughterSafe is run by the regional health authorities (Interior Health) and was collaboratively designed by public health professionals and volunteer farmers in rural and remote communities. SlaughterSafe is part of a larger provincial government initiative to promote food safety and food security regarding livestock and meat production in remote communities.

The MIR allows for innovative approaches, such as mobile slaughter facilities that can provide services to several rural communities. Many small scale producers, however, have criticized the MIR as restricting their ability to slaughter their animals in areas not served by provincially-licensed facilities. This created high costs associated with meat processing for farmers in more remote communities, such as the Gulf Islands, Sunshine Coast, and Central Coastal areas.

Ministry of Environment
The BC Ministry of Environment (MoE) manages and delivers a wide range of programs and services that support the Province's environmental and economic goals. The Ministry is a leader in implementing the provincial government's climate change initiatives and in promoting recreational opportunities, such as hunting, fishing and exploring BC's parks. MoE is responsible for a wide variety of legislation affecting agricultural activities, such as the *Drainage, Ditch and Dike Act*, *Environmental Management Act*, *Fish Protection Act*, *Integrated Pest Management Act*, *Water Protection Act*, and *Wildlife Act*. MoE's role in sustainable environmental management and stewardship includes implementation of BC's Climate Action Plan and Living Water Smart Plan.

Agricultural Waste Control Regulation:
The Agricultural Waste Control Regulation (AWCR) is enforced under the *Environmental Management Act* (EMA). Agricultural waste discharges require authorization and can be regulated by a code of

practice. Minor amendments were made to the AWCR in 2004 and 2008, to establish consistent rules for all boilers used in agriculture, as well as emission standards for biomass (wood-fired) boilers used in agriculture. In October 2009 the MoE announced a review of the AWCR, which is still underway, to harmonize the standards in this regulation with other regulations, update handling and disposal of agricultural technologies regarding agricultural wastes, and for compliance and enforcement issues.

Riparian Areas Regulation:
The Riparian Areas Regulation (RAR) was enacted under Section 12 of the *Fish Protection Act* in 2004, and calls on local governments to protect riparian areas during residential, commercial, and industrial development by ensuring that proposed activities are subject to a science based assessment conducted by a Qualified Environmental Professional (QEP). Riparian areas are defined as freshwater habitat areas along the border of streams, lakes, and wetlands.

The RAR applies only to communities on the east side of Vancouver Island, the Lower Mainland and the Southern Interior (including all of the Squamish Lillooet Regional District), as these are the parts of the province that are experiencing the most rapid urban growth. A local government must ensure that its bylaws and permits under Part 26 of the *Local Government Act* provide a level of protection that is comparable to or exceeds that of RAR. Part 26 of the *Local Government Act* includes:

(a) removal, alteration, disruption or destruction of vegetation;
(b) disturbance of soils;
(c) construction or erection of buildings and structures;
(d) creation of non-structural impervious or semi-impervious surfaces;
(e) flood protection works;
(f) construction of roads, trails, docks, wharves and bridges;
(g) provision and maintenance of sewer and water services;
(h) development of drainage systems;
(i) development of utility corridors;
(j) subdivision as defined in section 872 of the *Local Government Act;*

The RAR does not apply to agricultural activities, however, the construction of residential structures or other "development" activities within agricultural areas (such as within the ALR), would be subject to the RAR. It also applies to non-farming activities on non-ALR lands that may otherwise be used, designated, or zoned for agriculture. Other aquatic-related regulations also still apply to agricultural activities, such as the *Water Act* and *Fisheries Act*, and practices to encourage stewardship in agricultural lands are highly recommended.

Ministry of Community, Sport, and Cultural Development
Formerly the Ministry of Community and Rural Development, the BC Ministry of Community, Sport, and Cultural Development (MCSCD) is responsible for the administration and maintenance of a number of statutes establishing the legal framework for local governments in BC. The purpose of the MCSCD is to equip communities across BC to build strong, competitive economies. The four key pieces of policy and legislation administered by the MCSCD affecting agricultural land use at the local level are the *Community Charter* the *Local Government Act,* the *Assessment Act* and the *Land Title Act*.

Community Charter:
The *Community Charter* came into effect in 2004 and establishes the legal framework for core municipal powers. The purposes of the *Charter* are to provide municipalities and their councils (and to a lesser extent Regional Districts and their Boards) with:

(a) A legal framework for the powers, duties and functions necessary to fulfil their purposes;
(b) The authority and discretion to address existing and future community needs; and
(c) The flexibility to determine the public interest of their communities and to respond to the different needs and changing circumstances of their communities.

Local Government Act:
The *Local Government Act (LGA)* establishes the legal framework for regional districts and contains important local government regulations concerning planning and land use. Under the *Local Government Act* and *Community Charter,* local governments are responsible for the development and implementation of official community plans (OCPs), land use zoning and other land use bylaws. The LGA provides several directions toward farming through local land use planning, including:

- Section 878 (1) stipulates that local governments may include in OCPs "policies…respecting the maintenance and enhancement of farming on land in a farming area or in an area designated for agricultural use the community plan";
- Section 903(5) states that "…a local government must not exercise the (zoning) powers under this section to prohibit or restrict the use of land for a farm business in a farming area unless the local government receives the approval of the minister responsible for the administration of the *Farm Practices Protection (Right to Farm) Act*."
- Section 917 provides the authority for local governments to adopt farm bylaws to regulate farm management activities in farm areas, subject to approval from the minister responsible for Agriculture;
- Section 919.1 (1) provides local governments with the authority to designate a development permit area (DPA) for the "protection of farming."

Assessment Act:
The *Assessment Act* is administered by BC Assessment, a provincial Crown Corporation responsible for the classification of properties in B.C. for property assessment and tax purposes. Farm classification is a voluntary program providing the benefit of a low tax rate for assessed properties.

Even though property may be zoned as agricultural land, or in the provincial ALR, farm classification will only be granted if the land (or at least a portion of it) is being actively used for primary agricultural production and it meets the other requirements of the Act. Only land can be classified as farmland - buildings (residences and outbuildings) are classified separately, typically as residential.

Land qualifies for farm classification under the following conditions:

- The land is used for "primary agricultural production";
- The land is the site of "a farmer's dwelling";
- The land is used for training and boarding horses in a horse rearing operation;
- The land otherwise contributes to primary agricultural production such as land used for drainage, irrigation, buffers and windbreaks.

Agricultural production for purely on-site consumption and the breeding and raising of pets, other than horses, does not qualify. A certain minimum amount of income must be produced from the primary agricultural production, and these requirements vary depending on the total land area. For example, a minimum annual value of $2,500 is required for land between 8,000 m^2 and 4.0 ha and $10,000 if the total land area is less than 8,000 m^2.

The *Assessment Act* has been criticized in the past as creating an unfair burden to small lot farmers and farmers who operate outside of the ALR. In 2009, the Farm Assessment Review Panel provided a report to the Provincial Government recommending a number of changes to the farm assessment process and Regulation 411/95 (Farm Assessment Review Panel, 2009). Prior to the review, assessment policy dictated that on a parcel of land, only that portion that was actually used for agricultural production would be classed as farm, with the remainder of the parcel classed as residential by default. This approach is commonly referred to as "split classification" of farm land, and it applied to farms both in and outside of the ALR. At the time of the review there were about 8,000 farms that were "split classified" around the province and this was of particular concern for smaller farms in the rural areas of southern Vancouver Island, the Gulf Islands, and the Lower Mainland, where property values are very high.

Some of the Panel's recommendations have been incorporated since the review, including the elimination of the split classification of farm properties in the ALR that are not used for other purposes and for non-ALR properties where at least 50% of the property is in, or contributes to, production, or 25% is in production and meets a higher income threshold ($10,000). For leased land, only the land actually in production will be classed as farm.

Land Title and Survey Authority Act:
The Land Title and Survey Authority of BC (LTSA) is a statutory corporation responsible for managing the land title and survey systems of BC and its mandate and responsibilities are set out in the *Land Title and Survey Authority Act*. The mandate of the LTSA is to create confidence by delivering assured land title and land survey systems essential to the property market and economic foundation of the province.

As pertaining to agriculture, the LTSA provides specific directions regarding subdivision through the *Land Title Act* (RSBC, 1996b). Section 86 (1) states that an approving officer may refuse to approve a subdivision if:

> (ix) the subdivision is unsuited to the configuration of the land being subdivided or to the use intended, or makes impracticable future subdivision of the land within the proposed subdivision or of land adjacent to it;
> (x) the anticipated development of the subdivision would unreasonably interfere with farming operations on adjoining or reasonably adjacent properties, due to inadequate buffering or separation of the development from the farm, or;
> (xi) despite subparagraph (ix), the extent or location of highways and highway allowances shown on the plan is such that it would unreasonably or unnecessarily increase access to land in an agricultural land reserve.

Section 219 of the *Land Title Act* states that a municipality or regional district may register a covenant on the title to land to protect specific characteristics of land in or adjacent to the ALR.

Local and Regional Plans

St'at'imc Preliminary Draft Land Use Plan

St'át'imc Preliminary Draft Land Use Plan has been developed by the St'át'imc Land and Resource Authority (SLRA), using information handed down through the generations since time immemorial.

The vision is of a continuing and renewed relationship between St'át'imc people (úcwalmicw) and the land (tmicw) which:
• respects St'át'imc cultural traditions - using the ways (nt'ákmen), laws (nxékmen) and standards of our people as passed down through the generations;
• respects nature – putting the health of the water, the air, the plants, the animals and the land itself before all else;
• is under St'át'imc authority – letting our people decide collectively how the land and resources of the St'át'imc territory will be managed; and,
• serves the St'át'imc communities – recognizing that resources continue to provide sustenance in old and new ways to all our people.

The St'át'imc goal is to ensure that the Nxekmenlhkálha lti tmícwa (St'át'imc Land Use Plan) provides for the needs of the four-legged people (e.g., deer, grizzly); the winged people (e.g., raptors); the root people (e.g. berries, medicinal plants); as well as the two-legged people (the St'át'imc). The methodology used by the SLRA in the development of the preliminary draft land use plan was designed to give life to the St'át'imc Vision and Principles through a St'át'imc ecosystem-based planning process. In particular, the focus is first on what to leave behind on the land to sustain ecology and culture, rather than on resource extraction and short-term economic benefit.

The St'át'imc Land Designations are:

- Water Protection Areas – to ensure water quality, quantity and timing of flow to St'át'imc communities, domestic use watersheds and 50 metre no logging buffers on all streams and water bodies are included in Water Protection Areas.
- Cultural Protection Area – all of St'át'imc territory is designated as a Cultural Protection Area, in which St'át'imc written authorization is required before land or resources are allocated, extracted or used.
- Grizzly Protection Areas – to ensure that grizzly' food, shelter and security (safety) needs are met.
- Deer Protection Areas – to ensure that migration corridors and wintering and fawning areas are protected.
- Fish Protection Areas – to protect areas of high intensity St'át'imc use within one km of fish streams and to protect fish habitat through buffers along streams.
- General Habitat Protection – to protect remaining old growth forests, ecosystems that are naturally rare, and remnants of heavily impacted ecosystems in St'át'imc territory; by maintaining habitat we seek to meet the needs (e.g., food and medicines) for all species and present and future generations of humankind.
- Environmentally Sensitive Areas – to ensure that resource development and road building don't occur on steep slopes or in areas where soils are poor/forests will have problems regenerating.
- Community Economic Development – low impact St'át'imc economic activities (harvesting of traditional foods, low impact eco-tourism) are allowed in specified land designations; the location of other community economic development areas is the subject of an ongoing community process.
- Restoration Areas –areas of St'át'imc territory that have been damaged by past human activities and require restoration, including the effects of hydro dams.

The Lillooet Land Resource Management Plan (LRMP)

From 1996-2001 the BC Ministry of Sustainable Resource Management undertook the Lillooet Land Resource Management Plan (LRMP). The plan provides strategic direction for provincially-administered land resources in the Lillooet area. While the document is now somewhat dated the planning process itself helped to identify several issues related to agriculture. These include:

- Agricultural expansion is limited by the availability of affordable arable Crown land, irrigation water and rangelands.
- Current ranching and agri-tourism operations require access to productive Crown range to remain viable.
- Increasing competition for and conflict over Crown resources from other types of use and development.
- Loss to livestock due to predator/livestock interactions.

In order to overcome these challenges a number of agricultural objectives were identified through the LRMP process, including:

- Enhance access to Crown Land to support the expansion and diversification of a sustainable agriculture industry
- Maintain or enhance the productivity of agricultural lands by retaining existing water rights for irrigation and by identifying new sources of irrigation water
- Minimize livestock/predator interactions
- Minimize agricultural conflicts that may result from adjacent land uses such as community activities expansion, industrial activities, wildlife or recreational activities

Rangeland was given particular attention in the LRMP. Rangeland issues were identified as:

- Improper range practices can degrade rangeland health and productivity, and negatively impact other resource values.
- The viability of industries dependent on range agreements relies on the maintenance of current range agreements and the ability to capitalize on new grazing opportunities.
- Noxious weed invasion decreases the health, productivity and biodiversity of rangelands.
- Lack of a comprehensive inventory describing the current condition of rangeland resources.

Rangeland objectives included:

- Maintain or enhance sustainable livestock grazing on Crown range
- Manage livestock grazing to maintain healthy and vigorous rangeland plant communities
- Manage livestock to maintain and restore riparian areas in a properly functioning condition and, in community watersheds, to prevent declines in water quality
- Prevent and control noxious weed invasion
- Subject to available resources, increase knowledge and information about the range resource

The SLRD Integrated Sustainability Plan (ISP)

The SLRD adopted its ISP titled “Sustainable SLRD – Integrated Sustainability Plan” in 2013. The SLRD ISP is a high level policy document that is comprehensive, long-term and is intended to guide SLRD legislative, policy and planning decisions, as well as corporate operations. The ISP delivers a vision, strategic plan and implementation process for creating a successful and sustainable region twenty years

from now and beyond. Within this document, the Food and Agriculture Strategy Area addresses how the region supports an affordable and reliable food system and promotes agricultural activities within the region that nourishes residents' appetite, celebrations and culture. The strategy is aimed at maintaining the integrity of the land while moving toward a more sustainable food system, from farm to fork to disposal.

In the process of developing the ISP, the following Descriptions of Success for Food and Agriculture Strategy Area were utilized:

By 2030:

1. The region celebrates local food and related products, and the buy-local ethic of residents and businesses supports the agricultural sector within the region.
2. The SLRD is known as a region that produces and celebrates healthy, sustainable, delicious and organic foods and food products.
3. Sustainable agriculture and aquaculture, including local value-added processing and agri-tourism, is a major contributor to the regional economy.
4. There is safe, nutritious and affordable local food throughout the region for all.
5. The region's farmland, watercourses, riparian areas and watersheds are protected while still supporting and enhancing farming and agricultural activities.
6. Agricultural land is preserved and protected regionally in perpetuity.
7. Conflicts between agricultural and non-agricultural land uses are minimized.
8. Farming is viewed as an attractive lifestyle and barriers to entering an agricultural career have been reduced.
9. Farming practices are safe and sustainable, and contribute to regional food security.
10. Agricultural practices support young farmers, community gardens, alternative agriculture, farming education and recreational programs.
11. Regional partners work together to protect agricultural lands and support the adoption of best practices throughout the agricultural sector.
12. The necessary provincial resources and local/regional safeguards are in place to support agricultural production and protect agricultural lands from flooding, disease infestation, invasive species and other natural hazards.

Within the ISP, Appendix B: List of Potential Actions for Consideration describes the list of initiatives identified to move the SLRD from the *Current Reality* toward the *Desired Future* as defined by the criteria for success and sustainability. Actions include everything from basic operational activities to the development of policies and strategic plans. [An initial longer list of actions was identified through input from the public and SLRD staff]. The list was then prioritized by the ISP Steering Committee and presented to SLRD managers for review. The following List of Food and Agriculture Actions were identified for consideration:

Table i. SLRD ISP agricultural-related policies.

Potential Action for Consideration	Reference	Description
Encourage agricultural and conservation land trust organizations as a way of protecting significant lands and farmlands through the development approvals process.	SLRD ISP Appendix B	This is a short-term action (to be contemplated in the next 1 – 2 years) tasked to the Planning/Administration Department as the Responsible Departments.
Prepare Agricultural Area plans for Areas B and D (Area C Complete).	SLRD ISP Appendix B	This is a short-term action (to be contemplated in the next 1-2 years) tasked to the Planning Department as the Responsible Department.
Lobby for appropriate changes to the ALC Act to encourage more people to have access to farming.	SLRD ISP Appendix B	This is a short- action (to be contemplated in the next 1 – 2 years) tasked to the Board as the Responsible Department.

Regional Growth Strategy

A Regional Growth Strategy (RGS) is a broad policy framework describing the common direction the regional district and member municipalities will follow in promoting human settlements that are social, economically, and environmentally healthy and making efficient use of public facilities and services, land and other resources. The Regional Board adopted the "SLRD Regional Growth Strategy – Bylaw No. 1062, 2008" in June 2010. It addresses growth management (south) and economic recovery issues (north) over a 20-year period for the SLRD area. Smart growth principles and strategies guide land use and development practices, encouraging more compact development and minimal encroachment on natural areas, particularly Agricultural Land Reserve areas and protected watersheds.

The SLRD RGS calls for several specific policy directions related to land use, which ultimately supports agriculture and food security, which are described in the following table:

Table ii. SLRD RGS agricultural-related policies.

RGS Strategic Direction	Reference	Description
"Focus development into Compact, Complete Sustainable Communities"	Part 3, Goal 1	This is the main growth management direction contained in the RGS. Population growth and settlement development will be primarily directed to existing Urban areas and Master Planned Communities on the basis of smart growth principles that aim to avoid sprawl, and protect valuable resource areas for their highest and best uses (agricultural, environmental, forestry resources areas, etc.)
Prevent major settlement growth in Non-Settlement Areas	Goal 1.1 (d) (ii) & (g)	Non-settlement Areas will be maintained in a predominantly non-settled state without significant urban or rural land development and in accordance with smart growth principles which direct residential development toward compact communities and maintain the integrity of the resource lands that separate the settlement areas. Major land developments will be limited to agricultural developments in the Agricultural Land Reserve, resource extraction and industrial uses (forestry, mining, etc.) on resource lands, Backcountry Resorts and Destination Resorts without residential components. Residential development in the designated Non-Settlement Areas will be discouraged

		by generally maintaining subdivision minimum parcel sizes of 40 ha.
Designation of a Special Planning Area for the future revitalization of Lillooet and Area	Goal 1.1 (i)	Special Planning Areas will provide for more detailed sub-regional planning and will include the following areas identified on the Regional Settlement Planning Map 1 and the Lillooet & Area Settlement Planning Map 1d: (i) Lillooet and Area Sub-regional Economic Enhancement Strategy: The objectives are to establish economic development strategies in conjunction with Goal 4 of the RGS –Achieve a Sustainable Economy and to establish a framework for coordinated local government – First Nations land use planning through the ongoing OCP review process, assisted by transportation improvements (Goal 2). This strategy may identify suitable community revitalization, destination resort, tourism and resource industry development opportunities.
Economic Revitalization Efforts in the North	Part 3, Goal 3	The RGS supports economic revitalization efforts in the north through the preparation of a Lillooet and Area Sub-regional Economic Enhancement Strategy Economic Development Strategy for the North (The objectives are to establish economic development strategies in conjunction with Goal 4 of the RGS –Achieve a Sustainable Economy and to establish a framework for coordinated local government – First Nations land use planning through the ongoing OCP review process, assisted by transportation improvements (Goal 2). This strategy may identify suitable community revitalization, destination resort, tourism and resource industry development opportunities.)
Agricultural Area Plans for Lillooet and Pemberton Valley	RGS – Section 4.1 (e)	This is a sample of a strategic direction The RGS calls for the Undertaking of Agriculture Plans for Lillooet sub-region and the Pemberton Valley in conjunction with First Nations, Ministry of Agriculture and Lands and the Agricultural Land Commission that will provide the basis for new agricultural investment and protection of the ALR. This will be pursued by the regional district staff in consultation with farmers and the Ministry of Agriculture and Lands and subject to availability of funding.)
Invasive Species Management	RGS – Section 5.1.(f)	This is a sample of a strategic direction which supports the natural management of invasive species, whereby the SLRD and other agencies would consider alternatives to chemical treatments as a tool

District of Lillooet Official Community Plan

The District of Lillooet has a recently updated Official Community Plan – Bylaw No. 320 - adopted in 2009. The OCP notes that Lillooet contains large tracts of land which have been designated for Agricultural/Resource Use and this designation includes lands that are subject to the regulations and conditions imposed by the A*gricultural Land Commission Act*. In Section 4 of the OCP it specifically states "*the District supports and encourages protection of agricultural lands and the enhancement of the local agricultural economy*" and thus, has established the following objectives: to protect agricultural land for agricultural purposes and to support and enhance agricultural activity in Lillooet.

The following table lists specific policies found in Section 4 – Agriculture / Resource Lands Designation of the District of Lillooet Official Community Plan – Bylaw No. 320:

Table iii. District of Lillooet OCP agricultural-related policies.

Policy	Reference
The District will encourage economic development initiatives to recognize agriculture as a viable economic activity for Lillooet and to identify strategies to bring new agricultural developments and businesses to Lillooet.	District of Lillooet Official Community Plan – Bylaw No. 320, Policy 4.3.2
The District supports strategies to promote the agricultural attributes and historical successes of agriculture in Lillooet.	District of Lillooet Official Community Plan – Bylaw No. 320, Policy 4.3.3

The District will work with the Ministry of Agriculture to research and promote new agricultural opportunities such as grapes, speciality berries and fruits, market gardens and food processing facilities.	District of Lillooet Official Community Plan – Bylaw No. 320, Policy 4.3.4
The District will ensure zoning regulations are consistent with ALC policies regarding agri-tourism.	District of Lillooet Official Community Plan – Bylaw No. 320, Policy 4.3.5
The District recognizes the agricultural, recreational, and public use potential of Crown land in this category and supports the provincial government's general policy of integrated multiple use land management.	District of Lillooet Official Community Plan – Bylaw No. 320, Policy 4.3.6
The District will discourage subdivision of lands within this category. Municipal utilities and services generally will not be provided to these lands. Where water services have been approved, they will be limited to domestic supply only on the basis of one connection per existing lot.	District of Lillooet Official Community Plan – Bylaw No. 320, Policy 4.3.7
The District will attempt to minimize conflicts between agricultural and other land uses (residential/recreational) through the use of: • access restrictions, where appropriate; • minimum distance setbacks for intensive agricultural operations; • fencing requirements and landscape buffers on the non-agricultural side of the development for residential or recreational developments adjacent to agricultural operations; • continued liaison with Provincial Ministries and Crown agencies in the planning, disposition, and management of Crown lands; and • compliance with the Farm Practices Protection Act (FPPA).	District of Lillooet Official Community Plan – Bylaw No. 320, Policy 4.3.8
Development Permit Area designations may be used to protect farming on lands designated for agricultural use.	District of Lillooet Official Community Plan – Bylaw No. 320, Policy 4.3.9
The District supports the ALC and the role of the Provincial Agricultural Land Commission in its efforts to protect and enhance farmland. Where land is in the ALR, minimum parcel sizes shall apply only when the land is: • excluded from the ALR; or • approved for subdivision within the ALR pursuant to the Agricultural Land Commission Act, regulations thereto, or orders to the Commission; or • exempted by the Agricultural Land Commission Act, regulations thereto, or orders of the Commission.	District of Lillooet Official Community Plan – Bylaw No. 320, Policy 4.3.10
The District will encourage all farming operations to comply with the following regulations and guidelines as administered by the province: • environmental guidelines for farming practise as produced by the provincial ministries; • regulations pertaining to agricultural waste control; and • code of Agricultural Practice for Waste Management.	District of Lillooet Official Community Plan – Bylaw No. 320, Policy 4.3.11
The District recognizes the importance of local food production and supports efforts to improve the local agricultural economy. Strategies include: • enhancing development opportunities for the local farmers market (e.g. new Downtown Square site); • support initiatives to increase agricultural awareness; • support development of community gardens and rooftop gardens; and • provide density bonusing for projects providing opportunities for local food production (e.g. rooftop gardens, edible landscapes, community gardens or greenhouses).	District of Lillooet Official Community Plan – Bylaw No. 320, Policy 4.3.12

SLRD Area B OCP Bylaw No. 1073 (2008)

The SLRD Area B OCP was developed in 2008 and adopted in 2010. Policies are provided to address community planning, economic development, cultural heritage, biodiversity, natural hazards, utilities, transportation, and land use. Policy direction is also provided for the Duffey Lake Corridor. The OCP

addresses the following six communities:

- Seton Portage-Shalalth,
- Yalakom Valley,
- Bridge River/West Pavilion,
- Texas Creek,
- Fountain, and
- Pavilion Lake.

This OCP also has three sub-area plans for the following communities:
1. Pavilion Lake,
2. Seton Portage, and,
3. Yalakom Valley.

Several policies contained within the Area B OCP relate to agriculture, as summarized in the following table. Section 11 of the OCP specifically focuses on Objectives and Policies related to Agriculture.

Objectives

- To contribute to local and regional food security.
- To preserve the agricultural land base in the plan area.
- To encourage diversification and economic sustainability of the farming community.
- To minimize the impacts from non-agricultural development occurring at the edge of farming areas and within agricultural lands.
- To balance the interests of agriculture and protection of the environment.

Policies within the OCP as they relate to agriculture are divided into the following sections:

- Agricultural Land Base (Land Use)
- Economic Sustainability
- Agriculture Interface
- Housing
- Environmental Protection

Highlights include:

- 11.6. In order to limit the fragmentation of multi-parcel farm operations by the sale of individual parcels, the SLRD will work collaboratively with farm property owners and their agents, and the Agricultural Land Commission on a case by case basis to reconcile potentially conflicting interests.
- 11.7. The owners of agricultural lands are encouraged to facilitate the use of the land for agriculture by actively farming or leasing or loaning their lands to persons that would undertake active farming.
- 11.9.The Regional District encourages economic diversification initiatives accessory to and compatible with farming that add value to locally produced farm products by:
    a) Supporting the development of farm outlets for the sale of local agricultural products;
    b) Permitting roadside stands for farm gate sales of agricultural products;
    c) Permitting bed and breakfasts in agricultural areas and guest houses/small scale agritourism operations that feature farm vacations and farming related activities; and,
    d) Support home occupations that produce value added products from locally produced

agricultural products.

- 11.12. Future development activities in the plan area shall result in minimal creation of new residential agriculture interfaces. Development and subdivisions at the residential - farm land interface shall be planned and mitigated as follows:
  a) no road endings shall abut the ALR boundary,
  b) the ALR – residential boundary shall be fenced and buffered as per the Agricultural Land Commission's Landscaped Buffer Specifications, and,
  c) Building setbacks and other mitigations will be considered as per the Ministry of Agriculture and Land's Guide to Edge Planning.
- 11.14. As per the Agricultural Land Commission Act and regulations, additional dwellings are permitted where necessary for farm use, provided:
  a) The property has farm classification under the Assessment Act; and,
  b) Supportive comments from the Regional Agrologist with the Ministry of Agriculture have been received.
- 11.16. Farmers are encouraged to prepare Environmental Farm Plans.
- 11.17. To promote the long term sustainability of agricultural production, ecosystem integrity, and human health, land use decision making shall apply the precautionary principle: When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically, and in this context, the proponent of an activity, rather than the public, should bear the burden of proof.

Table iv. Other SLRD Electoral Area B OCP agricultural-related policies.

Policy Subject	Reference	Policy Description
Agritourism	Policies 3.6 and 3.8	The development of small- and medium-scale tourism operations is supported, including agritourism operations associated with farms. The development of Agricultural Land Reserve, or other lands with agricultural potential, for nonfarm uses, including golf courses, is not supported.
Organic & GMO-free Agriculture	Yalakom Valley Sub-Area Plan Section 9.1 - 9.5	The policies contained in the Yalakom Valley Sub-Area Plan section of the Area B OCP are related to farming and food security. Several policies in the Agriculture section demonstrate support for Ecosystem-Based Conservation Planning Principles, discourage genetically modified organisms in the Valley, encourage soil & water conservation, and non-chemical weed control.

SLRD Areas A and B Zoning Bylaw, No. 670

The zoning bylaw for SLRD Areas A & B contains no Agriculture zone, but "agriculture" is a permitted use in:

- RR1 – Rural resource zone (2 ha minimum parcel area)
- RR2 – Rural resource zone (8 ha minimum parcel area)
- RR3 – Rural resource zone (40 ha minimum parcel area)

Note that there is a new Electoral Area B Zoning Bylaw 1300-2013 underway, that proposes to zone all of the ALR lands to an Agriculture One zone.

Currently, most of the ALR is located within RR2 and RR3 zones. Some ALR is located in RR1 zoning along the Fraser River south of the District of Lillooet. No mention of the ALR, ALC, or acts pertaining to the two.

Off-street parking requirements that would apply to agricultural operations:

- Garden nursery: 4 per 100 m2 of retail sales area plus 1 per 185 m2 of greenhouse area
- Animal shelters/kennels: 1 per 100 m2 gross floor area plus 2.8 per 100 m2 office floor area plus 1 per fleet vehicle
- Riding stable and academy: 1 per stall

Definitions:
Agriculture means the use of land for the growing, rearing, producing, and harvesting of agricultural products, including the storing of agricultural products, the sale of agricultural products produced from the same parcel or same farm, the repair of farm machinery and related equipment used on the same farm and includes farming, ranching, forestry, greenhouse and nursery uses and the keeping and raising of animals but does not include kennels.

Home Business means a business or professional practice carried on for remuneration, which is incidental to the residential use of a dwelling unit and does not include automobile body shops or metal fabricating or portable sawmills. Where permitted, home businesses shall comply with the following regulations:

.1 a maximum of one sign per parcel not exceeding 0.2 m2 in a R Zone and 1 m2 in an RR Zone is permitted advertising a home business; and if lit, shall only be illuminated by an external, indirect source;
.2 retail sales shall not exceed 20 percent of the area used for the home business;
.3 the home business shall not occupy more than a combined 150 m^2 floor area of the dwelling and accessory building on parcels less than 0.4 ha or 250 m2 on parcels greater than or equal to 0.4 ha.;
.4 a home business shall not include uses that produce noise, toxic or noxious matter, vibrations, smoke, dust, odour, litter, heat, glare, radiation, fire hazard, or electrical interference other than normally associated with a dwelling.

Home Industry means a small scale industrial use providing a service for remuneration which is carried on in conjunction with the single family dwelling or agricultural operation including, but not limited to, a carpentry shop, a welding shop, a metal working shop, a blacksmith's shop, a portable sawmill and the enclosed repair of vehicles and machinery.

4.14 Where expressly permitted within a zone, a home industry shall comply with the following regulations:

.1 the home industry is only permitted on parcels 8 ha or greater;
.2 a maximum of one (1) sign per parcel is permitted advertising a home industry;
.3 the size of the sign shall not exceed 1 m2 and if lit, shall only be illuminated by an external, indirect source;
.4 the maximum floor area and outdoor site area of a home industry is 500 m^2;
.5 a home industry shall not include a junk yard or a wrecking yard.

District of Lillooet Zoning Bylaw No. 400, 2011

The District of Lillooet zoning bylaw includes an Agricultural and Rural Resource Zone (AGR) with a minimum parcel area of 8 ha (20 acres). The purpose of the AGR Zone is to facilitate the agricultural and resource use of land and regulate agricultural and rural development activities on un-serviced large-scale rural lots.

Permitted uses within the AGR zone include:

- Agriculture, horticulture, silvaculture and the keeping of animals, excluding piggeries, fur farming and feedlots
- Equestrian
- Extraction of raw materials from the land as approved by the Agricultural Land Commission on lands in the ALR including the preliminary grading, cutting or crushing of materials provided no further processing is permitted on the site, except where the product is regulated by the "*Mines Regulation Act"* or is being used on the premises

Agriculture permitted in other zones with the following restrictions:
Rural Residential – RR-1 (minimum parcel area 0.175 ha or 0.43 acres)

- Agriculture including the keeping of animals, where the minimum lot size is 0.2 ha [.5 acre] subject to Section 4.31 (Keeping of Animals), except piggeries, fur farming, horses for commercial use, feedlots and other intensive livestock production are excluded.

Rural Residential – RR-2 (minimum parcel areas are 2 ha (on well/septic), 1 ha (community water/septic, and 0.405 ha (1 acre) (community water/sewer)

- Agriculture including the keeping of animals where the minimum lot size is .2 ha (0.5 acre) subject to Section 4.31 (Keeping of Animals), except piggeries, fur farming, horses for commercial use, feedlots and other intensive livestock production are excluded: except that on Lots 1 to 14 inclusive, District Lot 3 and District Lot 3056, Plan 38426 (Roshard Acres), the keeping of animals is prohibited.

Rural Residential – RR-3 (minimum parcel area is 8 ha)

- Agriculture including the keeping of animals, where the minimum lot size is .4 ha [1 acre] subject to Section 4.31 (Keeping of Animals) except piggeries, fur farming, feed lots and other intensive livestock production are excluded.
- Equestrian.

Light Industrial – I1

- Agricultural supply and service
- Packing and crating

- Warehousing and wholesale establishments

General Industrial - I2

- Agricultural supply and service
- Farm machinery and heavy equipment sales and repairs
- Food and beverage product, manufacturing processing, packaging and storage, excluding processing and packaging of fish and including only pre-dressed and government inspected meats and eviscerated poultry
- Packing and crating
- Warehousing and wholesale establishments

Open Space Reserve – OSR (Minimum parcel area 8 ha (20 acres))

- The purpose of the OSR Zone is to protect and preserve lands that are environmentally sensitive or hazardous in nature including community watershed and hillside areas within the Municipality that are to be retained as large undeveloped sites.
- Permitted uses include agriculture.

Definitions in the Lillooet Zoning Bylaw that pertain to agriculture:
Agriculture: Means the use of land, buildings or structures for growing, rearing, production and harvesting of agricultural products; and includes the processing of agricultural products harvested, reared or produced on the site and includes the storage and repair of farm equipment used in the agricultural operation of the site, as well as the keeping of bees, honey extracting, processing, packaging and sales. Specifically excluded are abattoirs.

Animal Unit: Means the number of livestock, poultry or other animals which would produce manure containing approximately 100 kg of nitrogen per year and as defined by the Ministry of Agriculture: 454 kg. liveweight of livestock, or approximately 1 horse, 1 cow/calf pair, 7 adult sheep/goats, 5 finishing pigs etc.

Equestrian: Means the commercial accommodation of horses for the purpose of boarding, training, breeding, riding lessons, community riding functions or the stabling of horses for other persons. All borders would apply

Farmers Market: Means the sale of farm produce from a licensed motor vehicle, open table or sun/rain shelter.

Feedlot: Means a building, structure or enclosure used to feed beef cattle and/or other livestock by a means other than grazing, where the number of livestock is more than one hundred (100) animal units in such building, structure or enclosure.

Home Based Business: Means an occupation or profession that is incidental to the principal residential use of a parcel occupied by a dwelling unit, including such uses as: home offices; studios; woodworking, upholstering and other home workshops; and, personal services except dry cleaners and laundromats.

Home Industry: Means secondary or ancillary use of a lot in conjunction with a dwelling for purposes such as manufacturing, processing, fabricating, assembling, storing, distributing, testing, servicing, or repairing of goods or materials including vehicle repair, maintenance and auto body shops and excluding

auto wrecking, manufacture of concrete products, bulk fuel or chemical storage or refining depots, animal or agriculture products processing, or the production of animal feeds, where lots are a minimum of 1 ha [2.47 acres] in size. Home Industry uses are permitted in rural residential, open space reserve and agricultural resource zones, as noted in the relevant bylaw section, where lots are larger than 1 hectare [2.47 acres] subject to the following regulations:
.1 All activities associated with the Home Industry shall be entirely conducted within a completely enclosed building except where it involves agricultural uses;
.2 No storage of materials, equipment or finished products is permitted outside an enclosed building;
.3 Exclusive of the resident's own licensed vehicles, no more than three (3) vehicles for repair shall be parked outdoors;
.4 No external indication shall exist that a building is used for any purpose other than normally associated with a dwelling except for a single non-illuminated sign not exceeding 0.2 square meters [2 square feet];
.5 Noise created by the Home Industry must not exceed 0 decibels (i.e. no noise) above ambient at the property lines;
.6 No building containing a Home Industry shall be located within 4.5 meters [15 ft.] of a lot line;
.7 Employees of a Home Industry shall be restricted to members of a family residing on the lot plus two other people;
.8 A Home Industry use shall be required to have a District of Lillooet Business License;
.9 The operation of a Home Industry shall be limited to the hours between 7:00 a.m. and 9:00 p.m.

Livestock: Means a farm animal/s considered an asset to an agricultural operation and includes cattle, horses, mules, donkeys, sheep, goats, swine, bison, llamas, alpacas, poultry and rabbits.

The Lillooet Zoning Bylaw also includes the following regulations that may impact agriculture:

Buffers
1. Any commercial, industrial or residential land use abutting an agricultural zone including land in the ALR shall provide and maintain a buffer on the non-agricultural side of the lot boundary that complies with the requirements of the Agricultural Land Commission's *Landscape Buffer Specifications, ALC 1993*.

Keeping of Animals
1. The keeping of animals, where permitted, shall be subject to the following regulations:
.1 On any parcel 2.0 ha or less in area, the total number of livestock, must not exceed one (1) animal unit for each 0.2 ha of parcel area;
.2 despite Section 4.31.1, on any parcel 0.4 ha or less in area, the total number of poultry and/or fur bearing animals shall not exceed twenty-five (25).
.3 All structures, pens, runs, enclosures and manure piles shall in addition be located to the satisfaction of the Medical Health Officer in respect of all nearby wells, lakes, streams, springs, groundwater or other bodies of water which in his opinion could suffer contamination therefrom and subject to the regulation of the *Waste Management Act*.

Parking Requirements
- Nursery/greenhouses: 1 parking space per 14 sq. meters [150 sq. ft.] gross floor area of retail sales building
- Vegetable stand: 3 parking spaces per sales clerk

Appendix IV: Agricultural Census Data for Area B

The Agricultural Census data provides only a "snapshot" in time and data is sometimes hidden to protect privacy in areas with very low population densities. As a result, the data summarized below includes agricultural information regarding SLRD Areas A and B, pooled together. Agricultural data from parcels within the District of Lillooet is not available. In order to improve the accuracy of this profile, the results from a "Farmer Survey", which was distributed to farmers and ranchers in the region, were included in the description of the agricultural profile.

In the Agricultural Census, an agricultural operation is defined as: *"a farm, ranch or other operation that produces agricultural products intended for sale."*

Agricultural Land Use: Number of Farms, Farming Area, and Crop and Livestock Production

The total number of farms in SLRD Areas A & B reporting to the Agricultural Census has fluctuated over the last 10 years:

- 44 farms in 2001
- 43 farms in 2006
- 48 farms in 2011

Total area (hectares) actively being farmed in SLRD Electoral Areas A & B has also fluctuated:

- 10,072 ha in 2001
- 15,123 ha in 2006
- 14,998 ha in 2011

Table v. Farming areas in the SLRD and Electoral Areas A & B (2011).

Land Use	SLRD Total	Electoral Areas A & B
	Area (ha)	Area (ha)
Jurisdictional area	1,669,380	752,994
Total ALR	25,470	13,937
Total area actively farmed	20,613	14,998
Land in crops	3,466	1,476
Tame or seeded pasture	1,635	1,165
Natural land for pasture	11,603	9,557
Woodlands and wetlands	3,082	2,305
All other land (incl. Xmas trees)	807	496

Land tenure is an indication of farm stability, with leased land representing less stability for the farm operator with regard to investments in infrastructure. Some farms have more than one type of tenure arrangement occurring at the same time.

Table vi. Land tenure arrangements for farms in SLRD Electoral Areas A & B.

Land Tenure	2001		2006		2011	
	Farms	Hectares	Farms	Hectares	Farms	Hectares
Owned	44	8,816	43	9,405	45	9,120
Leased from governments	6	916	9	X	13	5,694
Rented or leased from others	4	X	4	186	5	65
Crop-shared from others	1	X	2	X	3	X
Total	44	10,072	43	15,123	48	14,998

Table vii. Size of farms in SLRD Electoral Areas A & B.

Number of Farms by Size Category			
Farm Size	2001	2006	2011
< 10 acres	11	6	4
10 to 69 acres	15	15	17
70 to 129 acres	2	5	4
130 to 179 acres	3	2	3
180 to 239 acres	0	2	3
240 to 399 acres	6	4	4
400 to 559 acres	2	4	2
560 to 759 acres	0	0	2
760 to 1,119 acres	1	0	2
1,120 to 1,599 acres	2	1	4
1,600 to 2,239 acres	0	1	1
2,240 to 2,879 acres	1	0	0
2,880 to 3,519 acres	0	1	1
3,520 acres	1	2	1
Total farms	44	43	48

Crop production changes in some cases year to year, but trends emerge in regions where commodity or sector development is taking hold. In the SLRD Areas A & B there is an increasing trend in alfalfa production and the amount of area under fruit, berry, and nut production. Cattle production has also risen in the past 10 years, likely as a result of a natural market rebound from the mad cow disease issue which arose in the early 2000's. By contrast, hay production is decreasing.

Table viii. Crop production in SLRD Electoral Areas A & B.

	2001		2006		2011	
Crop Type	Farms	Hectares	Farms	Hectares	Farms	Hectares
Alfalfa and alfalfa mixtures	21	971	21	2,254	32	3,134
Tame Hay and Fodder	6	996	5	375	2	X
Oilseed and Grain	0	0	0	0	0	0
Fruits, Berries & Nuts	11	10	6	7	10	15
Vegetables	6	6	3	8	7	5
Hens and Chickens	3	135	5	225	11	222
Cattle and Calves	13	2,112	19	2,820	23	2,785
Sheep and Lambs	2	X	3	X	1	X
Goats	1	X	2	X	2	X
Horses and Ponies	21	168	21	118	24	171
Llamas and Alpacas	2	X	4	X	0	0
Honeybees	0	0	1	X	3	X

The number of farmers (or farm "operators") has increased from 60 in 2001 to 80 in 2011, representing a 33% increase in 10 years. At the same time, the average age of farmers is increasing, from 52.2 years old in 2001 to 55.2 years old in 2011. This is on par with the average age of farmers in BC, however a lack of farmers under the age of 35 is lower than on average in the province.

The number of operators working on a farm also provides an indication of farm size, or level of farming intensity on a per farm basis. In the Agricultural Census, up to three operators can be reported per farm. This is a count of distinct operators, therefore operators of two or more separate farms are included only once in the total (so the total will be less than the simple addition of the subcategories). The number of hours spent working on the farm per week also provides an indication of farming intensity.

Table ix. Number of farm operators per farm in the SRLD Electoral Areas A & B.

	2001		2006		2011	
	# of farms	Percentage	# of farms	Percentage	# of farms	Percentage
Farms with one operator	25	41.6%	20	33.3%	20	25%
Farms with two or more operators	20	33.3%	45	75%	55	68.8%
Total operators	60	100%	60	100%	80	100%

Table x. Amount of weekly labour on a per farm basis in the SLRD Areas A & B.

	SLRD - Area A & B	Lower Mainland	BC	Canada
< 20 hours	20 (25%)	4065 (46%)	13135 (44%)	92545 (31%)
20 to 40 hours	35 (44%)	2420 (28%)	9105 (30%)	83400 (28%)
> 40 hours	25 (32%)	2320 (26%)	7695 (26%)	117985 (40%)
Total number of operators	80 (100%)	8800 (100%)	29925 (100%)	293925 (100%)

Farm Practices

The following tables present information regarding the use of specific farm practices by farm operators. More than 80% of farms in SLRD Electoral Areas A & B report using irrigation.

Table xi. Number farms in SLRD Electoral Areas A & B reporting the use of chemicals, fertilizers, and/or lime.

	2001	2006	2011
Herbicides	3 (<10%)	4 (<10%)	4 (<10%)
Insecticides	1 (< 5%)	1 (< 5%)	4 (<10%)
Fungicides	1 (< 5%)	0 (< 5%)	1 (< 5%)
Commercial fertilizer	6 (< 20%)	8 (<20%)	8 (<20%)
Lime	N/A (< 5%)	1 (< 5%)	1 (< 5%)
Total Number of Farms	44	43	48

Table xii. Farms in the SLRD Electoral Areas A & B reporting Best Management Practices.

Best Management Practices Number of Farms	2001	2006	2011
Crop rotation	5	10	8
In-field winter grazing or feeding	N/A	N/A	20
Rotational grazing	N/A	18	11
Plowing down green crops	6	4	2
Winter cover crops	0	2	2
Nutrient management planning	N/A	N/A	10
Windbreaks or shelterbelts (natural or planted)	4	9	9
Buffer zones around water bodies	N/A	4	5
Total	44	43	48

Table xiii. Organic farming trends in SLRD Electoral Areas A & B.

Number of Farms Reporting	2001	2006	2011
Organic products (certified)	N/A (3)	11 (2)	3 (3)
Organic hay or field crops (certified)	N/A	5 (0)	1 (1)
Organic fruits & veg (certified)	N/A (3)	3 (2)	2 (2)
Organic animals or animal products (certified)	N/A	3 (0)	0 (0)

Farm Business Data

The majority of farms in the SLRD Electoral Areas A & B are run as sole proprietorships or partnerships.

Table xiv. Farm business types in SLRD Electoral Areas A & B.

	2001		2006		2011	
Business Type	Number of Farms	Percentage	Number of Farms	Percentage	Number of Farms	Percentage
Sole proprietorship	24	54.5%	22	51.2%	19	39.6%
Partnership without a written agreement	9	20.5%	13	30.2%	20	41.7%
Partnership with a written agreement	2	4.5%	2	4.7%	0	0%
Family corporation	7	15.9%	5	11.6%	7	14.6%
Non-family corporation	1	2.3%	1	2.3%	2	4.2%
Other operating arrangements	0	0%	0	0%	0	0%
Total	44	100%	43	100%	48	100%

Total farm capital has increased dramatically in the region in the past 10 years, most likely due to a sharp increase in the value of land and buildings. The value of farm machinery, livestock, and poultry, has decreased.

Total farm capital values:

- $24,327,342 in 2001
- $34,342,954 in 2006
- $109,353,033 in 2011

Table xv. Farm capital values in SLRD Electoral Areas A & B.

	2001			2006			2011		
Farm Capital Subcategory	# of farms	Value $/farm	Value $ in millions	# of farms	Value $/farm	Value $ in millions	# of farms	Value $/farm	Value $ in millions
Land and buildings	44	432,698	18.6	43	659,088	28.3	48	2,111,488	101.4
Farm machinery & equipment	44	74,640	3.3	43	98,869	4.3	35	24,664	0.9
Livestock and poultry	28	85,731	2.4	31	56,476	1.8	37	55,767	2.1
Total farm capital	44	552,894	24.3	43	798,673	34.3	48	2,278,188	109.4

Less than a third of farms report paying salaries and wages. This is likely due to the fact that revenues are paid directly to sole proprietors or partners, or that the income is directly reinvested into the farm.

Table xvi. Farm salaries and wages in the SLRD Electoral Areas A & B.

	2001			2006			2011		
	# of farms	Value per farm ($)	Value ($ in millions)	# of farms	Value per farm ($)	Value ($ in millions)	# of farms	Value per farm ($)	Value ($ in millions)
Paid to family	4	2,933	11,730	5	12,800	64,000	7	7,541	52,784
All other persons	11	13,496	148,451	11	8,327	91,593	6	97,164	582,982
Total wages and salaries	13	12,322	160,181	14	11,114	155,593	11	57,797	635,766

Farm expenses have risen in several categories, most notably fertilizers, seeds & plants, and fuel.

Table xvii. Farm expenses in the SLRD Electoral Areas A & B.

	2001			2006			2011		
	# of farms	Cost per farm ($)	Cost ($)	# of farms	Cost per farm ($)	Cost ($)	# of farms	Cost per farm ($)	Cost ($)
Fertilizer and lime	16	1,836	29,381	16	1,726	27,609	17	6,284	106,821
Chemicals	7	877	6,141	7	671	4,695	7	X	X
Seeds and plants	18	1,295	23,312	19	1,786	33,941	18	2,766	49,793
Feed, supplements and hay	23	12,623	290,334	25	5,720	142,988	28	3,885	108,783
Livestock and poultry	12	13,433	161,193	15	5,403	81,044	13	10,988	142,840
Veterinary and livestock health	23	1,043	23,994	24	2,584	62,005	21	2,312	48,543
Custom work, contract work and hired trucking	12	5,558	66,700	10	X	X	13	7,299	94,888
All fuel expenses	39	2,772	108,114	39	5,047	196,834	42	6,791	285,224
Repairs and maintenance to	36	1,785	64,243	32	7,622	243,918	37	5,032	186,197

farm machinery, equipment and vehicles									
Repairs and maintenance to farm buildings and fences	4	2,064	8,255	33	2,868	94,657	23	2,230	51,304
Rental and leasing of land and buildings	6	772	4,630	8	X	X	10	4,593	45,934
Electricity, telephone and internet	35	1,222	42,754	38	2,482	94,318	39	4,316	168,332
Farm interest expenses	14	8,717	122,034	16	4,630	74,074	15	8,834	132,514
All other expenses	40	3,844	153,766	36	8,104	291,759	41	12,935	530,320
Total farm business operating expenses	**44**	**29,819**	**1,312,029**	**43**	**39,080**	**1,680,434**	**48**	**54,395**	**2,610,953**

Despite increases in farm expenses, overall farm revenues are improving. This again may be a result of recovery from the mad cow disease issue that affected beef cattle farmers, as well as a shift towards more lucrative commodities such as grapes.

Table xviii. Gross farm receipts and gross margin.

	2001	2006	2011
Gross Farm Receipts	$1,237,283	$1,365,019	$2,865,187
Total Operating Expenses	$1,312,029	$1,680,434	$2,610,953
Gross Margin (%)	-5.70%	-18.8%	9.7%

Table xix. Average revenue per farm and per hectare.

Year	# of Farms	Gross Receipts ($)	Average per Farm ($)	Total Farm Area (Hectares)	Average per Hectare ($)
2001	44	1,237,283	28,120	10,072	123
2006	43	1,365,019	31,745	15,123	90
2011	48	2,865,187	59,691	14,998	191

Appendix V: Soils and Agricultural Capability

Surficial Geology

Bedrock geology is a combination of sedimentary rock (including limestone) and volcanic deposits. Since the end of the most recent ice age approximately 12,000 to 10,000 years ago, several landslides and debris flows have altered the local landscape. Deposits in the area are a combination of colluvial and morainal (glacial till) origins (Young et al., 1992).

Soil Types

Soil types are categorized based on distinguishing characteristics and criteria that dictate soil management techniques. Soil classification facilitates the organization and communication of information about soils, as well as the understanding of relationships between soils and environmental factors. Differences in soils are the result of the interaction of many factors: climate, organisms, parent material, topography and time.

Agricultural Capability Ratings

The Agriculture Capability rating system is a method designed to enable consistent and objective assessment of land based on inherent limitations for crop production (Department of Regional Economic Expansion, 1969). It was developed in the 1960s as part of the Canada Land Inventory (CLI). Agriculture Capability ratings are based on soil, landscape, and climate properties, not crop yield data, and limitations may or may not be altered by management (ALC, 2010). Agriculture Capability ratings can be used to help determine appropriate crop choices, realistic target yields and assess and mitigate site-specific risks such as flooding, stoniness, steep slopes, or nutrient loss.

In this classification, mineral and organic soils are each grouped into seven classes on the basis of soil and climate characteristics according to their potential for agricultural use. Lands in Classes 1 to 4 inclusive are considered capable of sustained agricultural production of most crops. Class 5 lands are considered capable of producing forage crops or specially adapted crops. Class 6 lands are capable of providing only pasture for livestock. Class 7 lands generally are incapable of use for either crops or livestock (they are usually rocky outcrops or wetlands). However, it is important to note that many successful farms in BC are located on Class 7 soils, indicating that some crops may be suited to sites that many others are not. In particular, cranberries and vineyards can often do well in Class 6 and 7 soils. *Unimproved* ratings are based on the conditions that exist at the time of the survey, without irrigation or other management systems in place. *Improved* ratings indicate the potential capability after existing limitations and/or hazards have been adequately alleviated. Improvements may include land grading, drainage, irrigation, diking, stone removal, salinity alleviation, subsoiling, and/or the addition of fertilizers or other soil amendments.

Other important assumptions that are made based on the classification system (BC Ministry of Agriculture and Food, 1983) include:

- Soils will be managed and cropped under a largely mechanized system.
- Water is available for irrigation.

- The following are not considered in the classification: distance to market, available transportation facilities, labour, location, farm size, type of ownership, cultural patterns, skill or resources of individual operators, and hazard of crop damage by storms.
- The classification does not include capability ratings for trees, fruit orchards, vineyards/grapes, ornamental plants, recreation, or wildlife.

In BC, most soils were mapped for agricultural capability ratings in the 1980s, and these maps remain in use throughout the province. The associated Computer Assisted Planning, Assessment, and Map Production (CAPAMP) system (Kenk and Sondheim, 1987) has since been translated into Geographic Information System database files.

The general agricultural capability limitation within the Lillooet and Area B region is lack of soil moisture and improvements generally refer to irrigation, removal of surface stones, installation of drainage where necessary, or addition of nutrients.

While soils vary from site to site, general recommendations for improvements to local soils for the purposes of agriculture include:

- Ground levelling (areas should be individually evaluated in regard to erodibility and machinery limitations);
- Applications of nutrients (fertilizers, manures, compost);
- Stone picking;
- Increasing organic matter content by adding animal manure, green manure, and/or compost; and
- Irrigating, often at frequent short intervals.

Soil Groupings

The following map indicates soil types and associated characteristics for the Lillooet and Cayoosh area. The soil type is indicated on the map by a two-letter code at the top of the symbol grouping.

For example the soil grouping symbol: CG5/R:gh
- The soil type is “CG” or “Cavanaugh” soil. Other numbers relate to slope, stoniness, and drainage.

Maps for other subareas are presented in the Appendix. A summary of the soil characteristics of the major soil types is provided in the table below. For a complete listing of soil types please refer to Young et al. (1992).

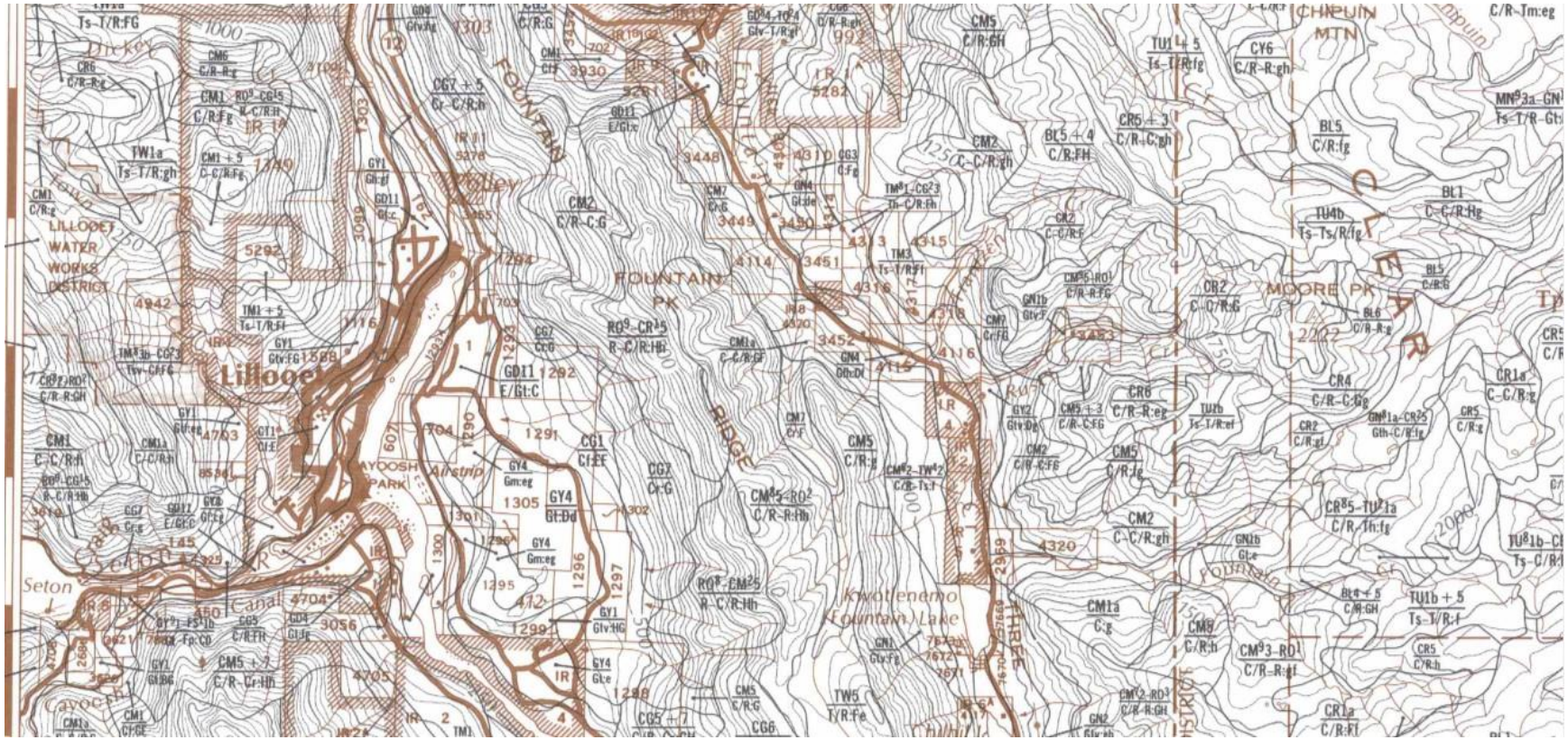

Figure i. Soil groupings for the Lillooet area (Young et al., 1992).

Table xx. Soil characteristics of the major soil types in Electoral Area B and Lillooet (Young et al., 1992).

Soil Name	Parent Material	Soil Texture and pH	Topography	Stoniness	Agricultural Capability Class	Grazing Capability Class
Chasm (CM)	Colluvial deposits. Eutric Brunisol.	Sand to sandy loam, neutral to mildly alkaline.	Moderately to extremely sloping.	Generally stony.	Class 6 Suitable for grazing	Class 4 Suitable for pinegrass
Cairn Mountain (CR)	Colluvial deposits. Brunisol.	Gravelly sandy loam, neutral deposits.	Moderately to extremely sloping.	Moderately to extremely stony.	Classes 6 and 7 Suitable for grazing	Class 5 Suitable for pinegrass
Cavanaugh (CG)	Colluvial fan deposits. Eutric Brunisol.	Gravelly loamy sand or gravelly sand. Mildly to moderately alkaline.	Moderately to extremely sloping.	Moderately to extremely stony.	Classes 5 and 6 Suitable for grazing and pasture	Class 4 Suitable for bunchgrass
Holden (HD)	Fluvioglacial deposits. Eutric Brunisol.	Gravelly sandy loam or loam overlying sand.	Very gently sloping to moderately rolling.	Moderately to very stony.	Classes 5 and 6 Suitable for grazing and pasture, forage and cereal grains.	Class 4 Suitable for pinegrass.
Timber (TM)	Morainal deposits. Eutric Brunisol	Silt loam or silty clay loam. Moderately alkaline.	Gently sloping to strongly rolling.	Slightly to moderately stony.	Classes 5 and 6 Suitable for grazing and pasture.	Class 3 Suitable for bunchgrass
Tunkwa (TW)	Morainal deposits. Luvisol.	Silt loam or loam. Mildly alkaline.	Gently sloping to strongly rolling	Slightly to very stony.	Classes 4, 5, and 6 Suitable for grazing, pasture, forage and cereal grains.	Classes 2 and 3 Suitable for pinegrass.
McLaren (ML)	Morainal deposits. Luvisol.	Gravelly sand loam or gravelly loam. Moderately alkaline.	Moderately rolling to steeply sloping.	Slightly to very stony.	Classes 5 and 6 Suitable for pasture and grazing.	Classes 2 and 3 Suitable for pinegrass.
Mellin (ME)	Morainal deposits. Luvisol.	Sandy loam or loam. Acidic to neutral.	Moderately rolling to hilly.	Very to exceedingly stony.	Class 6 Suitable for grazing.	Class 5 Suitable for pinegrass.
Rocky Outcrop (RO)	Exposed bedrock with less than 10 cm of soil on the rock surface.	Bedrock	Extremely sloping	Not suited to soil-based agriculture.	Not suitable for crops.	Not suitable for grazing.

Appendix VI: Lillooet News article about Blue Goose

Historic Diamond S Ranch sold: New owner is Blue Goose Cattle Company

http://www.lillooetnews.net/article/20130508/LILLOOET0101/305089994/-1/lillooet/historic-diamond-s-ranch-sold

Wendy Fraser, May 8, 2013

The historic Diamond S Ranch at Pavilion has been sold to the Blue Goose Cattle Company of Toronto. Kevin Reed, Blue Goose chairman of the board and CEO, confirmed the sale in an interview with the News last week.

"The deal to acquire the Diamond S closed the end of March," said Reed. "We have acquired deeded acreage of approximately 15,000 acres, and around 600 head of cattle came with the sale." He said the land purchase includes the ranch on top of Pavilion Mountain, along Highway 99 North and the valley bottom along Pavilion Creek.

Blue Goose is a privately owned Canadian operation with a leading position in the organic and natural beef production markets. The company has operations in B.C., Ontario and Colorado. Under its stewardship, it has more than 700,000 acres of deeded, leased and licensed grazing land, as well as one of the largest organic cattle herds in North America. In addition to its certified organic beef operation, the Blue Goose company has two other components – certified organic rainbow trout and certified organic poultry.

Reed described the Diamond S property as "ideal for continuation of what our core business is." He said Blue Goose intends to invest in the Diamond S ranch, adding more cattle to the ranch operation and increasing the number of employees as well.

"We're one of the largest producers in North America of what I call 'clean protein,'" said Reed. "Our customers are Whole Foods, Sobeys and Loblaws and high-end restaurants. I firmly believe that organic protein is in high demand."

The Diamond S is one of the oldest ranches in the province.

The Pavilion Mountain portion of the Diamond S was once known as "Carson's Kingdom" after Robert Carson, who acquired the land in 1866. The ranch stayed in the Carson family until 1942 when Colonel Victor Spencer purchased the ranch.

Colonel Spencer was the son of a prominent Vancouver businessman who owned a chain of department stores called Spencer's. In 1949, Spencer added to his holdings in the Pavilion area when he bought another historic ranch, the Bryson Ranch, located on the Pavilion Mountain plateau and in the valley below the mountain. Colonel Spencer also owned the Douglas Lake Ranch in the Nicola Valley, the Circle S Ranch at Dog Creek and Earlscourt, across the Fraser River from Lytton. Following Spencer's death in 1960, his ranches were sold.

Ted Termuende purchased the Diamond S in the 1960s and the Termuende family owned the ranch until its sale in March.

Commenting on the Spencer family connection to the ranch, Kevin Reed noted, “Life is sometimes a full circle.
“I used to coach the son of a good friend of mine and his name is Spencer Dyer. Prior to starting and running Blue Goose, I built a trust company here in Canada and I hired Spencer out of university and gave him his first job on Bay Street. He went on to work as investment banker and now he’s just joined us,” continued Reed. “I told him we were buying Diamond S and asked him if he knew the history there. He said, ‘No, not really.’ His great-grandfather was Colonel Spencer, so I was able to tell him a bit of his family history.

“Spencer just left Toronto to head to B.C. We have a finishing lot with an abattoir and a fertilizer plant in Salmon Arm. He just went out there two weeks ago to start learning that part of the business, so he’s pretty excited about getting out to the Diamond S too, to see where his family’s roots are and where his great-grandfather’s ashes are spread.”

Reed concluded, “We deeply respect the history and the folklore and the opportunity associated with the ranch. We look forward to investing in it and expanding our organic beef operation there. We’re really honoured to take a place in history with that ranch. And we think this is a great business to be in.

xxx

Appendix VII: Land Use Inventory Report

BRITISH COLUMBIA | Ministry of Agriculture

Land Use Inventory Report

Reference Number: 800.510-83.2014

Electoral Area B & Lillooet

Squamish-Lillooet Regional District

Summer 2013

Photo credit: Texas Creek Ranch, www.texascreekranch.com

Strengthening Farming Program
Ministry of Agriculture

May 16, 2014

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This project was made possible by a partnership between the Regional District of Squamish-Lillooet (SLRD) and the British Columbia Ministry of Agriculture. We would like to thank the farmers who stopped to talk to the survey crew and answer questions about farming in the Lillooet area. We would also like to thank the St'at'imc First Nation for their participation.

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Funding provided by :

Citation

BC Ministry of Agriculture. (2013). Growing Knowledge Land Use Inventory Report: Electoral Area B & Lillooet, Squamish-Lillooet Regional District, Summer 2013. (Reference No. 800.510-83.2014).

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Acronyms

AGRI	BC Ministry of Agriculture
ALC	Agricultural Land Commission
ALR	Agricultural Land Reserve
ALUI	Agricultural Land Use Inventory
GIS	Geographic Information Systems
SLRD	Squamish-Lillooet Regional District

Definitions

General

Agricultural Land Reserve (ALR) – A provincial zone in which agriculture is recognized as the priority use. Farming is encouraged and non-agricultural uses are controlled.

BC Assessment – The Crown corporation which produces annual, uniform property assessments that are used to calculate local and provincial taxation. The database purchased from BC Assessment contains information about property ownership, land use, and farm classification, which is useful for land use surveys.

Cadastre – The GIS layer containing parcel boundaries, i.e. legal lot lines.

Crown ownership – Crown ownership includes parcels which are owned by municipal, provincial or federal governments. Parcel ownership is determined by the Integrated Cadastre Fabric maintained by the Parcel Fabric Section of the BC Government.

Farm classification for tax assessment – Applies to parcels producing the minimum dollar amount to be classified as a farm by BC Assessment. Local governments apply a tax rate to farmland which is usually lower than for other land. To receive and maintain the farm classification, the land must generate annual income from agricultural production.

Farm Unit – An area of land used for a farm operation consisting of one or more contiguous or non-contiguous parcels, that may be owned, rented or leased, which form and are managed as a single farm.

Land Cover

Anthropogenic – The term *anthropogenic* describes an effect or object resulting from human activity. In this report, the term anthropogenic refers to land cover originating and maintained by human actions but excludes farmed land cover; cultivated field crops, farm infrastructure, and crop cover structures.

Anthropogenic – **Built up - Other** – Lands covered by various unused or unmaintained built objects (structures) and associated yards that are not directly used for farming.

Anthropogenic – **Managed vegetation** – Lands seeded or planted for landscaping, dust or soil control but not cultivated for harvest or pasture. Includes parklands, golf courses, landscaping, lawns, vegetated enclosures, remediation areas.

Anthropogenic – **Non Built or Bare** – Human created bare areas such as extraction or disposal sites. Includes piles, pits, fill dumps, dirt parking or storage areas.

Anthropogenic – **Residential** – Lands covered by built objects (structures) and their associated auxiliary buildings, yards, roads, and parking. Includes single and multifamily dwellings, and mobile homes.

Anthropogenic – **Residential footprint** – Includes the main residence plus its associated yard, driveway, parking and any auxiliary buildings or structures. When two residences are on a property, areas associated to both (such as shared driveways, parking or yard), are assigned to the closest residence.

Anthropogenic – **Settlement** – Lands covered by built objects (structures) and their associated yards, roads, and parking. Includes institutional, commercial, industrial, sports / recreation, military, non linear utility areas and storage / parking.

Anthropogenic – **Transportation** – Lands covered by built objects (structures). Includes roads, railways, and airports and associated buffers and yards.

Anthropogenic – **Utilities** – Lands covered by built objects (structures). Includes linear features such as pipelines or transmission lines.

Anthropogenic Waterbodies – Areas covered by water, snow or ice due to human construction. Includes reservoirs, canals, ditches, and artificial lakes - with or without non cultivated vegetation.

Crop cover structures – Land covered with built objects including permanent enclosed glass or poly structures (**greenhouses**) with or without climate control facilities for growing plants and vegetation under controlled environments, and barns used for growing crops such as mushrooms. Excludes non permanent structures such as hoop or tunnel covers.

Cultivated field crops - Land under cultivation for harvest or pasture. Includes crop land, fallow farmland, unused forage or pasture, un-housed container crops and crops under temporary covers. Excludes natural pasture, rangeland, greenhouses, mushroom barns and other crop houses.

Farm infrastructure – Land covered by farm related built objects (structures) and their associated yards, roads, parking. Includes barns, storage structures, paddocks, corrals, riding rings, farm equipment storage, and specialized farm buildings such as hatcheries. Excludes greenhouses, mushroom barns and other crop houses.

Natural and Semi-natural – Land cover which has not originated from human activities or is not being maintained by human actions. Includes regenerating lands, and old farm fields.

Natural and Semi-natural – Grassland – Land cover dominated by herbaceous plants with long, narrow leaves characterized by linear venation; including grasses, sedges, rushes, and other related species.

Natural and Semi-natural – Herbaceous – Land cover dominated by low, non woody plants such as ferns, grasses, horsetails, closers and dwarf woody plants. If greater than 50% cover is grass, the land is categorized as grassland.

Natural and Semi-natural – **Natural bare areas** – Includes bare rock areas, sands and deserts.

Natural and Semi-natural – **Natural pasture** – Smaller fenced areas usually on private land with uncultivated (not sown) natural or semi-natural grasses, herbs or shrubs used for grazing domestic livestock.

Natural and Semi-natural – **Rangeland** – Larger fenced areas usually on crown land with uncultivated (not sown) natural or semi-natural grasses, herbs or shrubs used for grazing domestic livestock.

Natural and Semi-natural – Shrubland – Land where less than 10% crown cover is native trees and at least 20% crown cover is multi-stemmed woody perennial plants, both evergreen and deciduous.

Natural and Semi-natural – Treed - closed – Land where between 60 and 100% of crown cover is native trees.

Natural and Semi-natural – Treed - open – Land where between 10 and 60% of crown cover is native trees.

Natural pasture or rangeland – Land with uncultivated (not sown) natural or semi-natural grasses, herbs or shrubs used for grazing domestic livestock. This land cover is considered "Used for grazing" and "Not used for farming" although usually these areas are extensions of more intensive farming areas.

Unmaintained field crops – Land under cultivation for field crops which has not been maintained for several years and probably would not warrant harvest.

Unmaintained forage or pasture – Land under cultivation for forage or pasture which has not been cut or grazed during the current growing season and has not been maintained for several years.

Unused forage or pasture – Land under cultivation for forage or pasture which has not been cut or grazed during the current growing season.

Livestock

Animal Unit Equivalent – A standard measurement used to compare different livestock types. One animal unit equivalent is approximately equal to one adult cow or horse.

Homesite –The homesite is the primary location of a farm unit or livestock operation where most livestock management occurs. It is the location of the main ranch or main barn of a **farm unit**.

Intensive livestock – Intensive livestock have specialized structures such as barns, feedlots, or stockyards designed for confined feeding at high stocking densities.

Non Homesite – Refers to a location where livestock are present, but related infrastructure is minimal. Non homesites are used for pasturing and are secondary to the farm units primary (homesite) location.

Non intensive livestock – Non intensive livestock have the ability to graze on pasture and often utilize non intensive barns and corrals/paddocks.

Scale of livestock operations – The scale system used in this report to describe livestock operations includes 4 levels:

- "**Very Small** Approximately 1 cow or horse or bison, 3 hogs, 5 goats or deer, 10 sheep, 50 turkeys, 100 chickens (1 animal unit equivalent)
- "**Small**" LESS THAN 25 cows or horses or bison, 75 hogs, 125 goats or deer, 250 sheep, 1250 turkeys, 2500 chickens (2 - 25 animal unit equivalents)
- "**Medium**" LESS THAN 100 cows or horses or bison, 300 hogs, 500 goats or deer, 1000 sheep, 5,000 turkeys, 10,000 chickens (25 - 100 animal unit equivalents)
- "**Large**" MORE THAN 100 cows or horses or bison, 300 hogs, 500 goats or deer, 1000 sheep, 5,000 turkeys, 10,000 chickens (over 100 animal unit equivalents)

Land Cover and Farming

Actively farmed – Land cover considered **Farmed** but excludes unused / unmaintained field crops, and unmaintained greenhouses. Does not include natural pasture or rangeland.

Farmed – Land cover directly contributing to agricultural production (both actively farmed and inactively farmed). Includes land in **Cultivated field crops, Farm infrastructure** and **Crop cover structures** (see individual definitions). Does not include natural pasture or rangeland.

Inactively farmed. Land cover considered "Farmed" but is currently inactive. Includes unused / unmaintained forage and pasture, unmaintained field crops, and unmaintained greenhouses or crop barns. Does not include natural pasture or rangeland.

Potential for farming – Land without significant topographical, physical or operational constraints to farming such as steep terrain, land under water, or built structures. For example, land with little slope, sufficient soils and exhibiting a natural treed land cover would be considered as having potential for farming. Areas less than 1 acre in size

Land Use

Heritage – Parcels with archaeology or heritage sites.

Institutional & community – Parcels with churches, cemeteries, hospitals, medical centers, education facilities, correctional facilities, or government and First Nation administration.

No apparent use – Parcel with no apparent human use; natural areas, long term fallow land, cleared land not in production, abandoned or neglected land, abandoned or unused structures.

Protected area / park / reserve – Includes provincial parks, other parks, and ecological reserves. Areas may have passive recreation such as hiking, nature viewing, or camping.

Recreation & leisure – Parcels with intensive recreation (such as zoos, rinks, courts, walking/biking trails), or extensive recreation (such as horseback riding, wilderness camping sites, fishing, hunting, skiing, etc.) Golf course are reported separately.

Water management – Areas used to actively or inactively manage water. Includes reservoirs, dikes, ditches, and managed wetlands.

Wildlife management – Areas used to actively or inactively manage wildlife. Includes wildlife reserves, breeding areas, fishing areas, and fish ladders/hatcheries.

Land Use and Farming

Used for farming – Parcels where the majority of the parcel area is farmed OR parcels which exhibit significant intensity of farming are considered "Used for farming". Specifically, parcels that meet at least one of the following criteria:

- medium or large scale livestock, apiculture or aquaculture operations
- at least 50% parcel area in cultivated field crops (excluding unused forage or pasture)
- at least 50% parcel area built up with farm infrastructure
- at least 25% parcel area built up with crop cover structures (excluding unmaintained structures)
- at least 40% parcel area in cultivated field crops (excluding unused forage or pasture) or farm infrastructure and small scale livestock, apiculture or aquaculture operations
- at least 33% parcel area in cultivated field crops (excluding unused forage or pasture) and at least 55% parcel area in cultivated field crops (excluding unused forage or pasture) or farm infrastructure
- at least 10% parcel area in crop cover structures (excluding unmaintained structures) and at least 40% parcel area in cultivated field crops (excluding unused forage or pasture) or farm infrastructure
- at least 20% parcel area and at least 20 ha in cultivated field crops (excluding unused forage or pasture)
- at least 25% parcel area and at least 10 ha in cultivated field crops (excluding unused forage or pasture)
- at least 30% parcel area and at least 5 ha in cultivated field crops (excluding unused forage or pasture)
- at least 10% parcel area and at least 2 ha built up with crop cover structures (excluding unmaintained structures)
- at least 20% parcel area and at least 1 ha built up with crop cover structures (excluding unmaintained structures)

Not used for farming – Parcels that do not meet the "Used for farming" criteria presented above.

Not used for farming but available – Parcels that do not meet the "Used for farming" criteria but can be used for agricultural purposes without displacing a current use

Used for grazing – Parcels "Not used for farming" with a significant portion of their area in natural pasture or rangeland and evidence of active domestic livestock grazing

Available for farming – Parcels that can be used for agricultural purposes without displacing a current use. Includes all parcels that do not meet the "Unavailable for farming" criteria.

Unavailable for farming – "Not used for farming" parcels where future agricultural development is improbable because of a conflicting land use that utilizes the majority of the parcel area. For example, most residential parcels are considered not available for farming if the parcel size is less than 0.4 hectares (approximately 1 acre) since most of the parcel is covered by built structures, pavement and landscaping.

Executive Summary

Squamish-Lillooet Regional District (SLRD) is located in the Coast Mountains of southwestern British Columbia. The regional district is responsible for land use planning and is currently developing an Agricultural Area Plan for the District of Lillooet and Electoral Area B. The Agricultural Area Plan will be informed, in part, by the Agricultural Land Use Inventory.

In the summer of 2013, the BC Ministry of Agriculture conducted an Agricultural Land Use Inventory (ALUI) in the District of Lillooet and Electoral Area B. The ALUI was funded in part by SLRD and the Investment Agriculture Foundation of BC.

ALUIs can be used to understand which agricultural activities are occurring in the surveyed area. The data provides an estimate of the capacity for agricultural expansion as well as quantifies the amount of land within the Agricultural Land Reserve (ALR) that is unavailable for agriculture. The data can also be used to estimate agricultural water demand with the use an irrigation water demand model.

The ALUI for Electoral Area B and Lillooet was conducted using a drive-by inventory that recorded land cover and land use on a per-parcel basis, as a "snapshot in time." Included in the inventory were

1) all parcels completely or partially within the ALR;
2) all parcels classified as having "farm" status by BC Assessment.
3) parcels zoned by local/regional governments to permit agriculture and showing signs of agriculture on aerial photography

Indian reserves were surveyed if they met one of the above criteria. Survey totals for land on Indian reserves are presented separately from main inventory totals due to differences in levels of governance, planning, and decision making processes.

The ALR in Electoral Area B and Lillooet consists of 12,890 hectares. Of this area:

- 65% or 8,393 hectares was included in the inventory area.
- 25% or 3,187 hectares was outside of legally surveyed parcels in rights-of way or unsurveyed land
- 10% or 1,310 hectares was in Indian reserves.

Another 5,728 hectares of land outside the ALR was surveyed bring the total inventory area to 14,121 hectares on 419 parcels. In addition to the inventory area, another 7,173 hectares associated with 25 Indian reserves was surveyed. Of these 7,173 hectares, 1,310 hectares are in the ALR and 5,863 hectares are outside.

The data on each parcel was collected in two ways: land cover (the biophysical material at the surface of the earth) and land use (how people utilize the land). A parcel could have numerous land covers and was assigned up to two land uses.

In the ALR by land cover, 1,720 hectares (13%) was farmed (both actively and inactively), 110 hectares (1%) was anthropogenically modified, and 6,563 hectares (51%) was in a natural or semi-natural state. Of the natural and semi-natural ALR land cover, 1,320 hectares is in natural pasture/rangeland. Another 1,310 hectares (10%) was on Indian reserves and 3,187 hectares (25%) was outside legal parcels and is considered unavailable for farming. An additional 311 hectares of land outside the ALR was farmed.

In the ALR by parcel land use, 2,388 hectares (19%) were defined as "Used for farming," 2,106 hectares (16%) were "Used for grazing", and 3,898 hectares (30%) were "Not used for farming". In this

analysis, farm residential uses and farm roads, were included in the "Used for farming" subtotal. Refer to the definitions section for the "Used for farming" criteria.

The inventory provided insight into ALR land available and with potential for farming by looking at land cover, land use, and physical site limitations. Of the 12,890 hectares of ALR land in Electoral Area B and Lillooet, 1,557 (12%) is actively farmed and 4 hectares (<1%) supports farming (e.g. houses, farm roads, farm buildings, etc). There are 102 hectares (1%) of the ALR unavailable for farming due to existing land use or land cover. There are 5,701 hectares (44%) with limited potential for agriculture due to physical site limitations of which nearly all are topography and/or soils. That leaves 1,012 hectares (8%) of the ALR that is available and has potential to be farmed.

In total, there were 2,009 hectares of cultivated field crops (1,702 hectares in the ALR and 307 hectares outside the ALR). The top crop was forage & pasture with 1,982 hectares or 99% of all cultivated land. There were 27 hectares of other crops including grapes, mixed vegetables, root vegetables, tree fruits, hops, and wheat. In addition to the inventory area, 518 hectares of crops were recorded on Indian reserves including 512 hectares of forage & pasture, 4 hectares of vegetables, and 1 hectare of tree fruits. In the forage & pasture category, 79 hectares were in forage, 218 hectares were in pasture, and 215 hectares were in used/ unmaintained forage or pasture.

Irrigation use was captured by crop type and irrigation system type, to aid in developing a water demand model for agriculture. A total of 1,288 hectares or 64% of all cultivated crops are irrigated in the Lillooet region. Sprinkler systems were the most common with 685 hectares, followed by surface irrigation system (394 hectares), and centre pivot systems (165 hectares). Giant gun systems (24 hectares) and trickle systems (20 hectares) were also recorded. An additional 82 hectares of sprinkler irrigation was found on Indian reserves.

Livestock activities were recorded, but are very difficult to measure using a windshield survey method. Livestock may be in barns, may be mobile, and may utilize more than one land parcel. The inventory data does not identify animal movement between parcels that make up a farm unit, but reports livestock at the parcel where the animals or related structures are observed. In Electoral Area B and Lillooet, equine was the most common type of livestock activity with 24 out of 39 activities (62%), followed by beef with 8 out of 39 activities (21%). Also recorded were 3 poultry, 2 llama/ alpaca, 1 sheep/lamb, and 1 dairy activities. All equine activities are "small" or "very small" scale while 5 of the 8 beef activities are "medium" or "large" scale. All livestock activities in the Lillooet area are "non-intensive". An additional 12 equine activities were recorded on Indian reserves. No actual livestock numbers were obtainable through the survey, so the results were reported as a range in terms of animal unit equivalents for each parcel.

Further analysis of ALR lands was conducted on 210 parcels with 8,235 hectares or 63.8% of the ALR land. Of all ALR parcels, 60% are greater than 16 hectares. The average ALR parcel size is 53.6 hectares, and the median parcel size is 30.0 hectares. Of the 210 parcels in the ALR, 58 (28%) were "Used for farming", 16 (8%) were "Used for grazing", and 136 parcels (65%) were "Not used for farming". In general, the proportion of parcel "Used for farming" increases as the parcel size increases. Although parcels of all sizes are "Used for farming", small parcels are less likely to be farmed.

Summary

This report provides the necessary background to understand the current status of agriculture on the land base and help make informed decision on how to best manage the agricultural land base in order to support and strengthen farming in the future.

Agrologist Comments

Lillooet was originally named after an Aboriginal pony and was known as Cayoosh Flats. The area is rich in First Nation culture and history and has been home to the St'at'imc people for thousands of years. The first non native settlers arrived in Lillooet with the discovery of gold. The region boomed during the Gold Rush, and was considered the "largest town west of Chicago and North of San Francisco". At the town's peak in 1860, Lillooet had 16,000 inhabitants. The road leading to Lillooet was long, rugged, and difficult to travel. It became necessary to grow food locally and agriculture expanded in the region. Crops were planted in the fertile valley bottoms and cattle were brought in to form ranches. Vegetables, wheat, beans, tobacco and tree fruits were all grown successfully. The tobacco production was especially successful and local brands were shipped across Western Canada. As the Gold Rush era ended, the population of Lillooet was reduced but many of the settlers decided to stay.

The Pacific Great Eastern Railway was built in 1914 and greatly increased access to the Lillooet area. At this time, the ranching industry was strengthened and more land was put into forage production. During World War II Japanese internment camps were set up on the east Lillooet flats after the attack on Pearl Harbour. Some of the Japanese grew vegetables that were sold locally. After the war, hops were planted and covered most of the flats north of Lillooet which is now a residential area.

For the next number of years, vegetables crops, fruits trees, and ranching were the main agricultural activities in the Lillooet area. In the mid 1980's ginseng production started. With its high selling price, ginseng attracted many growers. At its peak in the late 1990's, the Lillooet area had over 500 acres of ginseng. As prices fell and production slowed, the land was converted back to forage. Currently, forage production and ranching are the main agricultural activities. In the mid 2000's grapes were planted and the first winery opened in Lillooet. Vegetables are still grown on the east Lillooet flats, and recently a new hop farm was established. A weekly farmers market occurs each year starting in May and ending in October. This market demonstrates that there is support for local products.

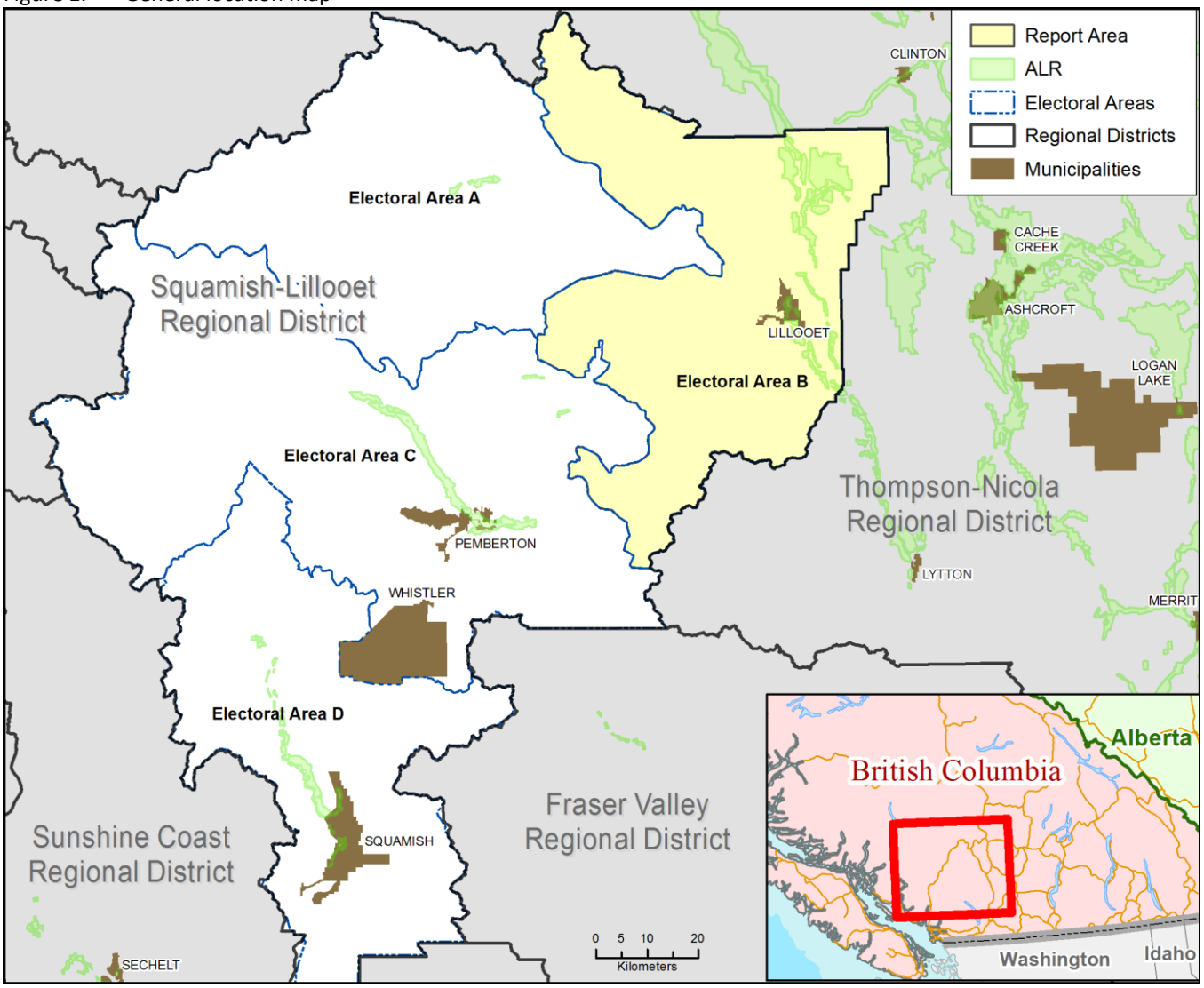
The climate in Lillooet is hot and dry with an average daily high of 28 degrees Celsius in summer. The annual precipitation is 350 mm, of which only 135 mm occurs during the growing season. The irrigation demand is over 600mm. These numbers indicate that precipitation alone does not provide enough water and that irrigation is required to grow a productive crop. Currently, most irrigation uses gravity feed mainlines to redirect water from higher elevation areas. This method of irrigation is generally only available early in the growing season. As the snow pack melts and the streams dry up in the warmer months, there may not be enough water available for irrigation. This is of concern especially on the eastern side of the Fraser River. The development of irrigation storage and infrastructure would allow for greater crop production, but is associated with a high cost.

General Information

Squamish-Lillooet Regional District (SLRD) is located in southwestern British Columbia and spans both sides of the southern Pacific Ranges of the Coast Mountains. The regional district has varied land cover that includes steep mountainous terrain, heavily forested areas, glaciers, river valleys, and floodplains.[1] SLRD is comprised of four Electoral Areas (A, B, C, and D) and the incorporated municipalities of Squamish, Whistler, Pemberton, and Lillooet.

Electoral Area B is the rural area surrounding the District of Lillooet and includes Pavilion, Texas Creek, Yalakom, Bridge River, and Seton Portage. Lillooet and Electoral Area B have a total area including land and water of 372,034 hectares[2] . Lillooet has a population of 2,324[2] and Electoral Area B has a population of 1,719[2] which includes 1,144 people residing on Indian reserves.

Figure 1. General location map



[1] Squamish-Lillooet Regional District Regional Growth Strategy. 2008. http://www.slrd.bc.ca/siteengine/activepage.asp?PageID=17

[2] Government of British Columbia; Ministry of Community, Sport & Cultural Development, Local Government Statistics http://www.cscd.gov.bc.ca/lgd/infra/library/regional_stats11_summary.pdf

AGRICULTURAL LAND RESERVE

The Agricultural Land Reserve (ALR) is a provincial land use zone that was designated in 1973 in which agriculture is recognized as the priority use. Within the ALR, farming is encouraged and non-agricultural uses are controlled.

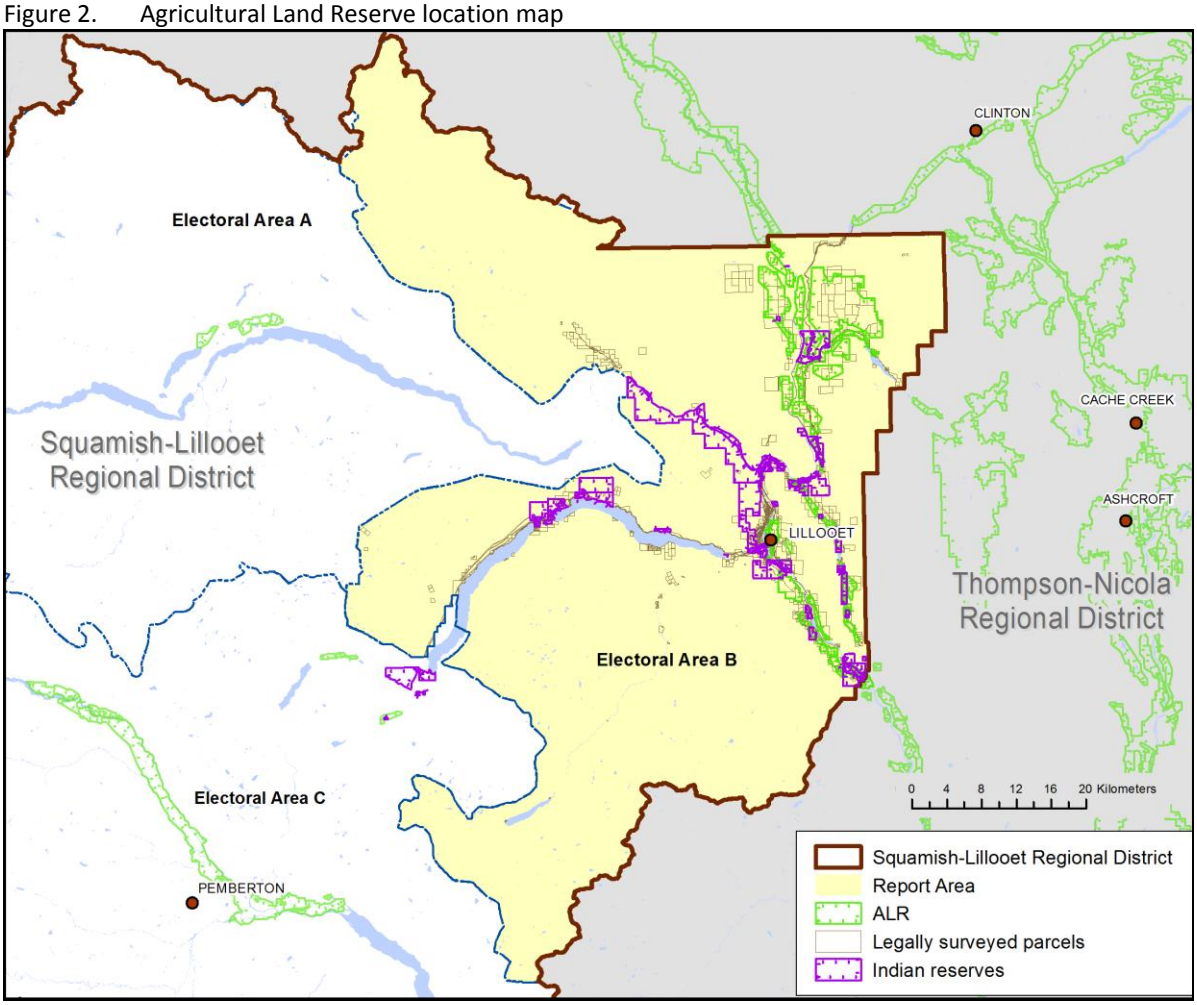
There are 25,349 hectares[3] of ALR land within the Squamish-Lillooet Regional District (see Figure 1); 12,890 hectares[4] or 51% is within the area of interest (Electoral B and Lillooet).

The total size of the area of interest is 372,034 hectares[5], of this area, only 33,406 hectares are in legally surveyed parcels. With 12,890 hectares[4] in the ALR, 3% of the area of interest, and 39% of all legal parcels are in the ALR. This area includes:

- 8,393 hectares in surveyed parcels
- 3,187 hectares outside surveyed parcels (rights-of-way, water, unsurveyed Crown land, etc.)
- 1,310 hectares in Indian reserves

Of the 8,393 hectares of ALR in surveyed parcels, 273 hectares are in Lillooet and 120 hectares are in Electoral Area B.

Figure 2. Agricultural Land Reserve location map



[3] Provincial Agricultural Land Commission (ALC) Annual Report 2012/13 Pg 39. http://www.alc.gov.bc.ca/publications/2012-13%20ALC_Annual%20Report_Final.pdf

[4] Agricultural Land Commission, ALR mapping, Land and Resource Data Warehouse, 2012-10-31 (area calculated in GIS).

[5] Government of British Columbia; Ministry of Community, Sport & Cultural Development, Local Government Statistics http://www.cscd.gov.bc.ca/lgd/infra/library/regional_stats11_summary.pdf.

INVENTORY AREA

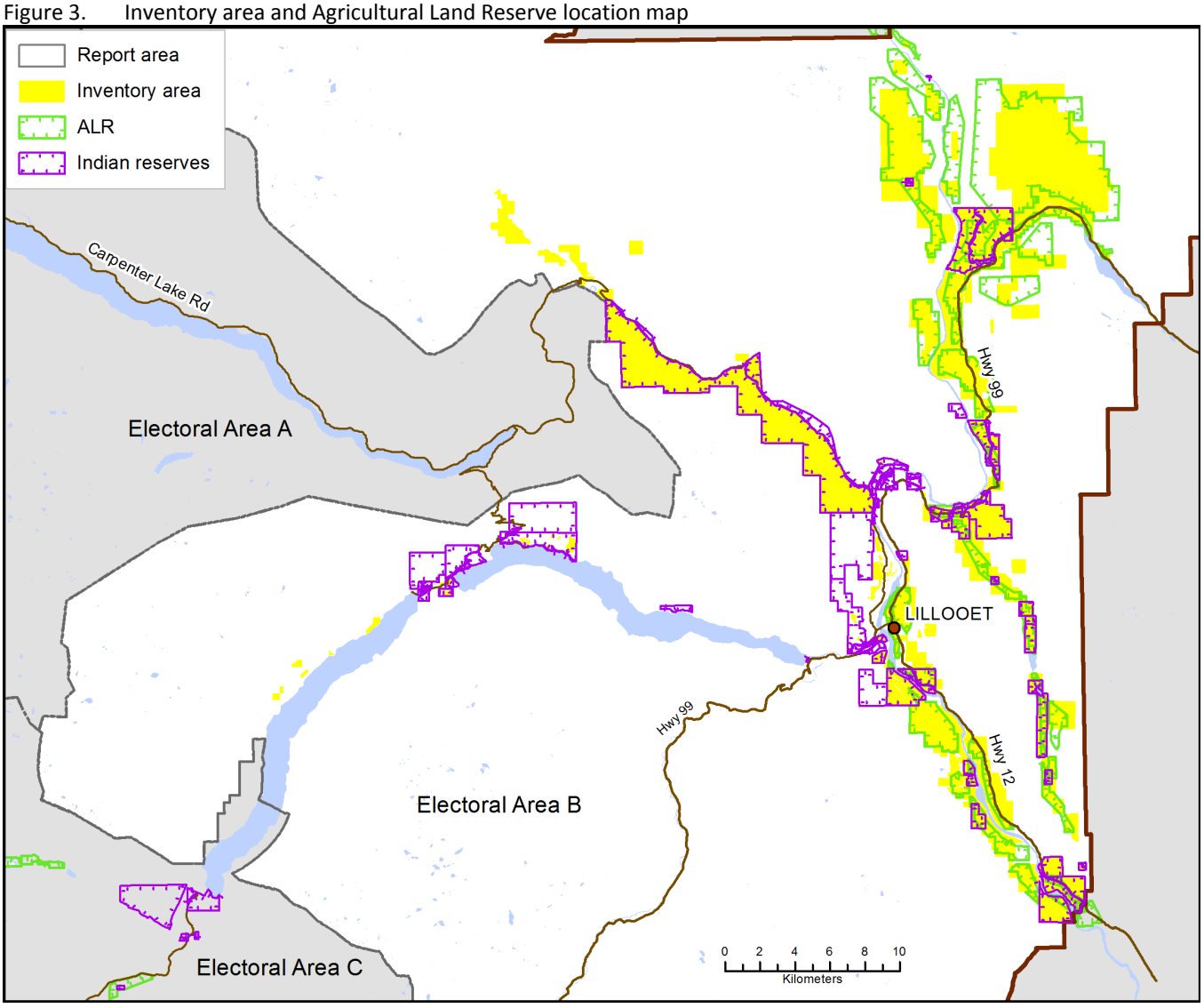
The total inventory area encompasses 419 parcels with a combined area of 14,121 hectares, or 42% of the legally surveyed parcels in the area of interest. Included are all parcels:

- completely or partially within the Agricultural Land Reserve
- classified by BC Assessment as having "Farm" status for property tax assessment
- zoned by local government bylaws to permit agriculture and exhibiting signs of agriculture on aerial photography

The amount of ALR land included in the inventory area is 8,393 hectares located on 276 parcels. This area is 65% of the ALR within Electoral Area B and Lillooet.

Indian reserves were surveyed if they were completely or partially within the Agricultural Land Reserve, or showed signs of agriculture on aerial photography. An additional 7,173 hectares associated with 8 bands and 25 reserves was inventoried. This area is comprised of 1,310 hectares in the ALR and 5,863 hectares outside the ALR. Land inventoried on reserves is reported separately from the main inventory totals due to differences in levels of governance, planning, and decision making processes.

Figure 3. Inventory area and Agricultural Land Reserve location map

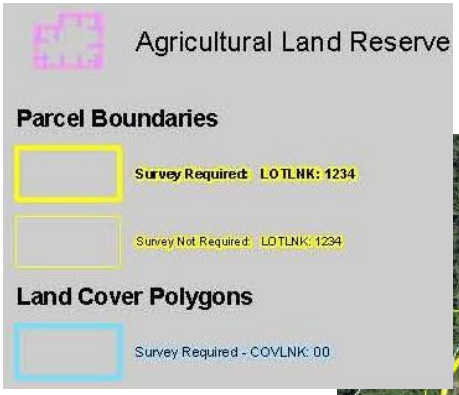


INVENTORY METHODOLOGY

AgFocus is an Agricultural Land Use Inventory System developed by BC Ministry of Agriculture's Strengthening Farming Program. AgFocus employs a "windshield" survey method designed to capture a snapshot in time of land use and land cover on legal parcels. For more information on AgFocus, please refer to these documents available from the Strengthening Farming Program:

- AgFocus – A Surveyor's Guide to Conducting an Agricultural Land Use Inventory
- AgFocus – Field Guide to Conducting an Agricultural Land Use Inventory
- AgFocus – A GIS Analyst's Guide to Agricultural Land Use Inventory Data

The Lillooet area land use inventory was conducted in the summer of 2013 by a BC Ministry of Agriculture agrologist assisted by a GIS technician. The survey crew visited each property and observed land use, land cover, and agriculture activity from the road. Where visibility was limited, data was interpreted from aerial photography in combination with local knowledge. The technician entered the survey data into a database on a laptop computer.



Field survey maps provided the basis for the survey and included:

- The legal parcel boundaries (cadastre)[6]
- Unique identifier for each legal parcel
- The preliminary land cover polygon boundaries (digitized prior to field survey using aerial photography)
- Unique identifier for each preliminary land cover polygon
- The boundary of the Agricultural Land Reserve (ALR)
- Base features such as streets, street names, watercourses and contours
- Aerial photography

[6] Cadastre mapping (2012) was provided through the Integrated Cadastral Society.

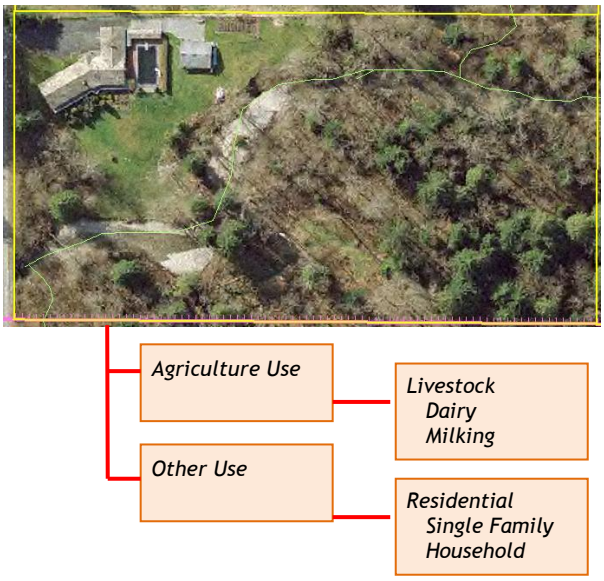
DESCRIPTION OF THE DATA

For each property in the study area, data was collected on general land use and land cover. For properties with agriculture present, data was collected on agricultural practices, irrigation, crop production methods, livestock, agricultural support (storage, compost, waste), and activities which add value to raw agricultural products.

Once acquired through the survey, the data was brought into a Geographic Information System (GIS) to facilitate analysis and mapping. Digital data, in the form of a tabular database and GIS spatial layers (for maps), may be available with certain restrictions through a terms of use agreement.

General land use:
Up to two general land uses (e.g. residential, commercial) were recorded for each property based on an assessment of overall economic importance, the property's tax status, and/or the extent of the land use. The survey for general land use focuses solely on human use and considers:

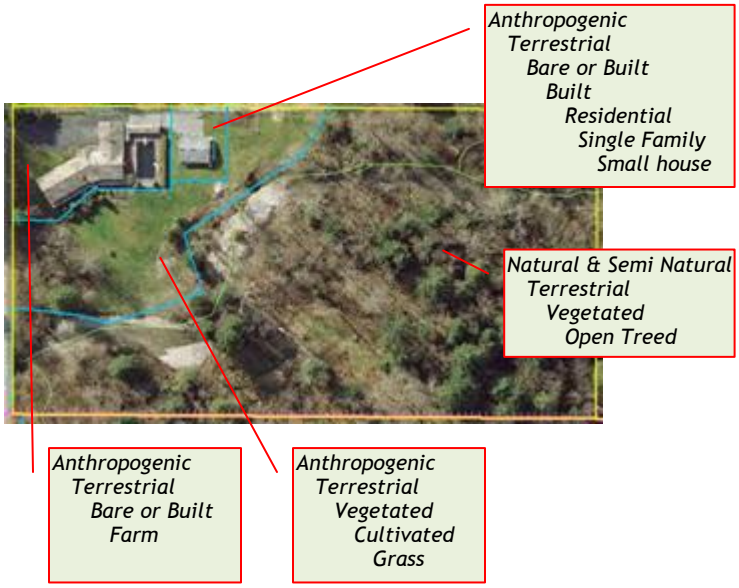
- The actual human use of land and related structures and modifications to the landscape
- Use-related land cover (where land cover implies a use or is important to interpreting patterns of use)
- Declared interests in the land (which may limit use) such as parks



In addition, the availability of non-farm use properties for future farming was assessed based on the amount of potential land for farming on the property and the compatibility of existing uses with future farming activities.

Land cover:
Land cover refers to the biophysical features of the land (e.g. crops, buildings, forested areas, woodlots, streams). Land cover was surveyed by separating the parcel into homogeneous components and assigning each a description. Prior to field survey, polygons were delineated in the office using orthophotography. Further delineation occurred during the field survey until one of the following was achieved:

- Minimum polygon size (500 sq m ~5400 sq ft) or minimum polygon width (10 m ~33 ft)
- Polygon is homogeneous in physical cover and homogeneous in irrigation method
- Maximum level of detail required was reached



In most cases, more than one land cover was recorded for each parcel surveyed.

Agricultural practices: Surveyors recorded agricultural practices associated with crops or livestock activities. For example, if a forage crop was being harvested for hay, it was recorded. Irrigation was also recorded, including the type of system used.

Agricultural crop production: Crop production and crop protection methods observed on the parcel were recorded such as wildlife scare devices, temperature or light control, or organic production. Organic production is not always visible and may have been recorded based on local knowledge or farmer interviews.

Livestock: Livestock operations and confinement methods along with the scale of the activity were estimated and recorded. Livestock not visible at the time of survey may have been inferred based on grazed pastures, manure storage, size of barn and other evidence.

Agricultural support: Ancillary agricultural activities, such as storage, compost or waste, supporting the production of a raw commodity on a farm unit were recorded.

Agricultural value added: Activities that add value to a raw commodity where at least 50% of the raw commodity is produced on the farm unit were recorded. This value-added activity included processing, direct sales and agri-tourism activities.

PRESENTATION OF THE DATA

The data is presented in the form of summarized tables and charts. Absolute data values are preserved throughout the summarization process to maintain precision. In the final formatting of the summarized tables and charts, data values are rounded to the nearest whole number. As a result, data presented in the summarized tables and charts may not appear to add up correctly.

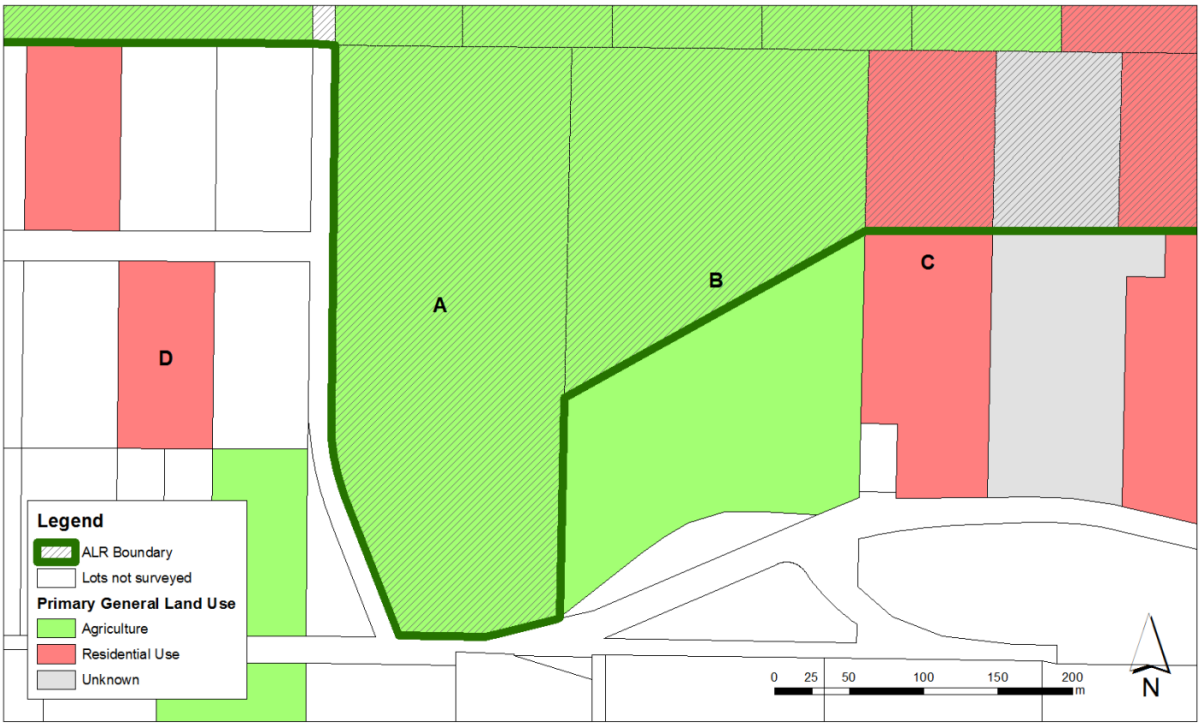
DETERMINATION OF PARCELS WITHIN THE ALR

Since much of the following analysis is parcel based, it is important to note that the ALR boundaries to not always coincide with parcel boundaries. As a result, many parcels have only a portion of their area in the ALR.

Figure 4 illustrates the frequent misalignment between parcel boundaries and the ALR boundary. Given that the dark green line represents the ALR boundary, Lot A is completely in the ALR and Lots B and C have a portion of their area in the ALR. Lot D is completely outside the ALR.

Many of the results presented in this report include 3 separate totals: the total parcel area, the portion of the parcel inside the ALR, and the portion of the parcel outside the ALR.

Figure 4. Parcel inclusion in the ALR



1. Land Cover and Farmed Area

Land cover describes the biophysical material at the surface of the earth and is distinct from land use which describes how people utilize the land.

Land use is surveyed by assigning the parcel up to two land uses. Some examples of land use are residential, commercial, and industrial. Refer to Section 2 of this report for more information on land use.

Land cover is surveyed by separating the parcel into homogeneous components and assigning each a description such as landscape lawn, natural open treed, anthropogenic wetland, blueberries, road, or small single family house. Most surveyed parcels have numerous different land cover types with each describing a different area of the parcel. Land cover more closely approximates the actual area of land in agricultural production or "Farmed" than land use.

Four land cover types are considered "Farmed":

- **Cultivated field crops**: vegetation under cultivation for harvest or pasture including land temporarily set aside from farming and perennial crops that were not harvested or grazed in the current growing season
- **Farm infrastructure**: built structures associated with farming such as barns, stables, corrals, riding rings, and their associated yards
- **Greenhouses**: permanent enclosed glass or poly structures with or without climate control facilities for growing plants and vegetation under controlled environments
- **Crop barns**: permanent enclosed structures with non-translucent walls for growing crops such as mushrooms or bean sprouts

Forage and pasture field crops which have not been cut or grazed during the current growing season (unused), unmaintained field crops, and unmaintained greenhouses are considered "Farmed" land covers but are considered inactive.

Natural pasture and rangeland are fenced areas with uncultivated (not sown) natural or semi-natural grasses, herbs or shrubs used for grazing domestic livestock. These areas are considered "Grazed" and not "Farmed" although usually these areas are extensions of more intensive farming areas.

Land cover types which may support farming, such as farm residences, vegetative buffers and farm road access, are not considered "Farmed".

Table 1. Land cover and farmed area

Land cover*		ALR		Outside ALR (ha)	Total area (ha)	% of inventory area	In Crown ownership (ha)**
		In ALR (ha)	% of ALR				
Actively farmed	Cultivated field crops	1,557	12%	281	1,837	13%	13
	Farm infrastructure	18	< 1%	6	24	< 1%	<1
	Greenhouses	<1	< 1%	-	<1	< 1%	-
Inactively farmed	Unmaintained field crops	16	< 1%	2	18	< 1%	-
	Unused forage or pasture	129	1%	25	154	1%	2
FARMED SUBTOTAL		**1,720**	**13%**	**313**	**2,033**	**14%**	**15**
Anthropogenic (not farmed)	Managed vegetation	40	< 1%	41	81	< 1%	1
	Non built or bare	5	< 1%	6	12	< 1%	<1
	Residential footprint	9	< 1%	20	29	< 1%	<1
	Settlement	<1	< 1%	5	6	< 1%	-
	Transportation	54	< 1%	21	75	< 1%	52
	Built up - other	<1	< 1%	<1	1	< 1%	<1
SUBTOTAL		**110**	**1%**	**93**	**204**	**1%**	**54**
Natural and Semi-natural	Vegetated	5,208	40%	4,444	9,652	68%	2,011
	Natural pasture or rangeland	1,320	10%	19	1,339	9%	2
	Wetlands	13	< 1%	6	19	< 1%	-
	Natural bare areas	14	< 1%	105	119	< 1%	56
	Waterbodies	7	< 1%	46	54	< 1%	6
SUBTOTAL		**6,563**	**51%**	**4,620**	**11,183**	**79%**	**2,075**
Unknown	Not surveyed	<1	< 1%	701	701	5%	549
TOTAL		**8,393**	**65%**	**5,728**	**14,121**	**100%**	**2,694**
Surveyed	Indian reserves	1,310	10%	5,863	7,173		
Not surveyed	Outside parcels	3,187	25%				
	Parcels areas < 100 sq m	<1	< 1%				
SUBTOTAL		**4,497**	**35%**				
TOTAL		**12,890**	**100%**	**11,591**	**21,294**		

* See "Land Cover" in the Definitions section for terms used in this table.

** In Crown ownership. This total does not land in Indian reserves as this area is reported separately.

Table 1 shows the extent of different land cover types across the entire inventory area.

There are 2,031 hectares of land in "Farmed" land cover although 172 of these hectares are "Inactively farmed" in unmaintained field crops and unused forage or pasture.

Refer to Map 1 for more information.

Figure 5. Land cover and farmed area in the ALR

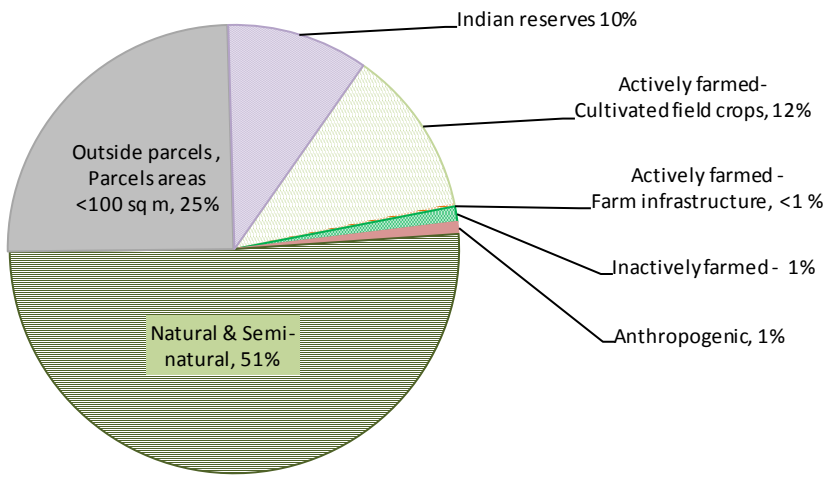


Figure 5 shows the proportion of different land cover types across the ALR in Electoral Area B and Lillooet.

Of the ALR land, 12% is "Actively farmed" while 1% is in unmaintained field crops or unused forage or pasture ("Inactively Farmed").

Land used in support of farming such as natural pasture, farm residences, vegetative buffers or roadways is not included as "Farmed".

Over half (51%) of the ALR area is in "Natural & Semi-natural" land cover.

Table 2. Land cover and farmed area on Indian reserves

Land cover*		ALR		Outside ALR (ha)	Total area (ha)
		In ALR (ha)	% of ALR		
Actively farmed	Cultivated field crops	161	1%	142	303
	Farm infrastructure	<1	< 1%	2	2
	Greenhouses	<1	< 1%	-	<1
Inactively farmed	Unmaintained field crops	-	-	8	8
	Unused forage or pasture	139	1%	69	207
FARMED SUBTOTAL		**301**	**2%**	**220**	**520**
Anthropogenic (not farmed)	Managed vegetation	7	< 1%	24	31
	Non built or bare	<1	< 1%	2	3
	Residential footprint	9	< 1%	11	19
	Settlement	3	< 1%	2	5
	Transportation	14	< 1%	7	20
	Built up - other	-	-	<1	<1
	Waterbodies	<1	< 1%	<1	<1
SUBTOTAL		**34**	**< 1%**	**45**	**79**
Natural and Semi-natural	Vegetated	964	7%	3,606	4,570
	Natural pasture or rangeland	4	< 1%	1	5
	Wetlands	3	< 1%	4	7
	Natural bare areas	1	< 1%	13	14
	Waterbodies	1	< 1%	64	65
SUBTOTAL		**974**	**8%**	**3,687**	**4,661**
Unknown	Not surveyed	<1	< 1%	1,911	1,912
TOTAL		**1,310**	**10%**	**5,863**	**7,173**

* See "Land Cover" in the Definitions section for terms used in this table.

Table 2 shows the extent of different land cover types across inventoried land on Indian reserves.

Table 3. Land cover and farmed area on Indian reserves by reserve name

Band name	Reserve name	Land Cover Category				Total area (ha)
		Farmed (ha)	Anthropogenic (not farmed) (ha)	Natural & Semi-natural (ha)	Not surveyed (ha)	
Bridge River	Bridge River	116	26	3,201	-	3,343
SUBTOTAL		**116**	**26**	**3,201**	**-**	**3,343**
Cayoose Creek	Cayoose Creek 1	12	<1	45	-	58
	Pashilqua 2	3	<1	24	276	304
SUBTOTAL		**15**	**<1**	**69**	**276**	**361**
Lytton	Fish Lake 7	5	<1	27	-	32
	Nesikpe 6	31	1	88	563	683
SUBTOTAL		**36**	**2**	**115**	**563**	**716**
Seton	Mission 5	5	<1	14	-	19
	Slosh 1	19	11	48	-	78
	Slosh 1A	4	-	1	-	5
SUBTOTAL		**28**	**11**	**64**	**-**	**102**
T''it''q''et	Lillooet 1	9	<1	9	-	18
	McCartney's Flat 4	43	5	110	-	158
	Riley Creek 1B	17	-	56	-	73
	Towinock	8	7	73	-	88
SUBTOTAL		**78**	**12**	**247**	**-**	**337**
Ts''kw''aylaxw	Pavilion 1	-	2	443	447	891
	Pavilion 1A	-	-	15	-	15
	Ts'kw'aylaxw 5	6	<1	10	-	16
SUBTOTAL		**6**	**2**	**469**	**447**	**923**
Xaxli''p	Chilhil 6	40	3	83	132	258
	Fountain 1	21	17	69	467	574
	Fountain 1A	-	-	-	5	5
	Fountain 1B	51	3	8	-	62
	Fountain 1D	4	1	14	22	41
	Fountain 3	85	<1	158	-	243
	Fountain 3A	-	<1	2	-	2
	Fountain 4	15	<1	77	-	92
	Fountain Creek 8	3	<1	13	-	16
	Quatlenemo 5	24	<1	73	-	97
SUBTOTAL		**242**	**26**	**496**	**626**	**1,391**
TOTAL		**520**	**79**	**4,661**	**1,912**	**7,173**

Table 3 shows the land cover types across the Indian reserves in the area of interest. In total, 520 hectares of reserve land is in "farmed" land cover, 79 hectares is in anthropogenic (not farmed), and 4,661 hectares is in natural & semi-natural land cover.

2. Land Use and Farm Use

Land use focuses solely on human use and describes the economic function or type of establishment using the parcel. A parcel can have a variety of activities on the land, yet serve a single use. For example, two parcels are said to be "Used for farming", even if one is a dairy farm and the other is in blueberries. If one parcel is a hotel and the other is a retail store, they are both considered as "commercial" land use.

Up to two general land uses (e.g. residential, commercial) are recorded for each parcel. Evaluation of land uses are based on overall economic importance, the property's tax status, and/or the extent of the land use.

Parcels where the majority of the parcel area is utilized for farming or parcels which exhibit significant evidence of intensive farming are considered "**Used for farming**". For a complete definition of "Used for farming", refer to the Definitions section of this report.

Parcels "**Not used for farming**" with a significant portion of their area in natural pasture or rangeland and evidence of active domestic livestock grazing are considered "**Used for grazing**".

Many parcels "Used for farming" or "Used for grazing" are also used for other purposes such as "Residential" or "Industrial". This report does not attempt to determine which use is primary.

Indian reserves are not considered to be legally surveyed parcels. This means that land use cannot be assessed on a parcel basis for reserves and no data on Indian reserves is presented in this section.

Table 4. Land use and farming use by parcel

Parcel land use*		ALR		Outside ALR (ha)	Total area (ha)	% of inventory area	Number of parcels	% of parcels	Average parcel size (ha)
		In ALR (ha)	% of ALR area						
Used only for farming - no other use		1,542	12 %	195	1,737	12 %	39	9 %	45
Used for farming - Mixed use	Residential	557	4 %	506	1,063	8 %	45	11 %	24
	Recreation & leisure - golf	138	1 %	< 1	138	<1 %	1	<1 %	138
	Gravel extraction	100	<1 %	< 1	100	<1 %	1	<1 %	100
	Utilities	51	<1 %	14	65	<1 %	1	<1 %	65
	Transportation	< 1	<1 %	2	3	<1 %	1	<1 %	3
USED FOR FARMING SUBTOTAL		2,388	19 %	718	3,107	22 %	88	21 %	
Used only for grazing - no ther use		1,983	15 %	188	2,171	15 %	15	4 %	145
Used for grazing - & Utilities		124	<1 %	< 1	124	<1 %	1	<1 %	124
USED FOR GRAZING SUBTOTAL		2,106	16 %	188	2,294	16 %	16	4 %	
Not used for farming	No apparent use	2,156	17 %	2,481	4,637	33 %	123	29 %	38
	Transportation	933	7 %	690	1,623	11 %	29	7 %	56
	Residential	369	3 %	1,008	1,378	10 %	139	33 %	10
	Utilities	257	2 %	289	546	4 %	15	4 %	36
	Heritage	112	<1 %	16	128	<1 %	1	<1 %	128
	Forestry	47	<1 %	154	201	1 %	1	<1 %	201
	Industrial	18	<1 %	27	45	<1 %	3	<1 %	15
	Gravel extraction	5	<1 %	18	23	<1 %	3	<1 %	8
	Recreation & leisure	< 1	<1 %	139	139	<1 %	1	<1 %	139
NOT USED FOR FARMING/GRAZING SUBTOTAL		3,898	30 %	4,822	8,720	62 %	315	75 %	
TOTAL		**8,393**	**65 %**	**5,728**	**14,121**	**100 %**	**419**	**100 %**	
Surveyed	Indian reserves	1,310	10 %	5,863	7,173				
Not surveyed	Outside parcels	3,187	25 %						
	Parcels areas < 100 sq m	< 1	<1 %						
SUBTOTAL		4,497	35 %						
TOTAL		**12,890**	**100 %**	**11,591**	**21,294**				

* See "Land Use" in the Definintions section for terms in this table.

Table 4 shows that of the ALR in the Lillooet area, 2,388 hectares or 19% is on parcels "Used for farming" and 2,106 hectares or 15% is on parcels "Used for grazing".

One parcel with the mixed use "Used for farming" and recreation & leisure - golf is associated with Sheep Pasture Golf Course.

There are 16 parcels that are "Used for grazing", 15 of which have no other land use.

Refer to Map 2 for more information.

Table 5. Parcel use and land cover in the ALR

Parcel Land Use		Land Cover Category						Total	
		Farmed *		Anthropogenic (not farmed)		Natural & Semi - natural			
		In ALR (ha)	% of ALR area	In ALR (ha)	% of ALR area	In ALR (ha)	% of ALR area	In ALR (ha)	% of ALR area
Used only for farming - no other use		975	8 %	1	<1 %	565	4 %	1,542	12 %
Used for farming - mixed use	Residential	326	3 %	11	<1 %	219	2 %	557	4 %
	Recreation & leisure - golf	116	<1 %	2	<1 %	20	<1 %	138	1 %
	Gravel extraction	75	<1 %	3	<1 %	22	<1 %	100	<1 %
	Utilities	16	<1 %	-	-	35	<1 %	51	<1 %
	Transportation	< 1	<1 %	-	-	-	-	< 1	<1 %
USED FOR FARMING SUBTOTAL		1,510	12 %	17	<1 %	862	7 %	2,388	19 %
Used only for grazing - no ther use		-	-	8	<1 %	1,975	15 %	1,983	15 %
Used for grazing - & Utilities		-	-	-	-	124	<1 %	124	<1 %
USED FOR GRAZING SUBTOTAL		-	-	8	<1 %	2,099	16 %	2,106	16 %
Not used for farming or grazing		211	2 %	85	<1 %	3,602	28 %	3,898	30 %
SUBTOTAL		1,720	13 %	110	<1 %	6,563	51 %	8,393	65 %
Surveyed	Indian reserves							1,310	10 %
Not surveyed	Outside parcels							3,187	25 %
	Parcels areas < 100 sq m							< 1	<1 %
SUBTOTAL								4,497	35 %
TOTAL ALR								**12,890**	**100 %**

* Some parcels that are "Not used for farming" have "Farmed" land cover, however, the extent or intensity is insufficient for the parcel to be considered "Used for farming". For a complete definition of "Used for farming" refer to the Definitions section.

Table 5 combines land use and land cover on ALR land. For example, parcels with the mixed use "Used for farming" and "Residential" have a total of 326 hectares in "Farmed" land cover, 11 hectares in "Anthropogenic" (not farmed) land cover, and 219 hectares in "Natural & Semi-natural" land cover.

Although 2,388 hectares or 19% of the ALR is on parcels "Used for farming" (refer to Table 4), only 1,510 hectares or 12% of the ALR is actually in "Farmed" land cover as many "Used for farming" parcels are also used for other purposes. Much of the "Farmed" land cover in the ALR (326 hectares or 3%) is on parcels also used for "Residential" purposes.

3. Availability of Land for Farming

The demand for locally grown agricultural products is anticipated to grow as the population grows [7]. This demand along with a number of other factors, such as commodity types and farm management requirements (nutrient management, bio-security), will influence agricultural land needs in the future. Lands suitable for agricultural development may not be available and agricultural sectors that require large land bases, such as dairy or berry, may find it difficult to access sufficient land. Future agriculture growth may come from new commodity types and intensifying land use rather than finding new land for development.

The analysis of the availability of land for farming examines how much land is available for farming, has the potential to be farmed, and the characteristics of this land.

Properties currently "Used for farming" or with some agriculture present are considered available for farming regardless of any existing non-farm use. In addition, properties with an existing use compatible with agriculture, such as residential, are considered available for farming since the existing land use can be maintained.

Properties not currently farmed with an established non-farm use that is incompatible with agriculture are considered unavailable for farming. These properties tend to have very high land values making it more difficult for a farmer to acquire and convert this land to farmland.

Land is further assessed for its farming potential based on physical and environmental characteristics. Only areas in natural and semi-natural vegetation, areas in managed vegetation (managed for landscaping, dust or soil control), and non-built or bare areas are considered to have potential for farming. Areas covered with built structures, steep slopes or rocky soils and areas with operational constraints such as a very small size, are considered not to have potential for farming. For this analysis, it is assumed that removing built structures and fill piles, filling in water bodies or remediating slopes to create land with potential for farming would likely not occur.

Indian reserves are not considered to be legally surveyed parcels. This means that land use cannot be assessed on a parcel basis for reserves and no data on Indian reserves is presented in this section.

[7] In BC, the regulated marketing system requires that over 95% of our milk, eggs, chicken and turkey be produced in BC. The need to produce these products increases in direct proportion to the population growth.

Table 6. Status of the land base with respect to farming

Land status		ALR		Outside ALR (ha)	Total area (ha)	% inventory area
		In ALR (ha)	% ALR Area			
Actively farmed	Cultivated field crops	1,557	12 %	281	1,837	13 %
	Farm infrastructure	18	<1 %	6	24	<1 %
	Greenhouses	< 1	<1 %	-	< 1	<1 %
ACTIVELY FARMED		1,575	12 %	286	1,861	13 %
Supporting farming	Residential footprint	3	<1 %	5	8	<1 %
	Transportation	< 1	<1 %	< 1	1	<1 %
SUPPORTING FARMING		4	<1 %	6	9	<1 %
Unavailable for farming due to existing land use	Transportation	35	<1 %	12	46	<1 %
	Gravel extraction	5	<1 %	9	13	<1 %
	Residential	2	<1 %	18	20	<1 %
	Industrial	< 1	<1 %	3	3	<1 %
Unavailable for farming due to existing land cover	Transportation	19	<1 %	10	29	<1 %
	Natural bare areas	14	<1 %	105	119	<1 %
	Wetlands	13	<1 %	6	19	<1 %
	Waterbodies	7	<1 %	46	54	<1 %
	Residential footprint	6	<1 %	10	16	<1 %
	Built up - other	1	<1 %	5	7	<1 %
UNAVAILABLE FOR FARMING		102	1 %	223	324	2 %
Site limitations	Topography &/or soils	5,692	44 %	4,291	9,983	71 %
	Flooding	6	<1 %	< 1	6	<1 %
	Operational	3	<1 %	4	7	<1 %
LIMITED POTENTIAL FOR FARMING		5,701	44 %	4,295	9,996	71 %
Available & with potential for farming	Natural & Semi-natural - Vegetation	529	4 %	152	681	5 %
	Natural pasture or rangeland	298	2 %	11	309	2 %
	Unused forage or pasture	129	1 %	25	154	1 %
	Anthropogenic - Managed vegetation	38	<1 %	25	63	<1 %
	Unmaintained field crops	16	<1 %	2	18	<1 %
	Anthropogenic - Non built or bare	2	<1 %	2	3	<1 %
AVAILABLE & WITH POTENTIAL FOR FARMING		1,012	8 %	216	1,228	9 %
Availablity & potential for farming unknown		< 1	<1 %	701	701	5 %
TOTAL		**8,393**	**65 %**	**5,728**	**14,121**	**100 %**
Surveyed	Indian reserves	1,310	10 %	5,863	7,173	
Not surveyed	Outside parcels	3,187	25 %			
	Parcels areas < 100 sq m	< 1	<1 %			
SUBTOTAL		4,497	35 %			
TOTAL		**12,890**	**100 %**	**11,591**	**21,294**	

Table 6 shows that 1,575 hectares or 12% of the ALR is actively used for farming; <1% is used in support of farming (farm residences, roads, etc); 1% is unavailable for farming; 44% has limited potential for farming; and 8% is available and has potential for farming.

Refer to Maps 2 and 3 for more information.

Figure 6. Availability and potential of ALR lands for farming

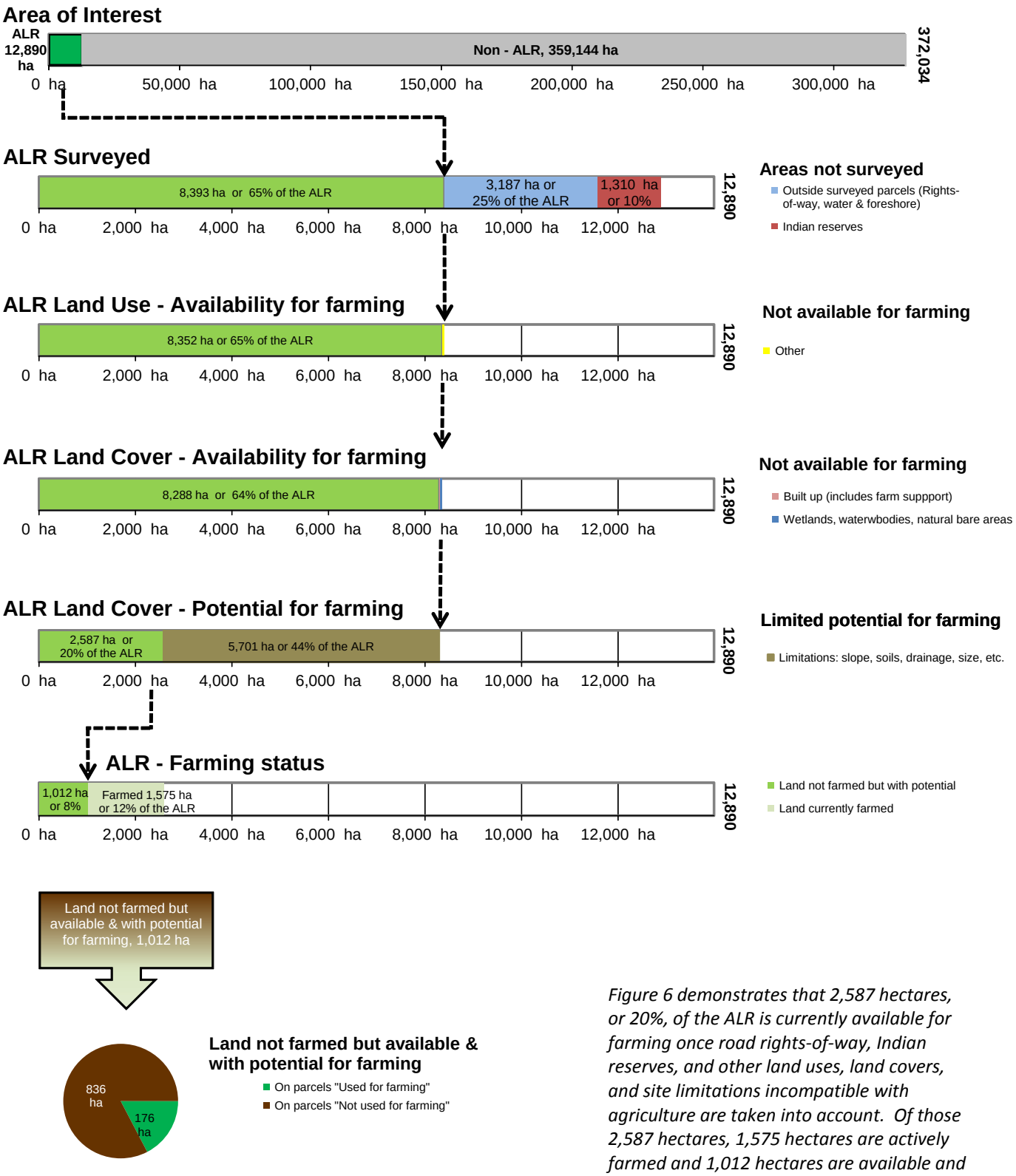


Figure 6 demonstrates that 2,587 hectares, or 20%, of the ALR is currently available for farming once road rights-of-way, Indian reserves, and other land uses, land covers, and site limitations incompatible with agriculture are taken into account. Of those 2,587 hectares, 1,575 hectares are actively farmed and 1,012 hectares are available and have potential for farming.

CHARACTERISTICS OF NOT FARMED BUT AVAILABLE LANDS

The potential for future agriculture expansion is affected by the size of the area available. Small areas can effectively be used for some intensive agricultural operations such as mushrooms, floriculture, greenhouses, poultry, and container nurseries. Small areas are also suitable for start-up farmers, horse enthusiasts, farmers testing new technologies, or established farmers wanting to expand through leases. Despite these opportunities, small areas provide fewer farming choices than large lots. They specifically exclude dairy, hogs, and vegetable greenhouses. A dairy cow, for example, produces sufficient manure per year to fertilize 0.4 hectares of forage production which means a dairy operation consisting of 50 cows would require access to 20 hectares of land. Without sufficient land area to utilize the manure as a fertilizer, the dairy operation would have to find other, more expensive, methods to handle the manure produced on the farm.

On Parcels "Used For Farming"

Table 7. Land use and cover on parcels "Used for farming" with land available for farming but not farmed

Mixed land use on "Used for farming" parcels	Number of parcels	Land not farmed but with potential for farming			Land currently farmed			% potential increase to total ALR farmed area
		In ALR (ha)	Outside ALR (ha)	Total area (ha)	In ALR (ha)	Outside ALR (ha)	Total area (ha)	
Used for farming only	12	147	3	149	433	11	444	9 %
Residential	32	24	21	45	203	109	312	2 %
Recreation & leisure - golf	1	5	-	5	116	< 1	116	<1 %
TOTAL	**45**	**176**	**24**	**199**	**752**	**120**	**872**	**11 %**

Table 7 demonstrates that the largest potential increase in farmed land on parcels that are already "Used for farming" could come from properties that are exclusively "Used for farming" and parcels with "Residential" use.

Figure 7. Land cover available for farming but not farmed on ALR parcels "Used for farming"

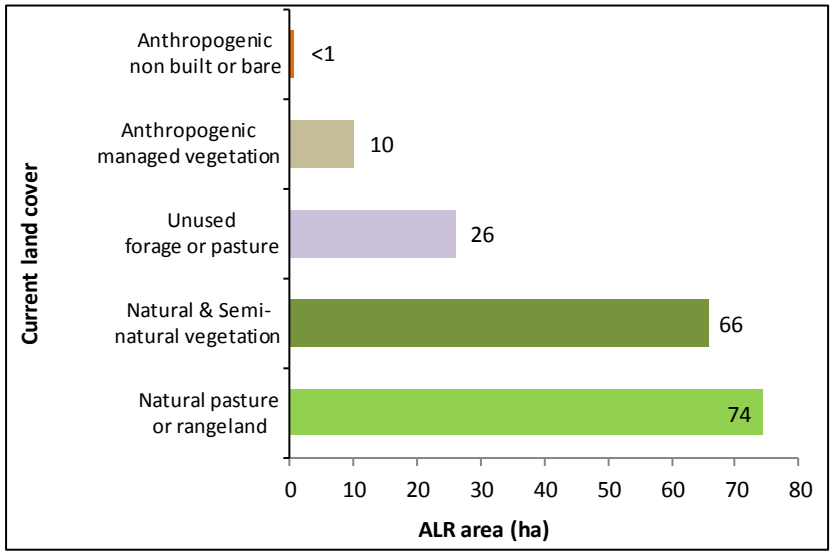


Figure 7 indicates that land currently in "Natural pasture or rangeland" and "Natural & Semi-natural vegetation" would provide the greatest gains in farmed land on parcels that are already "Used for farming".

Converting non-grazed "Natural & semi-natural vegetation" to farming may be better supported by the ranchers in the area.

On Parcels "Not Used For Farming"

Table 8. Land use and cover on parcels "Not used for farming" with land available for farming

Parcel Land use		Number of parcels	Land not farmed but with potential for farming			% potential increase to total ALR farmed area
			In ALR (ha)	Outside ALR (ha)	Total area (ha)	
Used only for grazing - no other use		7	323	10	332	20 %
Not used for farming or grazing	No apparent use	45	301	78	379	19 %
	Utilities	10	67	15	82	4 %
	Residential	50	59	68	126	4 %
	Heritage	1	57	-	57	4 %
	Forestry	1	17	-	17	1 %
	Transportation	1	7	1	8	<1 %
	Industrial	2	7	19	27	<1 %
	Recreation & leisure	1	-	1	1	-
TOTAL		**118**	**836**	**193**	**1,029**	**53 %**

Table 8 illustrates that for parcels currently "Not used for farming", the greatest potential for increasing actively farmed land could come from parcels that are "Used only for grazing" and from parcels with "no apparent use".

Figure 8. Land cover available for farming on "Not used for farming" ALR parcels

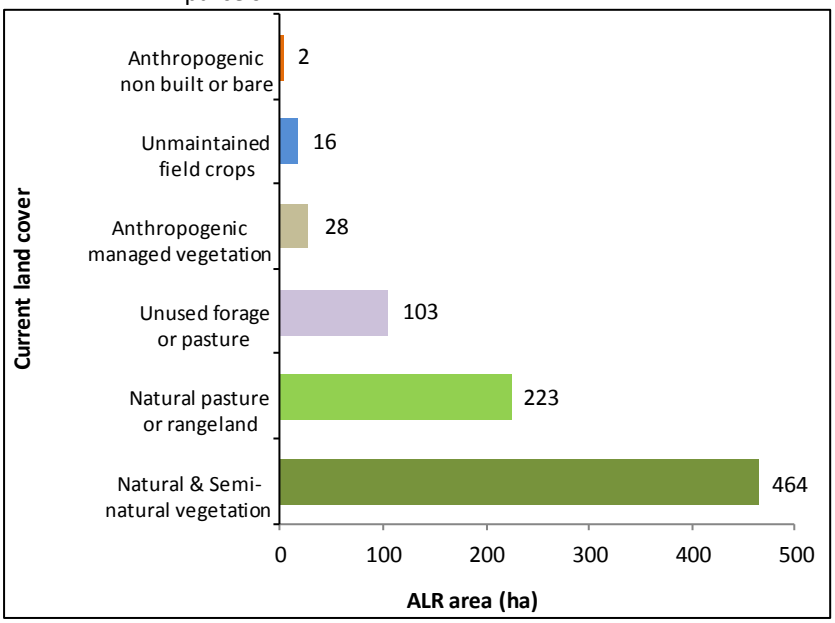


Figure 8 indicates that clearing land covered with "Natural & Semi-natural vegetation" would provide the greatest gains in farmed land on parcels "Not used for farming".

Figure 9. Natural & semi-natural land cover available for farming on "Not used for farming" ALR parcels

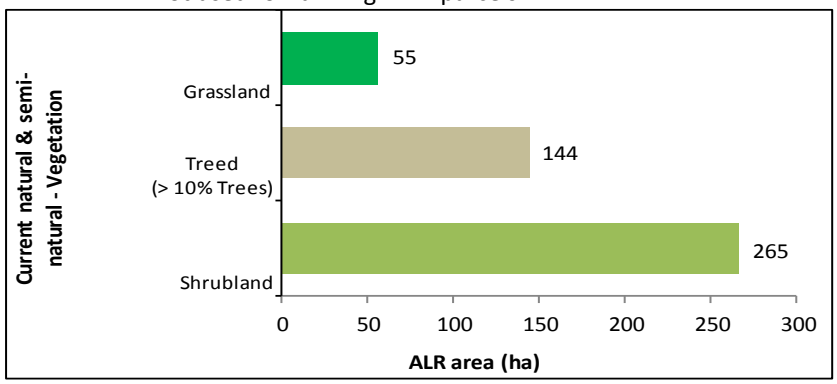


Figure 9 illustrates the types of "Natural and Semi-natural" land cover available for farming on "Not used for farming" parcels.

Figure 10. Size of areas available for farming but not farmed on parcels "Not used for farming"

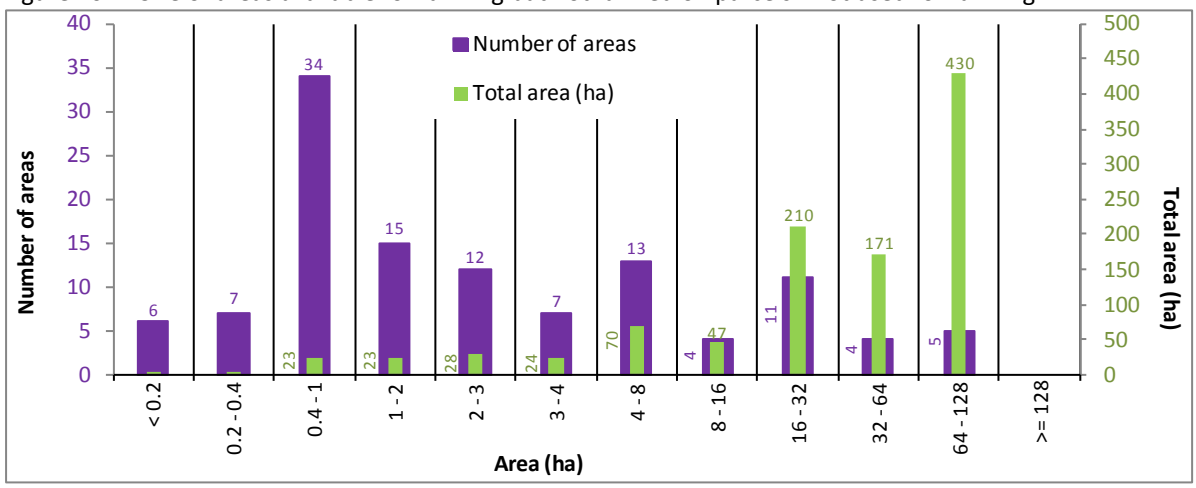


Figure 10 demonstrates that half of the areas available for farming (53 of 107 or 50%) are less than 2 hectares in size. Fewer options are available to efficiently farm small parcels. In general, areas should be at least 4 hectares to provide the widest range of farming options.

There are 37 areas greater than 4 hectares and available for farming but not farmed in Electoral Area B and Lillooet. These areas have a total of 928 hectares, or 90% of the 1,029 hectares available (refer to Table 8).

4. Farming Activities

CULTIVATED FIELD CROPS

Cultivated field crops are captured in a geographical information system (GIS) at the field or land cover polygon level by crop type (vegetables, forage or pasture, berries, etc.). Each crop type is then summarized to total land area and evaluated for field size characteristics.

Included with cultivated field crops is fallow farmland, inactively farmed land (i.e. forage or pasture crops which have not been harvested or grazed this season) and land temporarily set aside for wildlife or other purposes. Also included is bare cultivated land or land under preparation for planting as it is assumed these lands will be planted during the survey season. Excluded are crops grown in crop cover structures such as greenhouses or mushroom barns.

Cultivated crops on Indian reserves are reported separately from the inventory totals. This is primarily due to differences in levels of governance, planning, and decision making.

Cultivated field crops in Electoral Area B and Lillooet are described by five crop groupings:

- **Forage & pasture**: grass, mixed grass/legume
- **Grapes**
- **Vegetables**: mixed vegetables (a variety of vegetable type cultivated together), root vegetables (potatoes, carrots, garlic, dry onions, rutabagas, turnips, beets, or radishes)
- **Tree fruits**: mixed tree fruits
- **Wheat**

Table 9. Main field crop types by area

Type	ALR		Outside ALR (ha)	Total area (ha)	% of cultivated land	Number of parcels with crop type
	In ALR (ha)	% of ALR				
Forage & pasture	1,683	13%	299	1,982	99%	185
Grapes	9	< 1%	1	10	< 1%	5
Vegetables	8	< 1%	< 1	9	< 1%	6
Tree fruits	2	< 1%	4	6	< 1%	7
Hops	-	-	2	2	< 1%	1
Wheat	-	-	< 1	< 1	< 1%	1
TOTAL	**1,702**	**13%**	**307**	**2,009**	**100%**	**205**

Table 9 shows the 5 main field crop types produced on the 2,009 hectares of cultivated land in Electoral Area B and Lillooet.

"Forage & pasture" is the dominant cultivated field crop type accounting for 99% of all cultivated land and 13% of the ALR.

There are only 27 hectares of cultivated land in other crop types.

Refer to Map 4 for more information.

Figure 11. Main field crop types by percentage

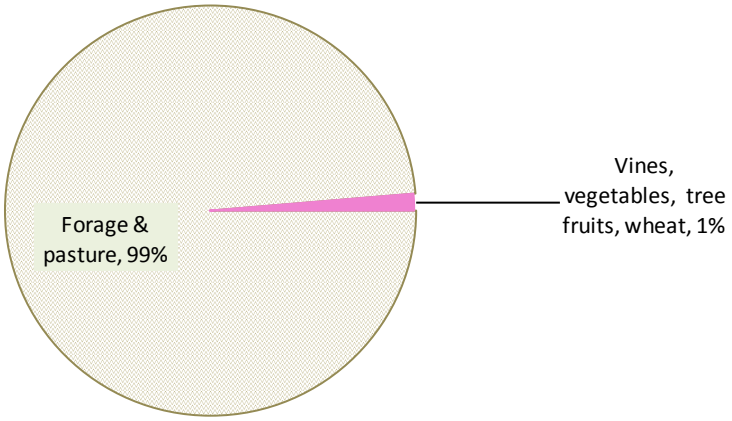


Figure 11 illustrates the predominance of forage & pasture crops.

Figure 12. All cultivated field crops by size[8]

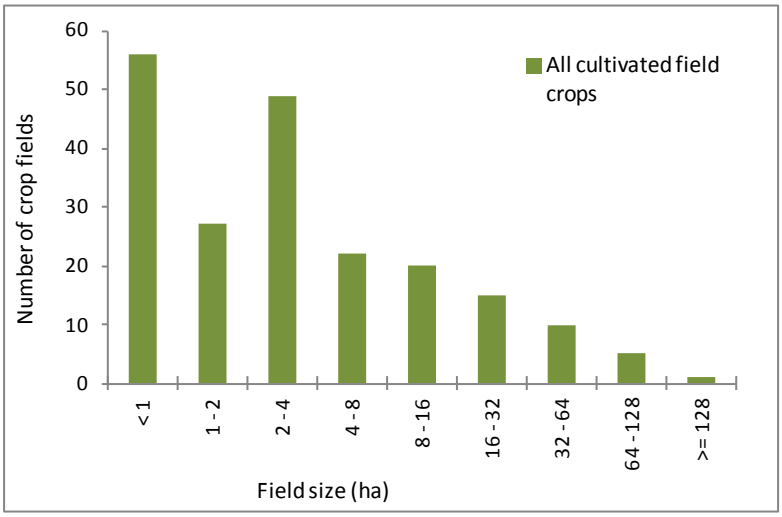


Figure 12 illustrates the number and size distribution of fields used for cultivated field crops.

In Lillooet and Electoral Area B, there are 205 individual crop fields with an average area of 10 hectares and a median area of 3 hectares.

The average parcel size where field crops occur is 33 hectares and the median size is 16 hectares.

If two or more crop fields of the same crop type are present on one parcel, they are counted as one crop field. A parcel may have several different crop fields.

Figure 13. Forage & pasture, vegetable, and berry fields by size

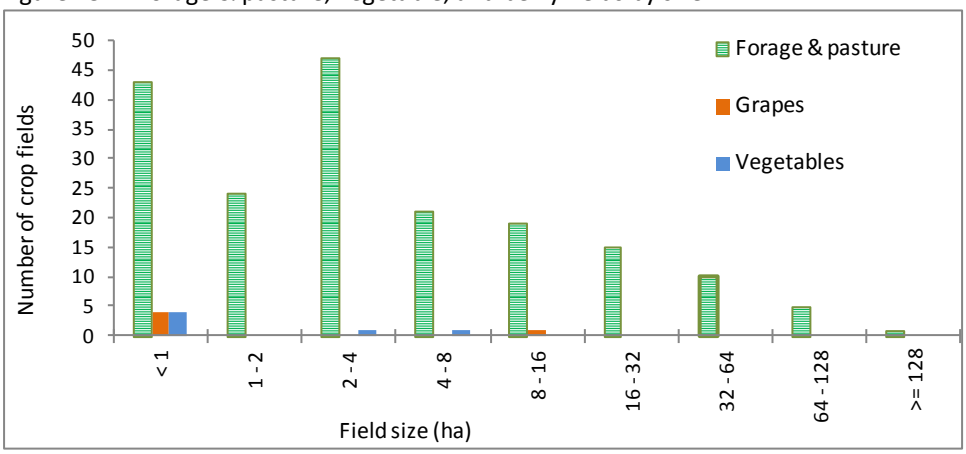


Figure 13 compares the top three main crop types by field sizes.

"Forage & pasture" dominates all field size categories.

Of the 5 grape fields, 4 are <1 hectare. The fifth is 9 hectares in size and is associated with Fort Berens Estate Winery.

[8] Each distinct crop type on one parcel is counted as one crop activity. Each crop activity will include at least one and perhaps more crop fields. A parcel may have more than one crop activity if there is more than one distinct type of crop on that parcel.

Table 10. Main field crop types by area on Indian reserves

Type	ALR		Outside ALR (ha)	Total area (ha)
	In ALR (ha)	% of ALR		
Forage & pasture	298	2%	214	512
Vegetables	2	< 1%	3	4
Tree fruits	-	-	1	1
TOTAL	**300**	**2%**	**218**	**518**

Table 10 shows the 3 field crop types produced on surveyed Indian reserves.

Table 11. Forage & pasture crops on Indian reserves

Forage & pasture crops		ALR		Outside ALR (ha)	Total area (ha)
		In ALR (ha)	% of ALR		
Forage (unmanaged)	Grass	14	< 1%	14	29
Forage (unmanaged)	Mixed grass / legume	35	< 1%	16	51
	Subtotal	**49**	**< 1%**	**30**	**79**
Pasture (unmanaged)	Grass	106	< 1%	95	202
Pasture (unmanaged)	Mixed grass / legume	4	< 1%	-	4
Pasture^	Grass	-	-	12	12
	Subtotal	**110**	**< 1%**	**107**	**218**
Unused	Grass	139	1%	69	207
Unmaintained / abandoned	Grass	-	-	7	7
	Subtotal	**139**	**1%**	**76**	**215**
	TOTAL	**298**	**2%**	**214**	**512**

^ Forage or pasture where the level of management could not be determined.

Table 11 details the forage & pasture crops on Indian reserves in the inventory area. There are 79 hectares in forage, 218 hectares in pasture, and 215 hectares in unused or unmaintained forage or pasture.

Forage & pasture crops

Forage is a cultivated crop that is cut and made into silage or hay for livestock feed. Three levels of forage management are described:

- **Forage (intensively managed)**: Management includes weed control & fertilizer / manure applications and crop is cut 4-8 times per year. Often there is no fencing and crop growth is vigorous, even and thick.
- **Forage (managed)**: Management includes weed control & fertilizer / manure applications and crop is cut several times per year. Often there is no fencing and crop growth is generally healthy and even.
- **Forage (unmanaged)**: Weed management & fertilizer / manure applications are minimal. Crop is cut only once per year. Crop growth is uneven with weeds.

Pasture is a cultivated crop that is used for grazing only and is not cut. Two levels of management are described:

- **Pasture (managed)**: Management includes weed control & fertilizer / manure applications. Usually fields are large to accommodate equipment. Fencing is in good condition and crop growth is vigorous with few weeds.
- **Pasture (unmanaged)**: Weed management & fertilizer / manure applications are minimal. Fencing is in good condition. Crop is varied (some weeds) and growth is uneven with signs of animal dung.

Some areas are used for both forage & pasture:

- **Forage & pasture (managed)**: Crop is cut 1 to 3 times per year and made into silage or haylage. Also used for grazing for 1 to 3 months per season. Fencing is in good condition and crop growth is reasonably even with few weeds. Usually associated with dairy operations.

Areas previously used for forage or pasture are considered inactively farmed:

- **Unused** refers to forage or pasture which has not been cut or grazed during the current growing season.
- **Unmaintained** refers to forage or pasture which has not been cut or grazed during the current growing season, has not been maintained for several years, and probably would not warrant harvest.

Table 12. Forage & pasture crops by area

Forage & pasture crops		ALR		Outside ALR (ha)	Total area (ha)	% of cultivated land
		In ALR (ha)	% of ALR			
Forage (managed)	Grass	7	< 1%	< 1	7	< 1%
Forage (managed)	Mixed grass / legume	150	1%	< 1	151	8%
Forage (unmanaged)	Grass	60	< 1%	69	129	6%
Forage (unmanaged)	Mixed grass / legume	540	4%	36	576	29%
	Subtotal	**757**	**6%**	**106**	**863**	**43%**
Pasture (managed)	Grass	17	< 1%	< 1	17	< 1%
Pasture (unmanaged)	Grass	721	6%	166	887	44%
Pasture (unmanaged)	Mixed grass / legume	42	< 1%	2	44	2%
	Subtotal	**780**	**6%**	**169**	**949**	**47%**
Unused	Grass	86	< 1%	16	102	5%
Unused	Mixed grass / legume	43	< 1%	8	52	3%
	Subtotal	**129**	**1%**	**25**	**154**	**8%**
Unmaintained / abandoned	Grass	16	< 1%	< 1	16	< 1%
	Subtotal	**16**	**< 1%**	**< 1**	**16**	**< 1%**
	TOTAL	**1,683**	**13%**	**299**	**1,982**	**99%**

Table 12 shows there is slightly more pasture (949 hectares) than forage (863 hectares) in the Lillooet, Electoral Area B region.. Grass is the main pasture crop type, while mixed grass/ legume is the main forage crop type.

Refer to Map 4 for more information.

Figure 14. Forage & pasture fields by size[9]

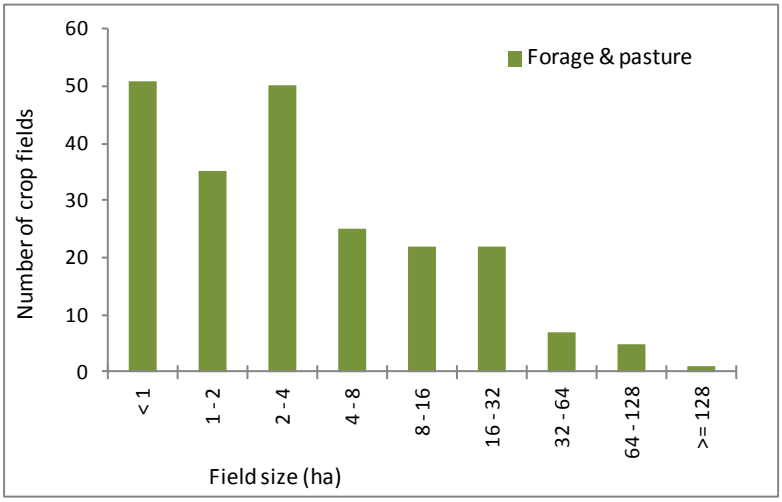


Figure 14 shows that "Forage & pasture" fields occur on a variety of field sizes. Sixty-two percent (62%) of all "Forage & pasture" fields are less than 4 hectares.

In total, there are 218 individual "Forage & pasture" fields with an average crop area of 9 hectares and a median area of 3 hectares.

These fields occur on 185 parcels with an average parcel size of 35 hectares and median parcel size of 16 hectares.

Figure 15. Forage & pasture fields by size and type

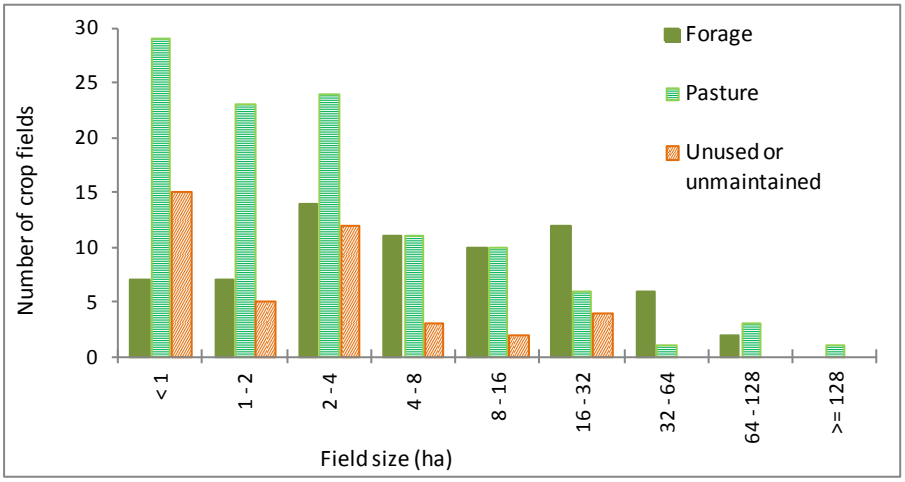


Figure 15 illustrates that there are more pasture than forage fields.

There are 108 pasture fields with an average crop area of 9 hectares, a median crop area of 2 hectares, and an average parcel size of 35 hectares.

In comparison, there are 69 forage fields with an average crop area of 13 hectares, a median crop area of 6 hectares, and an average parcel size of 52 hectares.

On average, forage fields have a larger cultivated area than pasture fields.

[9] Each distinct forage or pasture activity on one parcel is counted as one activity. Each activity will include at least one and perhaps more fields. A parcel may have more than one activity if there is more than one distinct type of forage or pasture activity on that parcel.

All Crop types

Table 13. All crop types by area

Cultivated field crop	ALR		Outside ALR (ha)	Total area (ha)	% of cultivated land
	In ALR (ha)	% of ALR			
Pasture (unmanaged)	763	6%	169	932	46%
Forage (unmanaged)	600	5%	105	705	35%
Forage (managed)	158	1%	< 1	158	8%
Unused forage/pasture	129	1%	25	154	8%
Pasture (managed)	17	< 1%	< 1	17	< 1%
Unmaintained forage/pasture	16	< 1%	< 1	16	< 1%
Grapes	9	< 1%	< 1	10	< 1%
Mixed vegetables	8	< 1%	< 1	8	< 1%
Tree fruits	2	< 1%	2	4	< 1%
Hops	-	-	2	2	< 1%
Tree fruits (Unmaintained)	-	-	1	1	< 1%
Grapes (Unmaintained)	-	-	< 1	< 1	< 1%
Root vegetables	< 1	< 1%	-	< 1	< 1%
Wheat	-	-	< 1	< 1	< 1%
TOTAL	**1,702**	**13%**	**307**	**2,009**	**100%**

Table 13 shows the 14 individual crops that account for 100% of the cultivated land in Electoral Area B and Lillooet.

Figure 16. All crop types by area

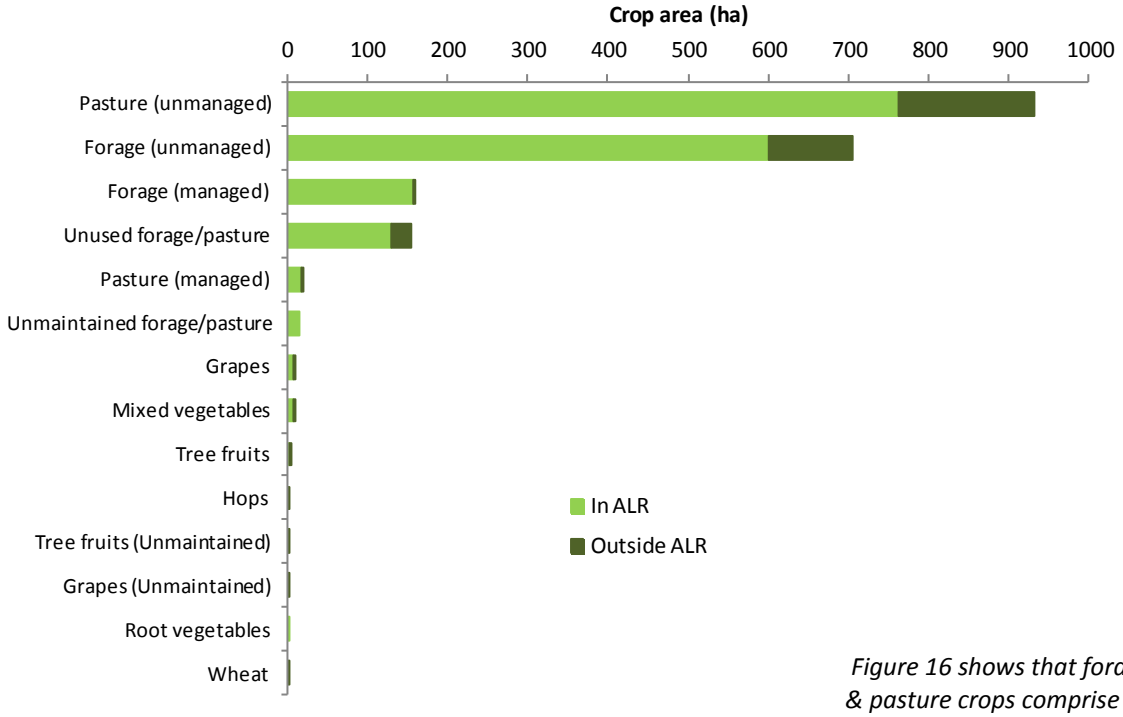


Figure 16 shows that forage & pasture crops comprise all significant crops.

NATURAL PASTURE & RANGELAND

Natural pastures and rangelands are fenced areas with uncultivated (not sown) natural or semi-natural grasses, herbs or shrubs used for grazing domestic livestock such as cattle, sheep or equines. Natural pastures are smaller fenced areas usually occurring on private land while rangeland refers to larger blocks of land (extensive areas from hundreds to thousands of acres in size) with perimeter fencing that may encompass many parcels or district lots. Rangelands tend to be on provincial Crown land.

Natural pastures are usually on land unsuited for cultivation due to poor soils (stoniness), seasonal flooding, or slope. In many cases, these areas are remote from the infrastructure necessary to facilitate agriculture improvements such as irrigation. Although some of these natural areas could be used for hay, most are grazed since the quality of hay is usually not worth the harvesting costs.

Most natural pastures and rangelands are influenced by humans to some degree. Fire may be used to control woody plants and remove over mature herbage. Introduction of livestock or equines has an effect on natural vegetation and can lead to changes in vegetation composition. Bush-clearing, fencing, drainage, application of fertilizers and trace elements are more intensive methods which influence natural vegetation as pasture. The introduction of grasses and legumes, without cultivation, is yet a further stage in influencing a natural area.

Natural pastures and rangelands are captured in a geographical information system at the field or land cover polygon level by the natural vegetation type that dominates the upper canopy (grassland, open treed, etc.). Each vegetation type is then summarized to total land area and evaluated for field size characteristics.

Table 14. Natural pasture and rangeland vegetation types by area

Rangeland and natural pasture		ALR		Outside ALR (ha)	Total area (ha)	% of suveyed area	% of rangelend & natural pasture
		In ALR (ha)	% of ALR				
Rangeland (natural)	Grassland	1,320	10%	18	1,338	9%	100%
Pasture (natural)	Treed - open	-	-	1	1	< 1%	< 1%
TOTAL		**1,320**	**10%**	**19**	**1,339**	**9%**	**100%**

Table 14 shows there are 1,338 hectares of rangeland while there was only 1 hectare of natural pasture.

Refer to Maps 3 & 4 for more information.

Figure 17. Natural pasture and rangeland areas by size

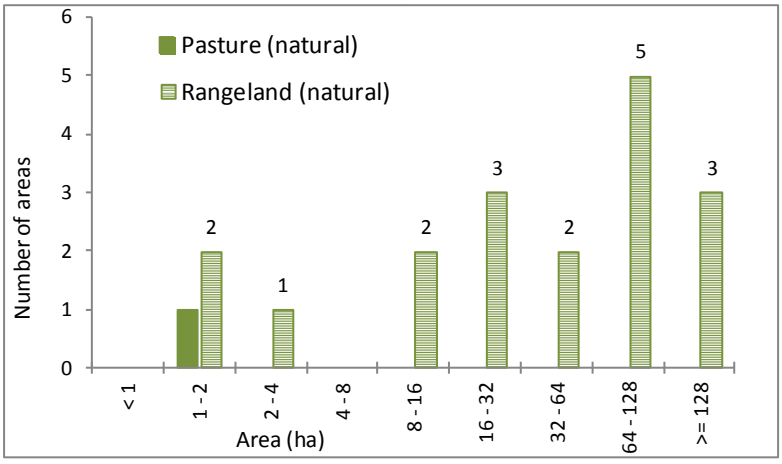


Figure 17 shows that rangeland areas are most likely to be greater than 8 hectares in size.

Rangelands occur on 18 parcels with an average parcel size of 74 hectares.

Rangelands typically utilize more than one parcel. Parcel size statistics do not accurately predict the size of rangeland areas.

GREENHOUSES & CROPS BARNS

Greenhouses are structures covered with translucent material and of sufficient size for a person to work inside[10]. They are permanent enclosed glass or polyethylene (poly) structures with or without climate control facilities for growing plants under controlled environments. Non permanent structures such as hoop covers are considered an agricultural practice and are not included here.

Crop barns are permanent structures with non-translucent walls that are used for growing crops such as mushrooms.

Table 15. Greenhouses by area[11]

Greenhouses		ALR		Outside ALR (ha)	Total area (ha)	% of greenhouse area
		In ALR (ha)	% of ALR			
Poly greenhouse	Vegetables	0.1	<0.1	-	0.1	60%
	Unknown	<0.1	<0.1	-	<0.1	40%
TOTAL		**0.2**	**<0.1**	**-**	**0.2**	**100%**

Table 15 shows that 0.2 hectares of ALR land is covered by poly greenhouses.

Only 2 greenhouses were recorded, 1 with vegetable crops and 1 with an unknown crop type. Both greenhouses are less than 1 hectare in size.

No glass greenhouses or crop barns were recorded.

[10] Source: *Guide for Bylaw Development in Farming Areas*, 2013. Ministry of Agriculture.

[11] The areas reported in this table exclude external yards, parking, warehouses and other infrastructure related to the greenhouse or crop barn operation. Poly refers to polyethylene.

IRRIGATION

Irrigation is the artificial application of water to the land or soil and may be used to assist in the growing of agricultural crops, maintenance of managed vegetation, and control of soil erosion or dust. The potential to irrigate is often limited by the quality and quantity of available irrigation water. High salinity or microbial contamination renders water unsuitable for irrigation. Insufficient water sources or water delivery infrastructure limits the potential to increase agricultural production through irrigation.

Irrigation is captured at the field or land cover level by system type (sub-surface, sprinkler, giant gun, trickle) and then summarized by crop type to the total land area under irrigation. Irrigated land includes all irrigated field crops and may also include irrigated fallow farmland, land set temporarily set aside for wildlife or other purposes, and land under preparation for planting. Also included are crops grown in greenhouses and crop barns. In addition, individual cultivated field crops are evaluated for percent of crop area under irrigation.

Irrigation on Indian reserves is reported separately from the inventory totals.

Table 16. Main crop types and irrigation

Cultivated field crop	Irrigation system in use (ha)					Total area irrigated (ha)	% of crop area irrigated
	Surface	Sprinkler	Centre pivot	Giant gun	Trickle		
Forage & pasture	394	680	165	24	-	1,263	64%
Grapes	-	-	-	-	10	10	96%
Vegetables	-	< 1	-	-	8	9	100%
Tree fruits	-	4	-	-	-	4	78%
Hops	-	-	-	-	2	2	100%
Wheat	-	-	-	-	-	-	-
TOTAL FIELD CROP AREA IRRIGATED	**394**	**685**	**165**	**24**	**20**	**1,288**	**64%**
Greenhouses	Flood and trickle irrigation					<1	100%

Table 16 illustrates that 64% of all cultivated field crops are irrigated. All vegetables, hops, and the majority of all grapes and tree fruits are irrigated. Fifty-nine percent (59%) of all forage & pasture crops are irrigate.

Trickle systems are used exclusively on non-forage and pasture crops (grapes, vegetables, and hops).

Refer to Map 1 for more information.

Figure 18. Irrigation systems by percentage of cultivated land

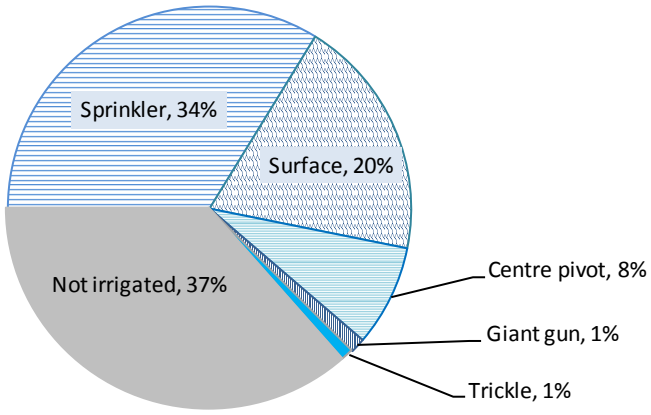


Figure 18 shows that 64% of the cultivated land in Electoral Area B and Lillooet is irrigated. Sprinkler irrigation is the most widely used system found on 34% of cultivated land followed by surface systems on 20% of cultivated land, and centre pivot systems on 8%.

Table 17. All crop types and irrigation

Cultivated field crop	Irrigation system in use (ha)					Total area irrigated (ha)	% crop area irrigated
	Surface	Sprinkler	Centre pivot	Giant gun	Trickle		
Pasture (unmanaged)	375	85	-	-	-	460	49%
Forage (unmanaged)	19	444	140	24	-	627	89%
Forage (managed)	-	133	25	-	-	158	100%
Unused forage/pasture	-	-	-	-	-	-	-
Pasture (managed)	-	17	-	-	-	17	100%
Unmaintained forage/pasture	-	-	-	-	-	-	-
Grapes	-	-	-	-	10	10	100%
Mixed vegetables	-	< 1	-	-	8	8	100%
Tree fruits	-	4	-	-	-	4	100%
Hops	-	-	-	-	2	2	100%
Tree fruits (Unmaintained)	-	-	-	-	-	-	-
Grapes (Unmaintained)	-	-	-	-	-	-	-
Root vegetables	-	< 1	-	-	-	< 1	100%
TOTAL	**394**	**685**	**165**	**24**	**20**	**1,288**	

Table 17 outlines the type of irrigation systems used on the 14 individual field crops in Electoral Area B and Lillooet.

Trickle systems are found only on grapes, mixed vegetables, and hops while surface, centre pivot, and giant gun systems are found exclusively on forage and pasture crops.

Table 18. Main crop types and irrigation on Indian reserves

Cultivated field crop	Irrigation system in use (ha)		Total area irrigated (ha)	% of crop area irrigated
	Sprinkler	Landscape / turf		
Forage & pasture	77	-	77	15%
Vegetables	4	< 1	4	95%
Tree fruits	1	-	1	100%
TOTAL FIELD CROP AREA IRRIGATED	**82**	**< 1**	**82**	**16%**

Table 18 shows that only 15% of all forage & pasture crops on Indian reserves are irrigated.

LIVESTOCK

Livestock activities are very difficult to measure using a windshield survey method. Livestock are often confined to structures making it difficult for the surveyor to see the animals. Local knowledge and other indicators such as animal confinement type (barn type), feeder system type, manure handling system type, and other visible elements may be used to infer the type of livestock and scale of activity that exist on a parcel. In addition, livestock are mobile and may utilize more than one land parcel. Livestock visible on a certain parcel one day may be visible on a different parcel the next day. This inventory does not attempt to identify animal movement between parcels that make up a farm unit but reports livestock at the parcel where the animals or related structures were observed.

Livestock activities on Indian reserves are reported separately from the inventory totals.

"**Main Type**" and "**Secondary Type**" of livestock are determined by comparing the scale of different livestock activities on the parcel. The "Main Type" of livestock does not represent the primary agricultural activity, but only the main type of livestock activity.

"**Intensive**" livestock activities utilize specialized structures such as barns, feedlots and stockyards designed for confined feeding at higher stocking densities.

"**Non Intensive**" livestock activities allow animals to graze on a pasture and often utilize non intensive barns and corrals/paddocks.

"**Unknown livestock**" refers to activities where non specialized livestock related structures were present but the livestock were not visible and therefore the specific type of livestock could not be determined.

"**Homesite**" refers to the location of the main ranch or main barn of a livestock operation or farm unit[12]. Often, other types of farm infrastructure, such as corrals, paddocks, barns, and feeding/watering facilities, as well as the farm residence, are also at this location. This is the primary location of the farm unit where most livestock management occurs.

"**Non Homesite**" refers to a location where livestock are present but related infrastructure is minimal. Often pasture fencing and watering are the only apparent infrastructure improvements. This location is often used only for pasturing livestock and is secondary to an operation's primary (or homesite) location.

The scale system used to describe livestock operations relies on animal unit equivalents which is a standard measure used to compare different livestock types. One animal unit equivalent is approximately equal to one adult cow or horse. The scale system includes 4 levels:

- "**Very Small**" Approximately 1 cow or horse or bison, 3 hogs, 5 goats or deer, 10 sheep, 50 turkeys, 100 chickens (1 animal unit equivalent)
- "**Small**" LESS THAN 25 cows or horses or bison, 75 hogs, 125 goats or deer, 250 sheep, 1250 turkeys, 2500 chickens (2 - 25 animal unit equivalents)
- "**Medium**" LESS THAN 100 cows or horses or bison, 300 hogs, 500 goats or deer, 1000 sheep, 5000 turkeys, 10,000 chickens (25 - 100 animal unit equivalents)
- "**Large**" MORE THAN 100 cows or horses or bison, 300 hogs, 500 goats or deer, 1000 sheep, 5000 turkeys, 10,000 chickens (over 100 animal unit equivalents).

[12] Farm unit includes all the property belonging to a farm and may incorporate more than one parcel.

Table 19. Livestock and equine activities

Livestock group	Livestock detail	By parcel		Total activities	By activity type	
		Main type	Secondary type		*Intensive*	*Non Intensive*
Beef	Beef total	7	1	8	-	*8*
Dairy	Dairy total	1	-	1	-	*1*
Poultry	Chicken	2	-	2	-	*2*
	Duck	1	-	1	-	*1*
	Poultry total	3	-	3	-	*3*
Sheep / lamb	Sheep / lamb total	1	-	1	-	*1*
Llama / alpaca	Llama / alpaca total	-	2	2	-	*2*
Equine	Horse	20	2	22	-	*22*
	Donkey, ass	1	-	1	-	*1*
	Mixed equine	-	1	1	-	*1*
	Equine total	21	3	24	-	*24*
TOTAL		**33**	**6**	**39**	**-**	**39**

Table 19 shows equine is the most common type of livestock activity accounting for 24 of 39 or 62% of all livestock activities. Beef is the second most common livestock type with 8 activities or 21%.

All livestock activities are "non-intensive".

Table 20. Equine activities

Scale of equine activity	By parcel		Total number of activities	By activity type		By location	
	Main Type	Secondary Type		*Intensive*	*Non intensive*	*Homesite*	*Non homesite*
Very small scale (1 horse)	9	2	11	-	*11*	*11*	-
Small scale (2-25 horses)	11	1	12	-	*12*	*10*	*2*
Small scale (2-25 horses) - Boarding	1	-	1	-	*1*	-	*1*
TOTAL	**21**	**3**	**24**	**-**	***24***	***21***	***3***

Table 20 details the 24 equine activities. Only 21 activities are located on "homesites", and all activities are "small" or "very small" scale.

Table 21. Beef activities

Scale of beef activity	By parcel		Total number of activities	By activity type		By location	
	Main type	Secondary type		*Intensive*	*Non Intensive*	*Homesite*	*Non homesite*
Very small scale (1 cow)	1	-	1	-	*1*	*1*	-
Small scale (2 -25 cattle)	1	1	2	-	*2*	*2*	-
Medium scale (25 -100 cattle)	2	-	2	-	*2*	*2*	-
Large scale (> 100 cattle)	3	-	3	-	*3*	*2*	*1*
TOTAL	**7**	**1**	**8**	**-**	***8***	***7***	***1***

Table 21 details the 8 beef activities. One activity is "very small" scale and is not a significant beef operation. Of the remaining 7 activities, only 6 are located on "homesites" which indicates these activities are associated with 6 beef operations.

Figure 19. Livestock and equine activities by scale and type

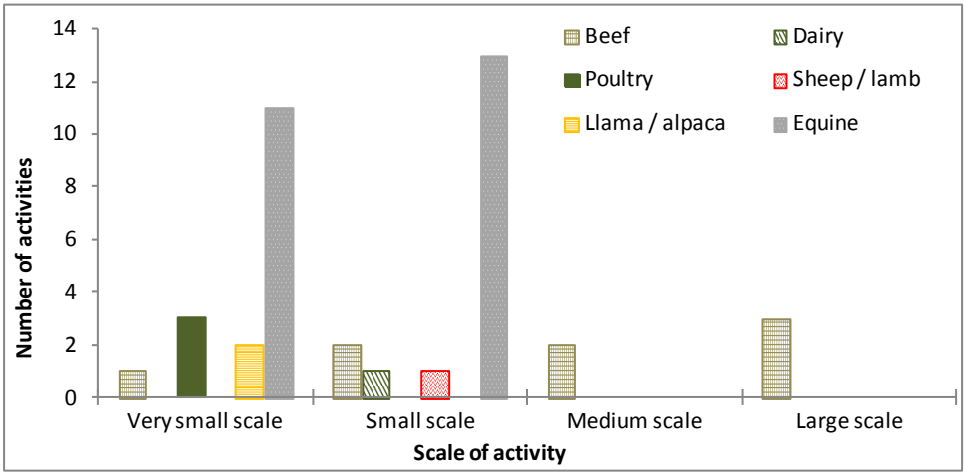


Figure 19 illustrates the scale of livestock activities (including equine).

Most livestock and equine activities are "small" or "very small" scale.

There are 2 "medium" scale activities, and 3 "large" scale activities, all of which are beef.

Figure 20. Livestock and equine activities by scale

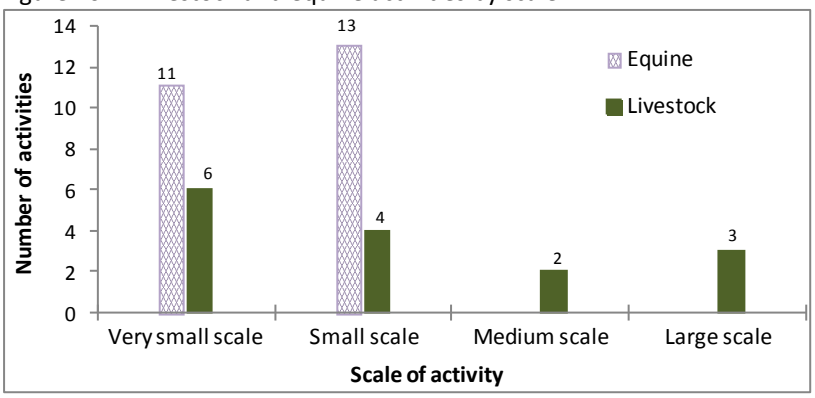


Figure 20 compares the scale of livestock and equine activities.

Even though 24 of the 39 livestock activities are equine, all are "small" or "very small" scale.

There are no "medium" or "large" scale equine activities, while there are 5 "medium" or "large" scale livestock activities.

Figure 21. Livestock and equine activities by parcel size and scale

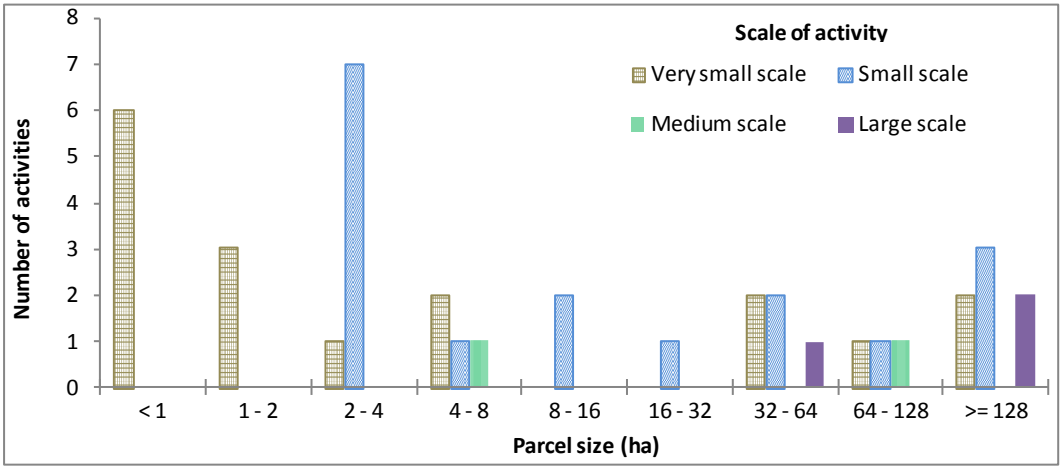


Figure 21 illustrates the distribution of livestock activities by scale across parcel size categories.

All "large" and most "medium" scale activities occur on larger parcels. "Very small" scale activities occur on across the spectrum of parcels sizes. Four out the five "very small" scale activities on parcels larger than 32 hectares are associated with equines.

"Small" scale livestock activities occur on all parcel size categories greater than 2 hectares.

Figure 22. Livestock and equine activities by parcel size and type

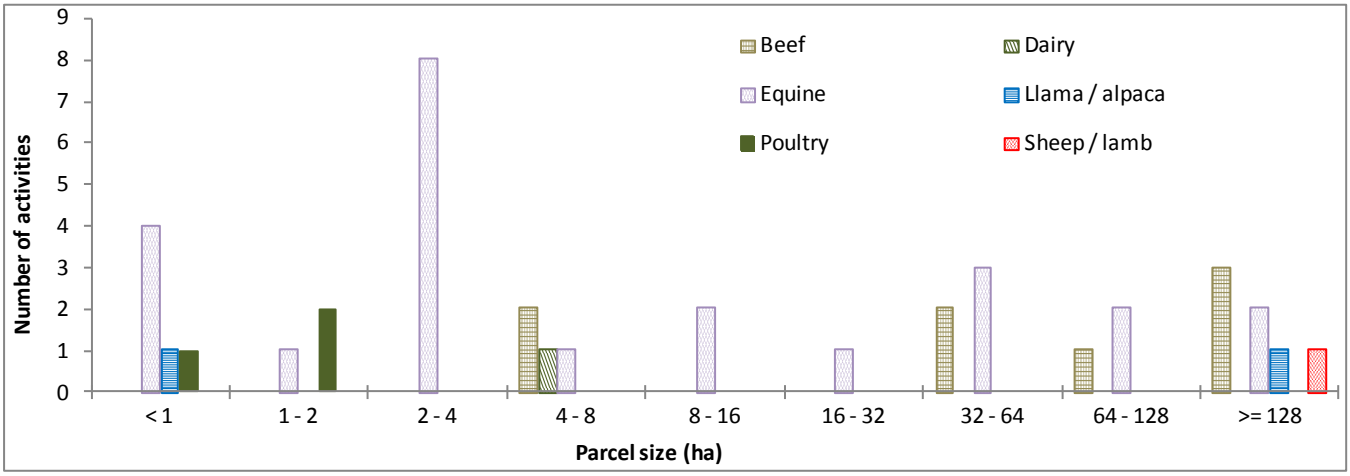


Figure 22 compares the distribution of different livestock types across parcel size categories.

Equine activities occurs across all parcels sizes including parcels <1 hectare and parcels >= 128 hectares. All equine and livestock activities occurring on parcels less than 2 hectares are "very small" scale.

There are 6 activities on parcels >= 128 hectares. Three are associated with Diamond S Ranch (one beef homesite activity, 1 beef non-homesite grazing activity, and 1 equine activity) and 3 are associated with Cwyn Mawr Ranch and Sheep Pasture Golf Course.

Figure 23. Livestock and equine activities by parcel size

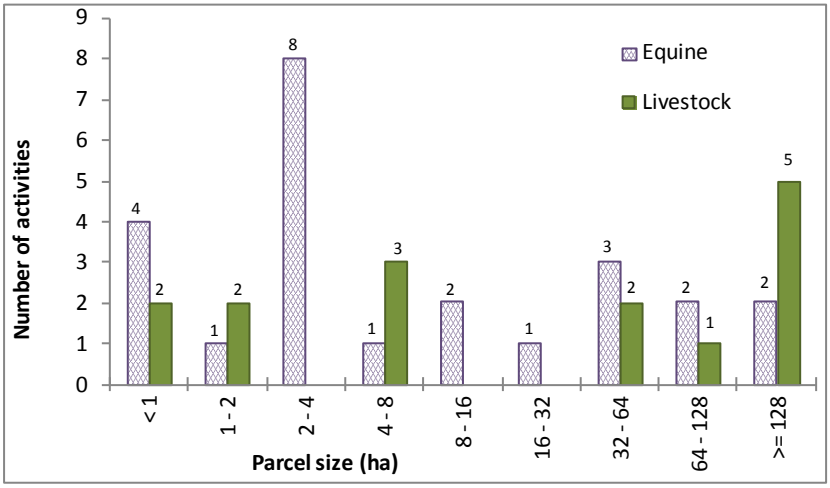


Figure 23 compares the distribution of equine and livestock activities across parcel size categories.

Both equine and livestock activities occur on parcels < 1 hectare and >=128 hectares.

Figure 24. Average area in forage, pasture, and farm infrastructure on parcels with livestock activities (excluding very small scale)

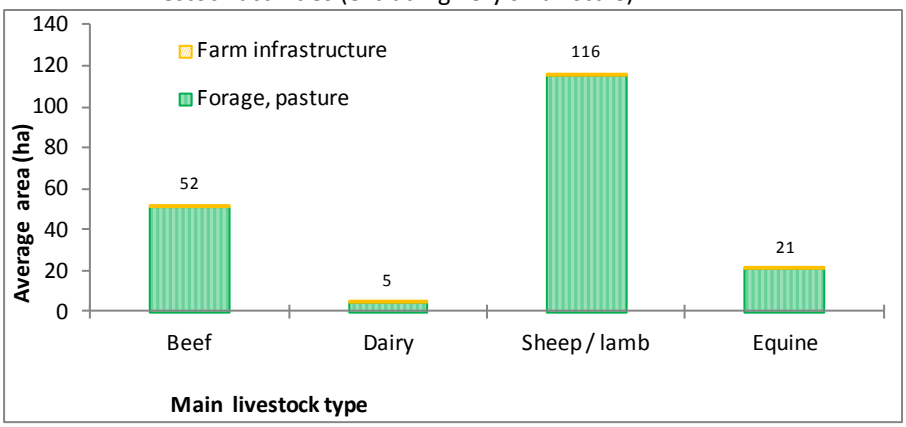


Figure 24 shows that on average, a beef activity is associated with 52 hectares of forage, pasture and farm infrastructure.

There is one sheep/lamb activity that is associated with 116 hectares of forage, pasture and farm infrastructure. This activity is on a parcels that also houses a "small" scale beef activity , a "very small" equine activity, and is associated with Cwyn Mawr Ranch and Sheep Pasture Golf Course.

Figure 25. Total area in forage, pasture, and farm infrastructure on parcels with livestock activities (excluding very small scale)

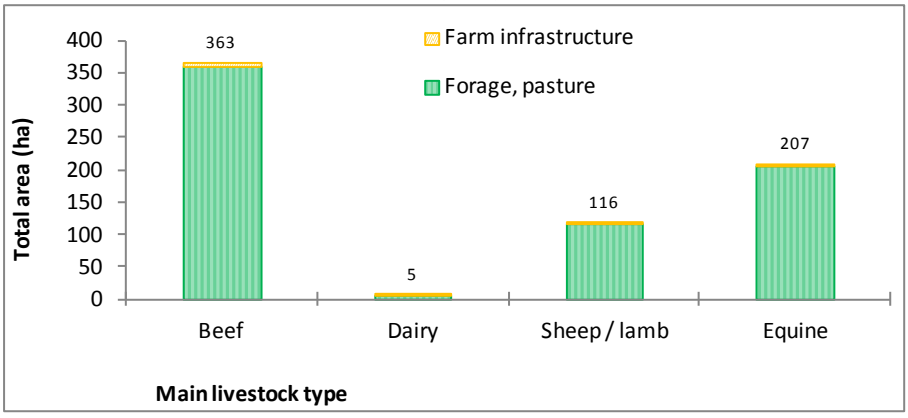


Figure 25 shows that beef activities use a greater total area for forage, pasture than any other livestock activity.

Figure 26. Percent of parcel area utilized for forage, pasture, and farm infrastructure on parcels with livestock activities (excluding very small scale)

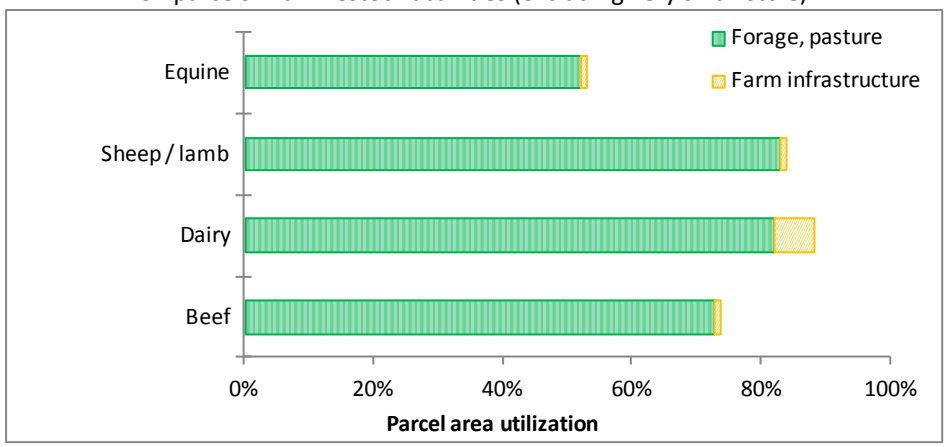


Figure 26 shows that on average, sheep/ lamb, dairy, and beef activities use between 72% and 88% of their parcel area for forage, pasture and farm infrastructure.

Equine activities on average, utilize only 53% of their parcel area.

Figure 27. Land cover on parcels with livestock activities (excluding very small scale)

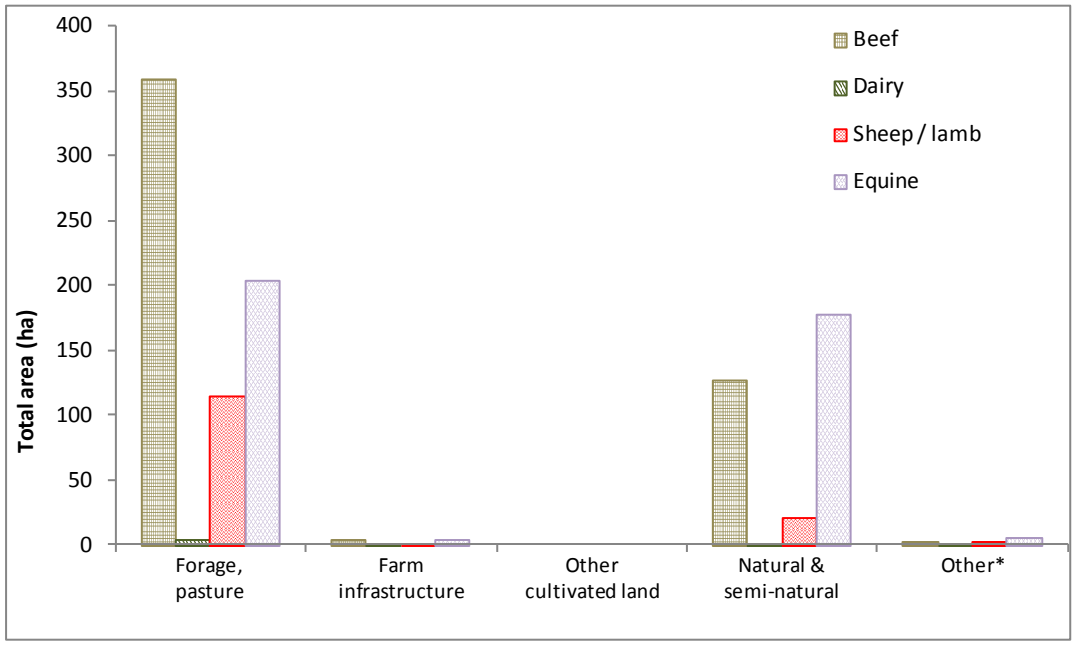


Figure 27 shows that beef, equine, and sheep / lamb activities have significant amounts of forage & pasture associated with them. These operations are growing some of their own feed.

* Other includes vegetated lands seeded or planted for landscaping, dust, or soil control but not cultivated for harvest or pasture, lands covered by built objects but not farm infrastructure, and bare areas such as piles, pits, fill dumps.

Table 22. Equine activities on Indian reserves

Scale of equine activity	By parcel		Total number of activities	*By activity type*		*By location*	
	Main Type	Secondary Type		*Intensive*	*Non intensive*	*Homesite*	*Non homesite*
Very small scale (1 horse)	2	-	2	-	*2*	*2*	-
Small scale (2-25 horses)	9	1	10	-	*10*	*10*	-
TOTAL	**11**	**1**	**12**	**-**	***12***	***12***	**-**

Table 22 details the 12 equine activities recorded on Indian reserves. All activities are "small" or "very small" scale. No other livestock activities were recorded on reserves.

ON-FARM VALUE-ADDED

Activities which add value to raw commodities produced on the farm are reported in this section. At least 50% of the commodity utilized must be produced on farm[13] or the activity is considered non-agricultural. In many cases, local knowledge in combination with the field survey is used to determine if an activity meets the criteria to be considered on-farm value-added. The three main categories of value-added are: processing, direct sales, and agri-tourism.

Processing is an activity that maintains or raises the quality or alters the physical or chemical characteristics of a raw farm commodity, or adds value to it in any way. Processing includes grain mill or oilseed crushing, meat processing, wine or cider, kitchen / bakery, and canning. This category does not include crop washing and packaging.

Direct sales to the public occur through permanent stores, temporary stores such as fruit stands, U-pick, or restaurant / take out service located on the farm. Direct farm marketing sites are considered ambassadors of agriculture. Direct farm marketing engages the public's interest in food production and increases awareness of the benefits of local agriculture.

Agri-tourism promotes visits to the operation for the purpose of recreation, education or active involvement in the operation - a tourism experience. Agri-tourism must be in a farm setting and secondary to primary agricultural operation to be considered value-added. Included are corn mazes, petting zoos, bed & breakfasts, campsites, winery or orchard tours, guest ranches offering equestrian related activities, horse or donkey rental for trail riding / outfitting, and seasonal events such as farm festivals or pumpkin patches.

The scale system used to describe value-added activities reflects the human effort need to support the activity. The scale system includes 3 levels:

- "**Small**" scale represents a predominantly single household endeavour with management requiring less than one full time worker. Examples of small scale include a temporary roadside fruit stand, a small field u-pick, or egg sales from a backyard flock.
- "**Medium**" scale is sufficient to add value to on-farm products for sale to small local markets or serve a moderate number of people. Usually includes designated parking for customers and requires at least one full-time worker to manage. An example is 3-10 tourist accommodation spots.
- "**Large**" scale is intended to add value to large amounts of on-farm generated products or serve large numbers of people. Requires multiple workers to operate value-added components of the farm operation. An example is more than 10 tourist accommodation spots.

Table 23. Value added activities

Scale of activity	Value added	Description	Number of activities	Average parcel size (ha)
Small scale	Direct sales	Permanent retail store	1	4
	Processing	Wine / cider processing	1	26
		TOTAL NUMBER OF ACTIVITIES	**2**	

Table 21 details the 2 "small" scale value added activities recorded in the Lillooet area.

The permanent retail store is associated with Golden Cariboo Honey. Although this parcel has a small scale apiary, it does not met the "Used for farming" criteria (refer to the definitions section).

The wine / cider processing is associated with Fort Berens Estate Winery.

[13] On-farm refers to the farm unit which includes all the property belonging to the farm and may incorporate more than one parcel.

5. Condition of ALR Lands

This section presents a parcel based analysis of parcel size and residential uses in the ALR.

PARCEL INCLUSION IN THE ALR

The inventory area included 8,393 hectares of ALR on 276 parcels which is 65% of the ALR within Electoral Area B and Lillooet. Another 1,310 hectares or 10% of ALR was inventoried on Indian reserves. ALR land on Indian reserves is not included in the following section as reserves function differently from municipalities in terms governance and decision making.

The remaining 25% of the ALR was excluded from the inventory as it is outside of legally surveyed parcels.

ALR boundaries do not always coincide with parcel boundaries which results in many parcels having only a portion of their area in the ALR. To achieve an accurate picture of the ALR land in the Electoral Area B and Lillooet only parcels that meet the following criteria are included in this section of the report:

- parcels > 0.05 hectares in size with at least half their area (>= 50%) in the ALR, or
- parcels with at least 10 hectares (>= 10 hectares) of ALR land.

In total, 210 parcels, with 8,235 hectares or 63.8% of the ALR land meets the above criteria and is included in the further analysis of the ALR. This includes 33 parcels that have less than 50% of their area in the ALR but each has greater than 12 hectares of ALR land. These 33 parcels have a combined ALR area of 899 hectares.

Figure 28. Parcel inclusion in the ALR

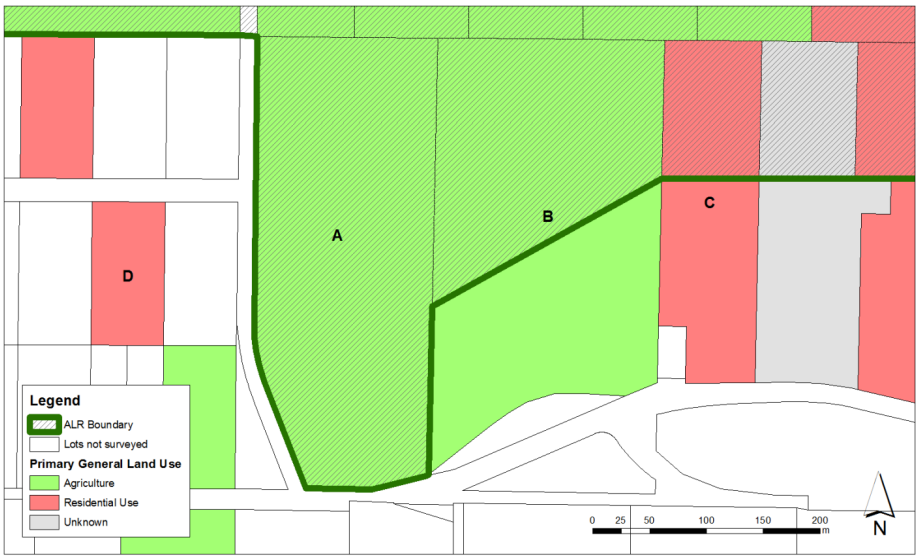


Figure 28 illustrates the distinction between parcels considered to be within or outside the ALR:

Considered to be within the ALR:

- *lot A is completely in the ALR*
- *lot B has 50% or more of its area in the ALR.*

Considered to be outside the ALR:

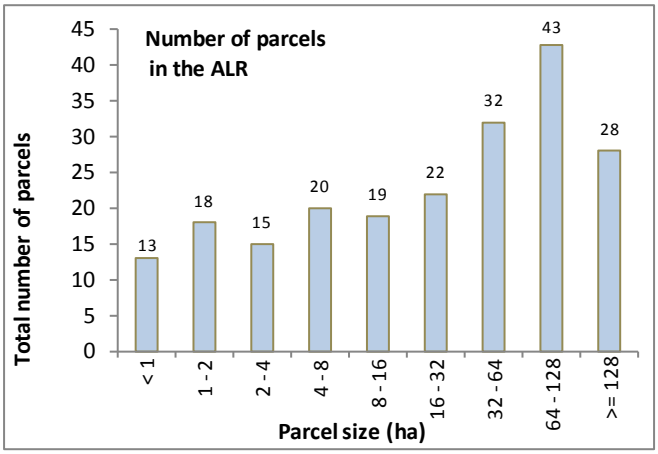
- *lot C has less than 50% of its area and less than 10 hectares in the ALR*
- *lot D is completely outside the ALR.*

PARCEL SIZE & FARMING IN THE ALR

Parcel size must be considered when determining the agricultural potential of a land parcel. Larger parcels usually allow farmers greater flexibility to expand or change their type of operation as the economy and markets change. Although some types of agriculture can be successful on small parcels, (e.g. intensive market gardens, greenhouse operations, nurseries), generally the smaller the parcel is, the fewer viable options there are for farming.

A farming operation may utilize more than one parcel as a farm unit[14], however it is generally more efficient to run a farm on fewer larger parcels than many smaller parcels. Larger parcels accommodate equipment more efficiently and reduce the need to move farm equipment on public roads. Smaller parcels are more impacted by bylaws designed to reduce potential land use conflicts, such as setbacks from lot lines and road allowances, and may encourage alternative land uses such as residential.

Figure 29. Number of parcels in the ALR by parcel size



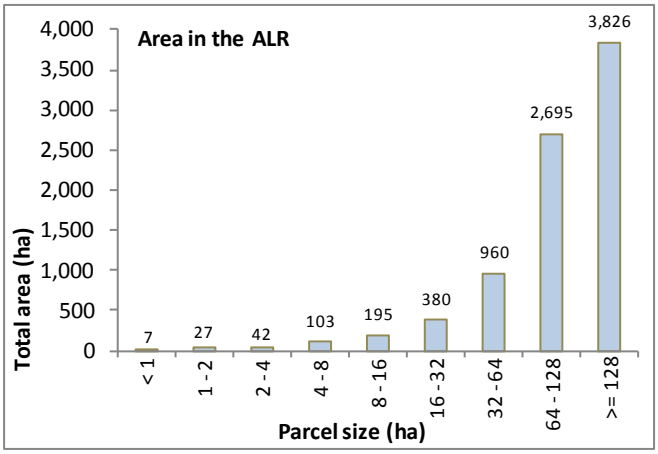
The average ALR parcel size in Electoral Area B and Lillooet is 53.6 hectares and the median parcel size is 30.0 hectares.

Figure 29 illustrates that of the 210 parcels in the ALR:

- *6% (13 parcels) are less than 1 hectare.*
- *22% (46 parcels) are less than 4 hectares.*
- *9% (20 parcels) are between 4 and 8 hectares.*
- *9% (19 parcels) are between 8 and 16 hectares.*
- *60% (125 parcels) are greater than 16 hectares.*

Refer to Map 5 for more information.

Figure 30. Total area in the ALR by parcel size



In Electoral Area B and Lillooet nearly all of the ALR area is in larger parcels.

Figure 30 illustrates that of the 8,235 hectares in the ALR:

- *<1% (7 hectares) is on parcels less than 1 hectare.*
- *1% (76 hectares) is on parcels less than 4 hectares.*
- *1% (103 hectares) is on parcels between 4 and 8 hectares.*
- *2% (195 hectares) is on parcels between 8 and 16 hectares.*
- *96% (7,861 hectares) is on parcels greater than 16 hectares.*

[14]Farm Unit – An area of land used for a farm operation consisting of one or more contiguous or non-contiguous parcels, that may be owned, rented or leased, which form and are managed as a single farm.

Table 24. Number of farmed and not farmed parcels in the ALR

Parcel status with respect to farming	Number of parcels	% of parcels in the ALR
Used for farming	58	28 %
Used for grazing	16	8 %
Not used for farming or grazing	136	65 %
TOTAL	**210**	**100 %**

Table 24 demonstrates that of the 210 parcels in the ALR, only 58 or 28% are "Used for farming".

Figure 31. Number of farmed and not farmed parcels in the ALR by parcel size

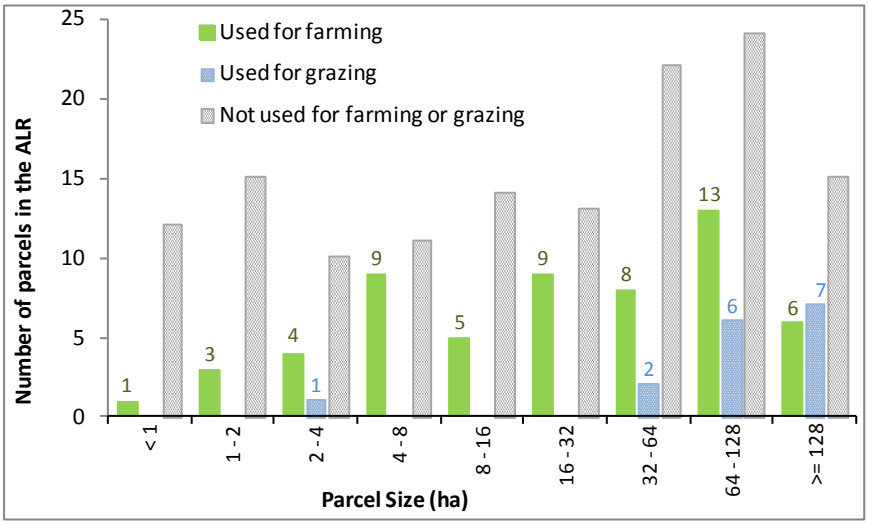


Figure 31 compares the distribution of "Used for farming" parcels with other parcels in the ALR.

The proportion of parcels that are "Used for farming" generally increases with parcel size.

Nearly all parcels that are "Used for grazing" are greater than 32 hectares.

Figure 32. Number of farmed and not farmed parcels in the ALR by parcel size (line chart)

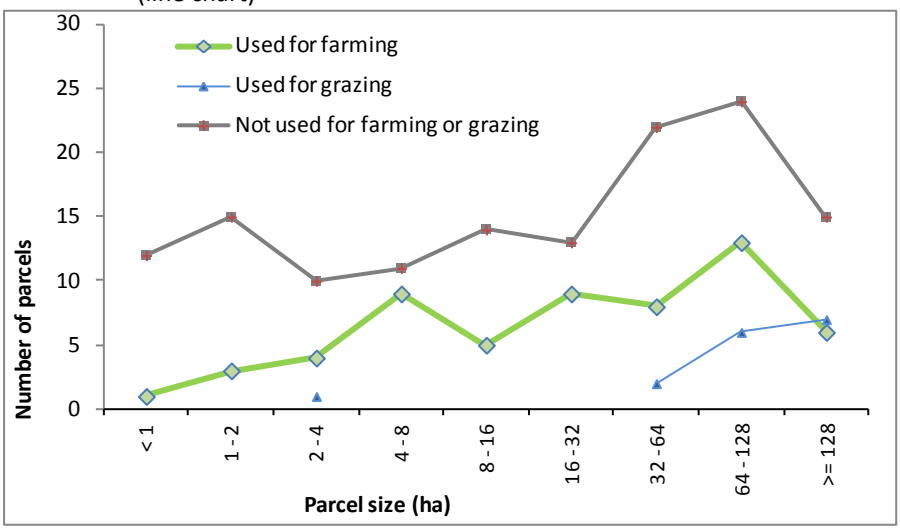


Figure 32 illustrates that although parcels of all sizes are "Used for farming", small parcels are less likely to be farmed.

Figure 33. Proportion of parcels farmed and not farmed by parcel size in the ALR

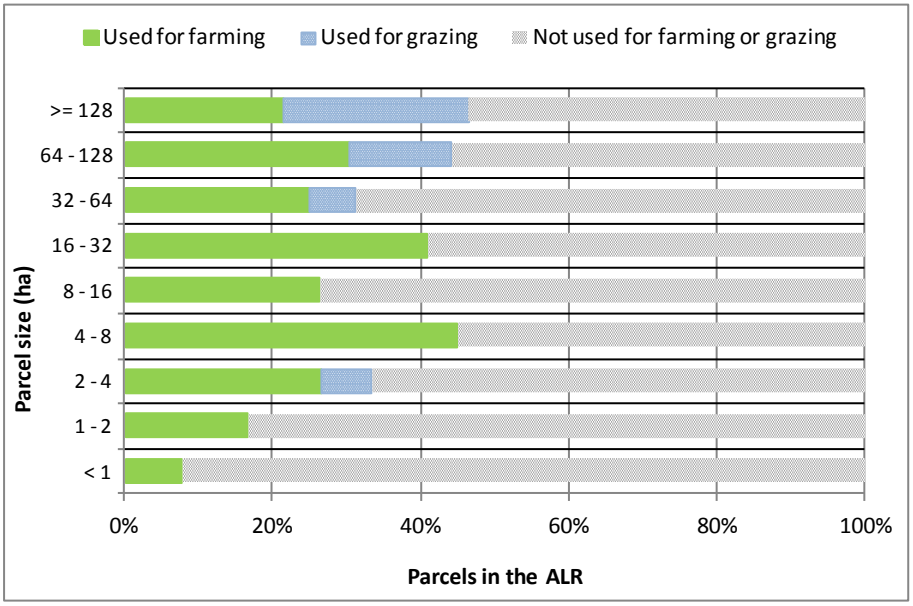


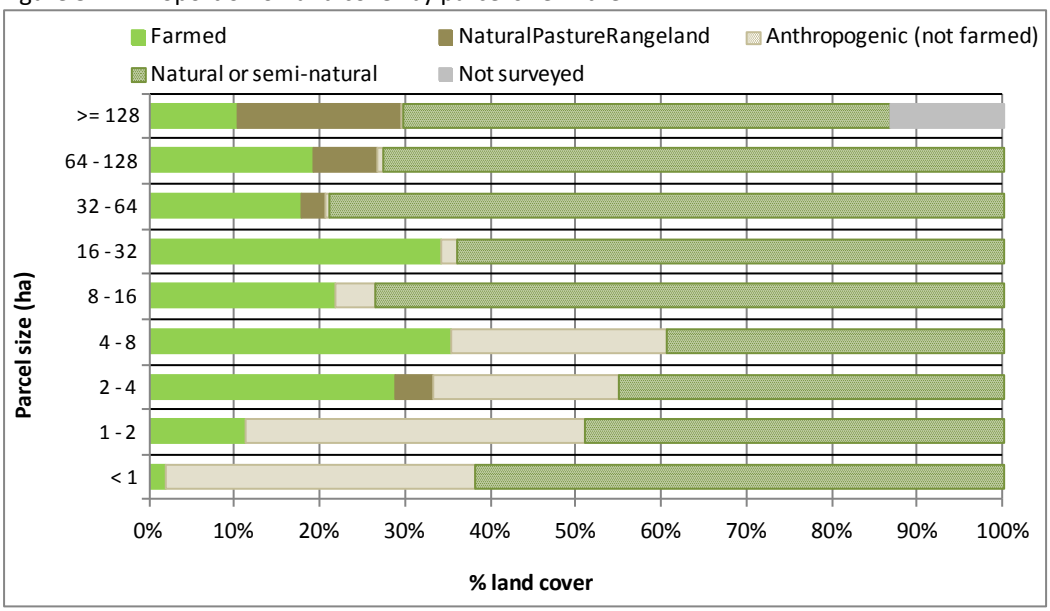
Figure 33 shows that the proportion of parcels "Used for farming" generally increases as the parcel size increases.

Only 8% of parcels less than 1 hectare are "Used for farming".

There are 6 parcels >= 128 hectares that are "Used for farming"; one is associated with Cwyn Mawr Ranch, and 5 are associated with Diamond S Ranch.

There are 7 parcels >=128 hectares that are "Used for grazing"; all are associated with Diamond S Ranch.

Figure 34. Proportion of land cover by parcel size in the ALR



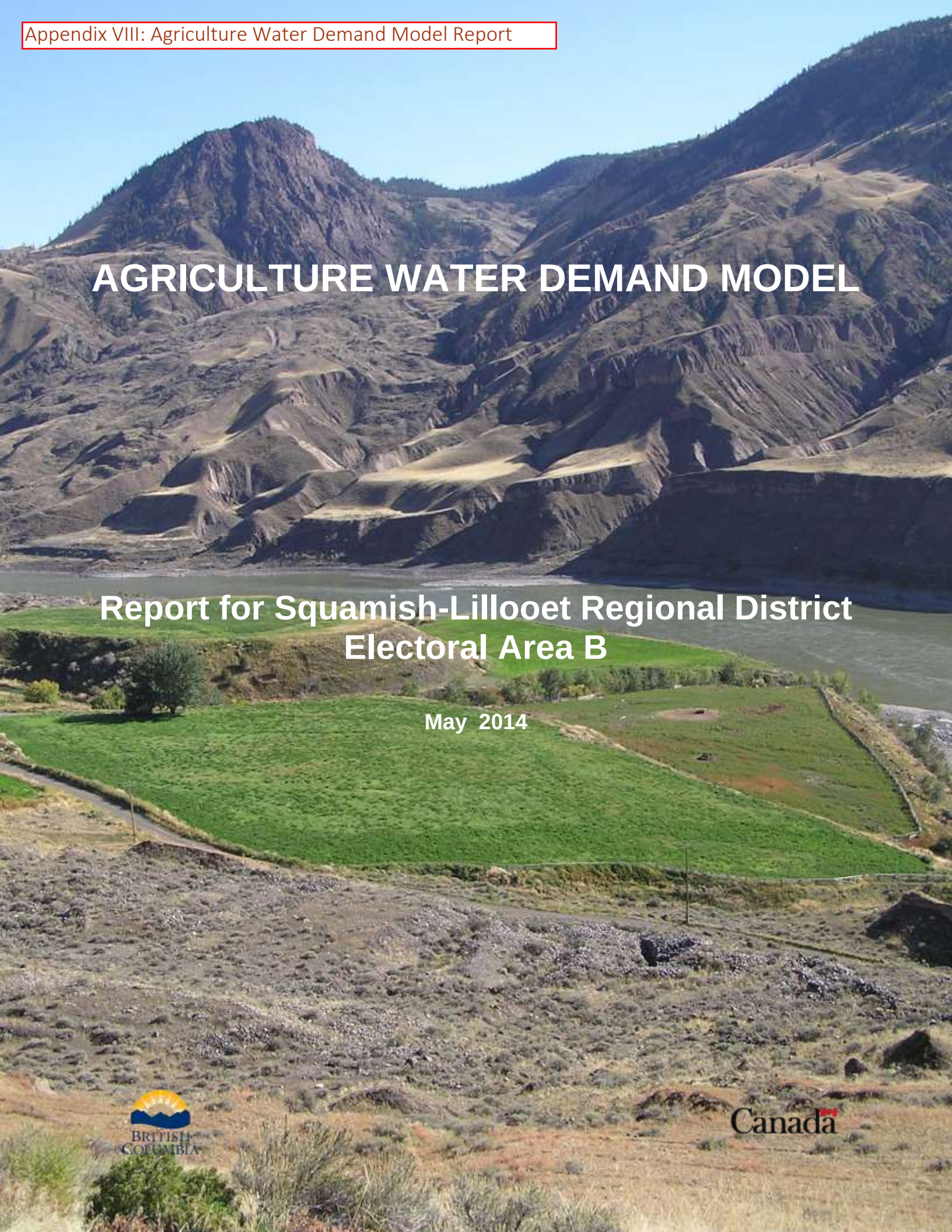
Similar to Figure 33 above, Figure 34 shows that the proportion of farmed land cover generally increases as the parcel size increases.

The largest proportions of "Anthropogenic" (not farmed) land cover occurs on parcels less than 2 hectares.

Appendix A - Maps

See the Squamish-Lillooet Regional District – Electoral Area B & Lillooet 2013 LUI Maps
http://www.al.gov.bc.ca/resmgmt/sf/gis/lui_reports/SLRD2013_ALUIMaps.pdf

Maps are 34 x 44 inches (ANSI E).



AGRICULTURE WATER DEMAND MODEL

Report for Squamish-Lillooet Regional District Electoral Area B

May 2014

BRITISH COLUMBIA

Canada

AGRICULTURE WATER DEMAND MODEL

Report for Squamish-Lillooet Regional District Electoral Area B

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Squamish - Lillooet REGIONAL DISTRICT

May 2014

DISCLAIMER

The data that is presented in this report provides the best estimates for agriculture water demand that can be generated at this time. While every effort has been made to ensure the accuracy and completeness of the information, the information should not be considered as final. The Government of Canada, the BC Ministry of Agriculture, or its directors, agents, employees, or contractors will not be liable for any claims, damages, or losses of any kind whatsoever arising out of the use of, or reliance upon, this information.

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Acknowledgements

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Michael Dykes	Ministry of Agriculture	Land Use Inventory

Background

The Agriculture Water Demand Model (AWDM) was developed in the Okanagan Watershed. It was developed in response to rapid population growth, drought conditions from climate change, and the overall increased demand for water. Many of the watersheds in British Columbia (BC) are fully allocated or will be in the next 15 to 20 years. The AWDM helps to understand current agricultural water use and helps to fulfil the Province's commitment under the "*Living Water Smart – BC Water Plan*" to reserve water for agricultural lands. The Model can be used to establish agricultural water reserves throughout the various watersheds in BC by providing current and future agricultural water use data.

Climate change scenarios developed by the University of British Columbia (UBC) and the Pacific Agri-Food Research Centre (PARC) in Summerland predict an increase in agricultural water demand due to warmer and longer summers and lower precipitation during summer months in the future.

The Agriculture Water Demand Model was developed to provide current and future agricultural water demands. The Model calculates water use on a property-by-property basis, and sums each property to obtain a total water demand for the entire basin or each sub-basin. Crop, irrigation system type, soil texture and climate data are used to calculate the water demand. Climate data from 2003 was used to present information on one of the hottest and driest years on record, and 1997 data was used to represent a wet year. Lands within the Agriculture Land Reserve (ALR), depicted in green in Figure 1, were included in the project.

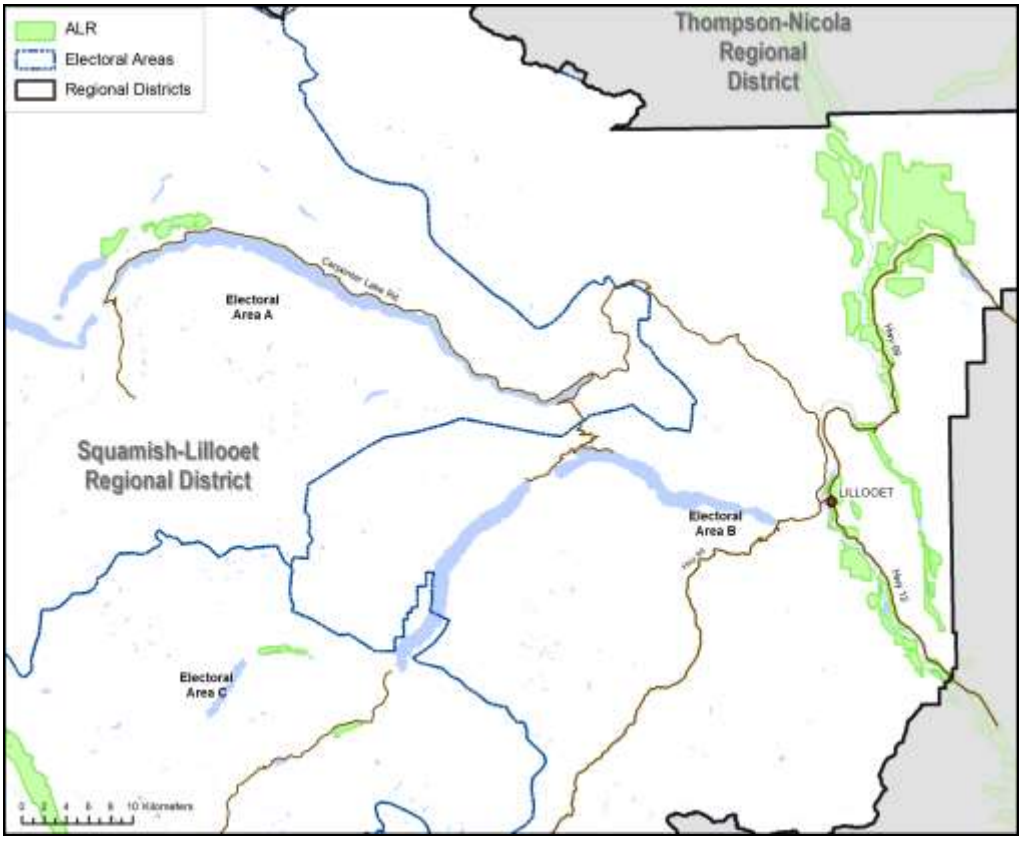

Figure 1 Map of ALR in the SLRD Electoral Area B

Methodology

The Model is based on a Geographic Information System (GIS) database that contains information on cropping, irrigation system type, soil texture and climate. An explanation of how the information was compiled for each is given below. The survey area included all properties within the ALR and areas that were zoned for agriculture by the local governments. The inventory was undertaken by Ministry of Agriculture (AGRI) staff, hired professional contractors and summer students. Figure 2 provides a schematic of the map sheets that were generated to conduct the survey. The yellow squares are the mapsheets, and the numbers in the squares are the reference for the BC Grid System in the Province.

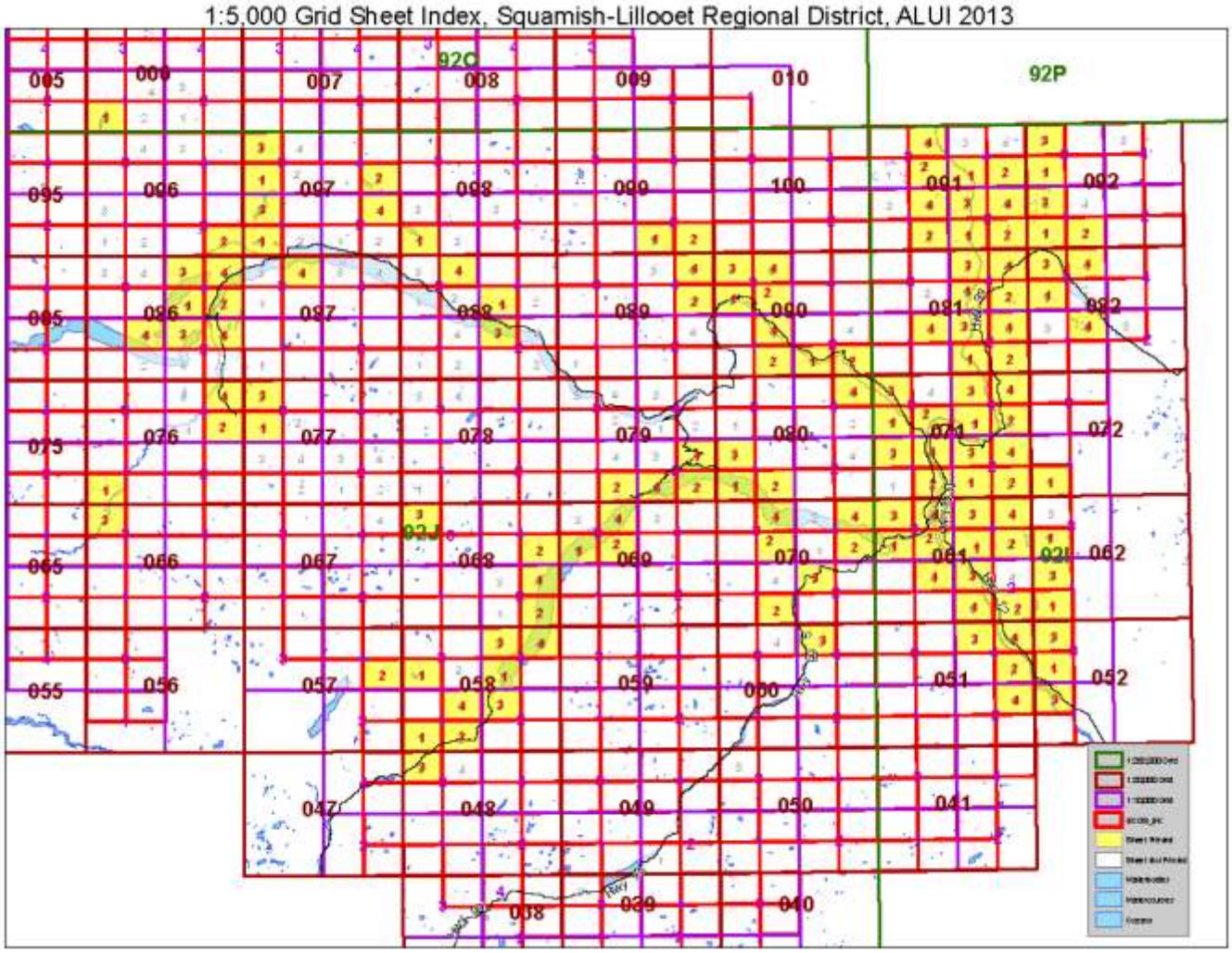

Figure 2 Map of SLRD Electoral Area B Overlaid with Map Sheets

Cadastre

Cadastre information was provided by GeoBC. The entire Regional District is covered in one dataset which allows the Model to calculate water demand for each parcel and to report out on sub-basins, local governments, water purveyors or groundwater aquifers by summing the data for those areas. The Squamish-Lillooet Regional District has requested to have the report focus on only Electoral B where all the agricultural lands currently are. A GIS technician used aerial photographs to conduct an initial

review of cropping information by cadastre, and divided the cadastre into polygons that separate farmstead and driveways from cropping areas. Different crops were also separated into different polygons if the difference could be identified on the aerial photographs. This data was entered into a database that was used by the field teams to conduct and complete the land use survey.

Land Use Survey

The survey maps and database were created by AGRI for the survey crew to enter data about each property. Surveys were done during the summer of 2013. The survey crew drove by each property where the team checked the database for accuracy using visual observation and the aerial photographs on the survey maps. A Professional Agrologist verified what was on the site, and a GIS technician altered the codes in the database as necessary (Figure 3). Corrections were handwritten on the maps. The maps were then brought back to the office to have the hand-drawn lines digitized into the GIS system and have the additional polygons entered into the database. Once acquired through the survey, the land use data was brought into the GIS to facilitate analysis and produce maps.

Figure 3 Land Use Survey

Figure 4 provides an example of a map sheet. Electoral Area B was divided into 229 map sheets. Each map sheet also had a key map to indicate where it was located in the region.

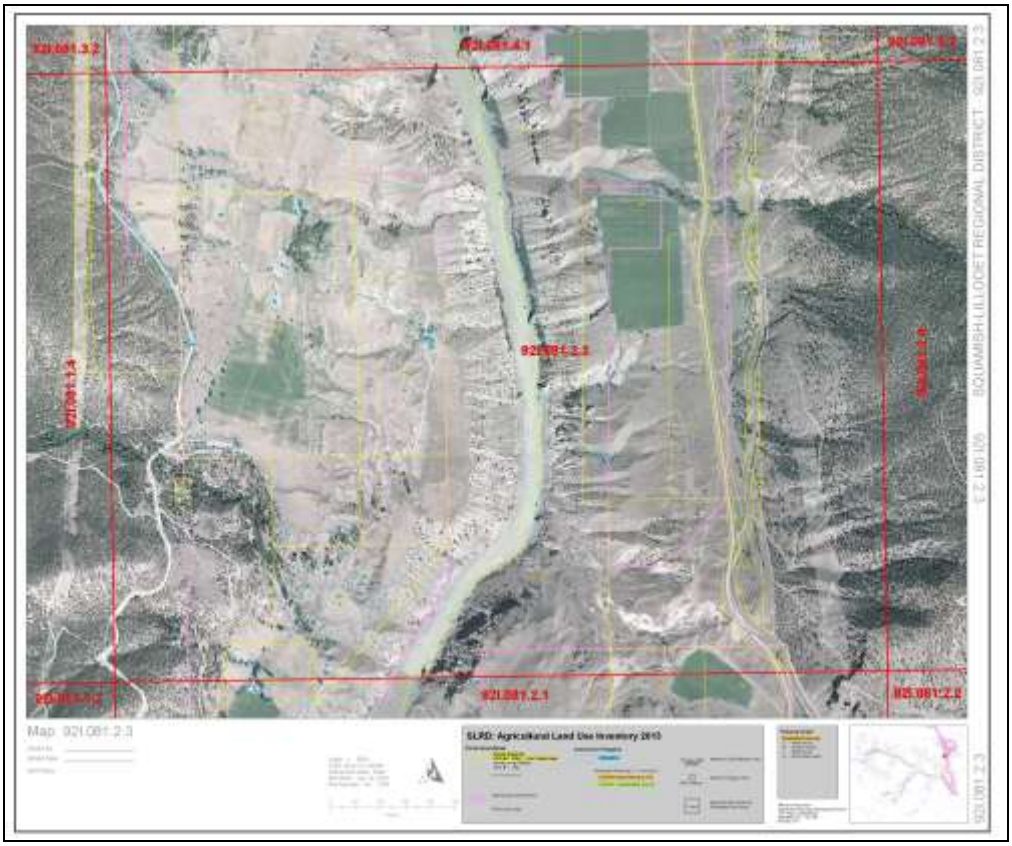

Figure 4 GIS Map Sheet

The smallest unit for which water use is calculated are the polygons within each cadastre. A polygon is determined by a change in land use or irrigation system within a cadastre. Polygons are designated as blue lines within each cadastre as shown in Figures 4 and 5. Electoral Area B encompasses 576 inventoried land parcels that are in or partially in the ALR. There are a total of 3,010 polygons (land covers) generated for Electoral Area B for this project. Figure 5 provides an enhanced view of a cadastre containing multiple polygons. Each cadastre has a unique identifier as does each polygon. The polygon identifier is acknowledged by PolygonID. This allows the survey team to call up the cadastre in the database, review the number of polygons within the cadastre and ensure the land use is coded accurately for each polygon.

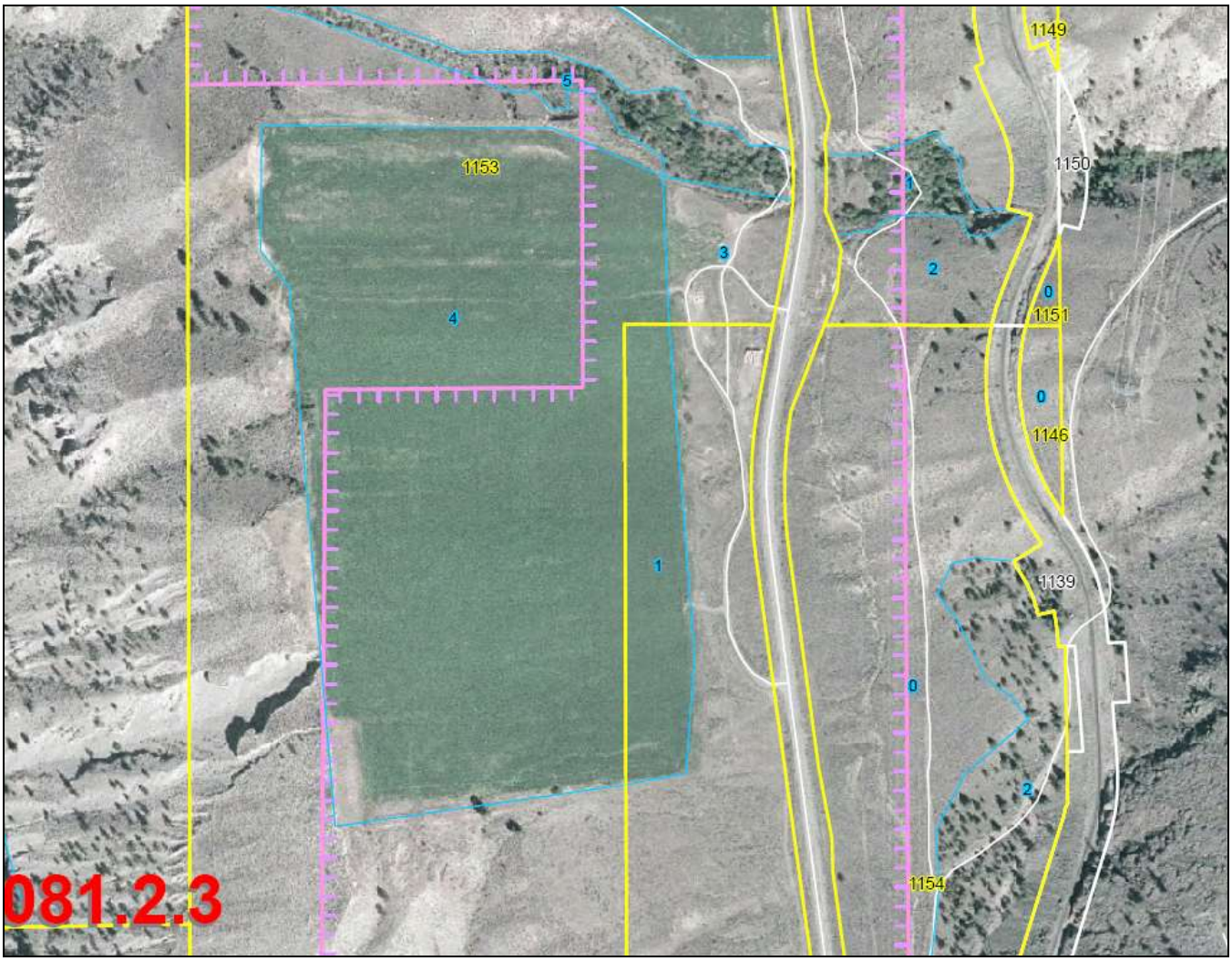

Figure 5 Cadastre with Polygons

Soil Information

Soil information is still a to-do item by the Ministry of Environment's Terrain and Soils Information System to digitize into the Model. It should be ready by the end of August. In the meantime, soil has been defaulted to sandy loam. The Computer Assisted Planning and Map Production application (CAPAMP) provided detailed (1:20,000 scale) soil surveys that were conducted in the Lower Mainland, on Southeast Vancouver Island, and in the Okanagan-Similkameen areas during the early 1980s. Products developed include soil survey reports, maps, agriculture capability and other related themes. Soil information required for this project was the soil texture (loam, etc.), the available water storage capacity and the peak infiltration rate for each texture type.

The intersection of soil boundaries with the cadastre and land use polygons creates additional polygons that the Model uses to calculate water demand. Figure 6 shows how the land use information is divided into additional polygons using the soil boundaries. The Model calculates water demand using every different combination of crop, soil and irrigation system as identified by each polygon.

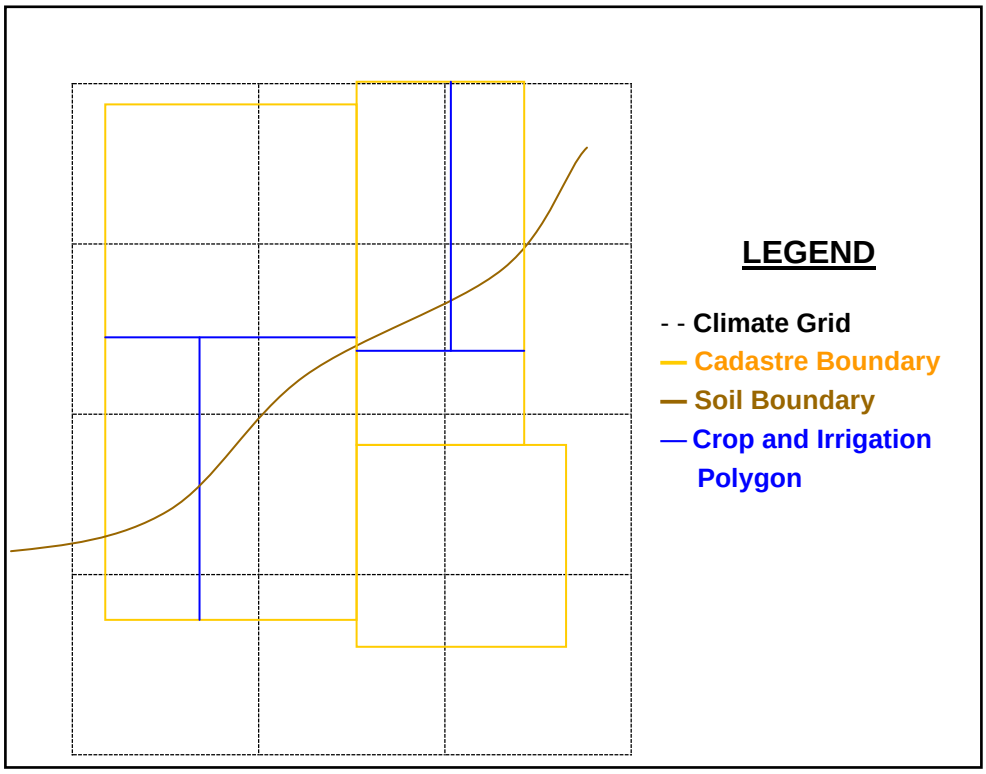

Figure 6 GIS Model Graphics

The next section will discuss about climate information where the climate grid does not develop additional polygons. Each polygon has the climate grid cell which is prominent for that polygon assigned to it.

Climate Information

The agricultural water demand is calculated using climate, crop, irrigation system and soil information data. The climate in the interior region is quite diverse. The climate generally gets cooler and wetter from south to north and as elevation increases. To incorporate the climatic diversity, climate layers were developed for the entire region on a 500 m x 500 m grid. Each grid cell contains daily climate data, minimum and maximum temperature (T_{min} and T_{max}), and precipitation which allows the Model to calculate a daily reference evapotranspiration rate (ET_o) value. A range of agro-climatic indices such as growing degree days (GDD), corn heat units (CHU), frost free days and temperature sum (Tsum) can also be calculated for each grid cell based on temperature data. These values are used to determine seeding dates and the length of the growing season in the Model.

The climate dataset is generated by using existing data from climate stations in and around Electoral Area B Basin from 1961 to 2006, and other station data close to the region. This climate dataset was then downscaled to provide a climate data layer for the entire watershed on the 500 m x 500 m grid.

Existing climate stations that were used to determine the climate coverage are shown in Figure 7. The attributes attached to each climate grid cell include:

- Latitude
- Longitude
- Elevation
- Aspect
- Slope
- Daily Precipitation
- Daily T_{min} and T_{max}

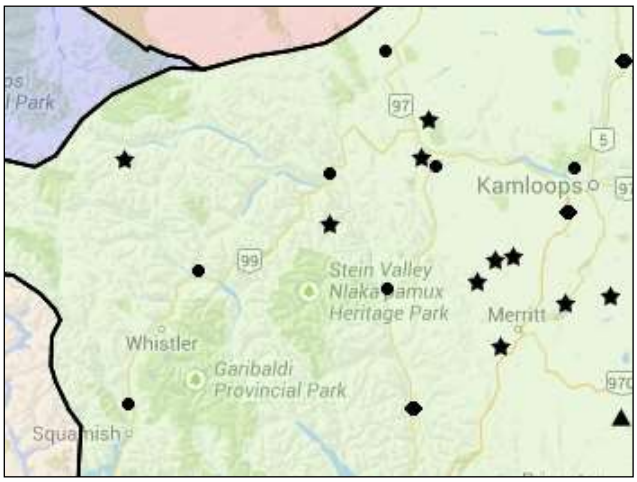

Figure 7 SLRD Area Climate Stations

A climate database generated contains T_{min}, T_{max}, T_{mean} and Precipitation for each day of the year from 1961 until 2006. The parameters that need to be selected, calculated and stored within the Model are evapotranspiration (ET_o), Tsum of 600 (for Electoral Area B), effective precipitation (EP), frost free days, GDD with base temperatures of 5 ^oC and 10 ^oC, CHU, and first frost date. These climate and crop parameters are used to determine the growing season length as well as the beginning and end of the growing season in Julian day.

Model Calculations

The model calculates the water demand for each polygon by using crop, irrigation, soil and climate parameters as explained below. Each polygon has been assigned an ID number as mentioned previously.

Crop

The CropID is an attribute of the PolygonID as each polygon will contain a single crop. The crop information (observed during the land use survey) has been collected and stored with PolygonID as part of the land use survey. CropID will provide cropping attributes to the Model for calculating water use for each polygon. CropID along with the climate data will also be used to calculate the growing season length and the beginning and end of the growing season. The attributes for CropID include rooting depth, availability coefficient, crop coefficient and a drip factor.

Rooting depth is the rooting depth for a mature crop in a deep soil.

An availability coefficient is assigned to each crop. The availability coefficient is used with the IrrigID to determine the soil moisture available to the crop for each PolygonID.

The crop coefficient adjusts the calculated ET_o for the stages of crop growth during the growing season. Crop coefficient curves have been developed for every crop. The crop coefficient curve allows the Model to calculate water demand with an adjusted daily ET_o value throughout the growing season.

The drip factor is used in the water use calculation for polygons where drip irrigation systems are used. Since the Model calculates water use by area, the drip factor adjusts the percentage of area irrigated by the drip system for that crop.

Irrigation

The IrrigID is an attribute of the PolygonID as each polygon will have a single irrigation system type operating. The irrigation information has been collected and stored (as observed during the land use survey) with the land use data. The land use survey determined if a polygon had an irrigation system operating, what the system type was, and if the system was being used. The IrrigID has an irrigation efficiency listed as an attribute.

Two of the IrrigID, Overtreedrip and Overtreemicro are polygons that have two systems in place. Two irrigation ID's occur when an overhead irrigation system has been retained to provide crop cooling or frost protection. In this case, the efficiencies used in the Model are the drip and microsprinkler efficiencies.

Soil

Since soil information was not available, soil has been defaulted to sandy loam. Typically, the soil layer would come from CAPAMP at the Ministry of Environment to generate multiple soil layers within each polygon. Each parcel was assigned the most predominant soil polygon, and then for each crop field

within that soil polygon, the most predominant texture within the crop's rooting depth was determined and assigned to the crop field.

Note that textures could repeat at different depths – the combined total of the thicknesses determined the most predominant texture. For example, a layer of 20 cm sand, followed by 40 cm clay and then 30 cm of sand would have sand be designated at the predominant soil texture.

The attributes attached to the SoilID is the Available Water Storage Capacity (AWSC) which is calculated using the soil texture and crop rooting depth.

The Maximum Soil Water Deficit (MSWD) is calculated to determine the parameters for the algorithm that is used to determine the Irrigation Requirement (IR). The Soil Moisture Deficit at the beginning of the season is calculated using the same terms as the MSWD.

Climate

The climate data in the Model is used to calculate a daily reference evapotranspiration rate (ET_o) for each climate grid cell. The data that is required to calculate this value are:

- Elevation, metres (m)
- Latitude, degrees (^{o})
- Minimum Temperature, degree Celsius (^{o}C)
- Maximum Temperature, degree Celsius (^{o}C)
- Classification as Coastal or Interior
- Classification as Arid or Humid
- Julian Day

Data that is assumed or are constants in this calculation are:

• Wind speed	2 m/s
• Albedo or canopy reflection coefficient,	0.23
• Solar constant, G_{sc}	0.082 $MJ^{-2}min^{-1}$
• Interior and Coastal coefficients, K_{Rs}	0.16 for interior locations 0.19 for coastal locations
• Humid and arid region coefficients, K_o	0 °C for humid/sub-humid climates 2 °C for arid/semi-arid climates

Agricultural Water Demand Equation

The Model calculates the Agriculture Water Demand (AWD) for each polygon, as a unique crop, irrigation system, soil and climate data is recorded on a polygon basis. The polygons are then summed to determine the AWD for each cadastre. The cadastre water demand values are then summed to determine AWD for the basin, sub-basin, water purveyor, electoral area or local government. The following steps provide the process used by the Model to calculate AWD. The entire process is outlined although not all of the steps may be used for Electoral Area B, e.g., flood harvesting.

1. Pre-Season Soil Moisture Content

Prior to the start of each crop's growing season, the soil's stored moisture content is modelled using the soil and crop evaporation and transpiration characteristics and the daily precipitation values. Precipitation increases the soil moisture content and evaporation (modelled using the reference potential evapotranspiration) depletes it. In general, during the pre-season, the soil moisture depth cannot be reduced beyond the maximum evaporation depth; grass crops in wet climates, however, can also remove moisture through crop transpiration.

The process used to model the pre-season soil moisture content is:

1. Determine whether the modelling area is considered to be in a *wet* or *dry* climate (see *Wet/Dry Climate Assessment*), and retrieve the early season evaporation factor in the modelling area
2. For each crop type, determine the start of the growing season (see *Growing Season Boundaries*)
3. For each crop and soil combination, determine the *maximum soil water deficit* (MSWD) and *maximum evaporation factor* (maxEvaporation)
4. Start the initial storedMoisture depth on January 1 at the MSWD level
5. For each day between the beginning of the calendar year and the crop's growing season start, calculate a new storedMoisture from:

    a. the potential evapotranspiration (ET_o)
    b. the early season evaporation factor (earlyEvaporationFactor)
    c. the effective precipitation (EP) = actual precipitation x earlyEvaporationFactor
    d. daily Climate Moisture Deficit (CMD) = ET_o – EP
    e. storedMoisture = previous day's storedMoisture – CMD

A negative daily CMD (precipitation in excess of the day's potential evapotranspiration) adds to the stored moisture level while a positive climate moisture deficit reduces the amount in the stored moisture reservoir. The stored moisture cannot exceed the maximum soil moisture deficit; any precipitation that would take the stored moisture level above the MSWD gets ignored.

For all crops and conditions except for grass in wet climates, the stored moisture content cannot drop below the maximum soil water deficit minus the maximum evaporation depth; without any crop transpiration in play, only a certain amount of water can be removed from the soil through evaporative processes alone. Grass in wet climates does grow and remove moisture from the soil prior to the start of the irrigation season however. In those cases, the stored moisture level can drop beyond the maximum evaporation depth, theoretically to 0.

Greenhouses and mushroom barns have no stored soil moisture content.

2. In-Season Precipitation

During the growing season, the amount of precipitation considered effective (EP) depends on the overall wetness of the modelling area's climate (see *Wet/Dry Climate Assessment*). In dry climates, the first 5 mm of precipitation is ignored, and the EP is calculated as 75% of the remainder:

$$EP = (Precip - 5) \times 0.75$$

In wet climates, the first 5 mm is included in the EP. The EP is 75% of the actual precipitation:

$$EP = Precip \times 0.75$$

Greenhouses and mushroom barns automatically have an EP value of 0.

3. Crop Cover Coefficient (K_c)

As the crops grow, the amount of water they lose due to transpiration changes. Each crop has a pair of polynomial equations that provide the crop coefficient for any day during the crop's growing season. It was found that two curves, one for modelling time periods up to the present and one for extending the modelling into the future, provided a better sequence of crop coefficients than using a single curve for all years (currently 1961 to 2100). The application automatically selects the current or future curve as modelling moves across the c*rop Curve Changeover Year*.

For alfalfa crops, there are different sets of equations corresponding to different cuttings throughout the growing season.

4. Crop Evapotranspiration (ET_c)

The evapotranspiration for each crop is calculated as the general ET_o multiplied by the crop coefficient (K_c):

$$ET_c = ET_o \times K_c$$

5. Climate Moisture Deficit (CMD)

During the growing season, the daily Climate Moisture Deficit (CMD) is calculated as the crop evapotranspiration (ET_c) less the Effective Precipitation (EP):

$$CMD = ET_c - EP$$

During each crop's growing season, a stored moisture reservoir methodology is used that is similar to the soil moisture content calculation in the pre-season. On a daily basis, the stored moisture level is used towards satisfying the climate moisture deficit to produce an *adjusted Climate Moisture Deficit* (CMD_a):

$$CMD_a = CMD - storedMoisture$$

If the storedMoisture level exceeds the day's CMD, then the CMD_a is 0 and the stored moisture level is reduced by the CMD amount. If the CMD is greater than the stored moisture, then all of the stored moisture is used (storedMoisture is set to 0) and the adjusted CMD creates an irrigation requirement.

The upper limit for the storedMoisture level during the growing season is the maximum soil water deficit (MSWD) setting.

6. Crop Water Requirement (CWR)

The Crop Water Requirement is calculated as the adjusted Climate Moisture Deficit (CMD_a) multiplied by the soil water factor (swFactor) and any stress factor (used primarily for grass crops):

$$CWR = CMD_a \times swFactor \times stressFactor$$

7. Irrigation Requirement (IR)

The Irrigation Requirement is the Crop Water Requirement (CWR) after taking into account the irrigation efficiency (I_e) and, for drip systems, the drip factor (D_f):

$$IR = CWR \times \frac{D_f}{I_e}$$

For irrigation systems other than drip, the drip factor is 1.

8. The Irrigation Water Demand (IWD_{perc} and IWD)

The portion of the Irrigation Water Demand lost to deep percolation is the Irrigation Requirement (IR) multiplied by the percolation factor (soilPercFactor):

$$IWD_{perc} = IR \times soilPercFactor$$

The final Irrigation Water Demand (IWD) is then the Irrigation Requirement (IR) plus the loss to percolation (IWD_{perc}):

$$IWD = IR + IWD_{perc}$$

9. Frost Protection

For some crops (e.g. cranberries), an application of water is often used under certain climatic conditions to provide protection against frost damage. For cranberries, the rule is: when the temperature drops to 0 ^{o}C or below between March 16 and May 20 or between October 1 and November 15, a frost event will be calculated. The calculated value is an application of 2.5 mm per hour for 10 hours. In addition, 60% of the water is recirculated and reused, accounting for evaporation and seepage losses.

This amounts to a modelled water demand of 10 mm over the cranberry crop's area for each day that a frost event occurs between the specified dates.

10. Annual Soil Moisture Deficit

Prior to each crop's growing season, the Model calculates the soil's moisture content by starting it at full (maximum soil water deficit level) on January 1, and adjusting it daily according to

precipitation and evaporation. During the growing season, simple evaporation is replaced by the crop's evapotranspiration as it progresses through its growth stages. At the completion of each crop's growing season, an annual soil moisture deficit (SMD) is calculated as the difference between the soil moisture content at that point and the maximum soil water deficit (MSWD):

$$SMD = MSWD - storedMoisture$$

In dry/cold climates, this amount represents water that the farmer would add to the soil in order to prevent it from freezing. Wet climates are assumed to have sufficient precipitation and warm enough temperatures to avoid the risk of freezing without this extra application of water; the SMD demand is therefore recorded only for dry areas.

There is no fixed date associated with irrigation to compensate for the annual soil moisture deficit. The farmer may choose to do it any time after the end of the growing season and before the freeze up. In the Model's summary reports, the water demand associated with the annual soil moisture deficit shows as occurring at time 0 (week 0, month 0, etc.) simply to differentiate it from other demands that do have a date of occurrence during the crop's growing season.

Greenhouses and mushroom barns do not have an annual soil moisture deficit.

11. Flood Harvesting

Cranberry crops are generally harvested using flood techniques. The Model calculates the flood harvesting demand as 250 mm of depth for 10% of the cranberry farmed area. For modelling purposes, it is assumed that 250 mm of water gets applied to the total cranberry crop area, 10% at a time. The water is reused for subsequent portions, but by the time the entire crop is harvested, all of the water is assumed to have been used and either depleted through losses or released from the farm.

The water demand is therefore calculated as a fixed 25 mm over the entire cranberry crop area. The harvesting generally takes place between mid-October and mid-November where the Model treats it as occurring on the fixed date of November 16.

Livestock Water Use

The Model calculates an estimated livestock water demand using agricultural census data and an estimate of the water use per animal. Water use for each animal type is calculated a bit differently depending on requirements. For example, for a dairy milking cow, the water demand for each animal includes, drinking, preparation for milking, pen and barn cleaning, milking system washout, bulk tank washout and milking parlor washing. However, for a dry dairy cow, the demand only includes drinking and pen and barn cleaning.

The water use is estimated on a daily basis per animal even though the facility is not cleaned daily. For example, for a broiler operation, the water use for cleaning a barn is calculated as 4 hours of pressure washing per cycle at a 10 gpm flow rate, multiplied by 6 cycles per barn with each barn holding 50,000 birds. On a daily basis, this is quite small with a value of 0.01 litres per day per bird applied.

For all cases, the daily livestock demand is applied to the farm location. However, in the case of beef, the livestock spend quite a bit of the year on the range. Since the actual location of the animals cannot be ascertained, the water demand is applied to the home farm location, even though most of the demand will not be from this location. Therefore, the animal water demand on a watershed scale will work fine but not when the demand is segregated into sub-watersheds or groundwater areas.

The estimates used for each livestock are shown in Table 1.

Table 1 Livestock Water Demand (Litres/day)

Animal Type	Drinking	Milking Preparation	Barn Component	Total
Milking Dairy Cow	65	5	15	85
Dry Cow	45		5	50
Swine	12		0.5	12.5
Poultry – Broiler	0.16		0.01	0.17
Poultry – Layer	0.08		0.01	0.09
Turkeys	0.35		0.01	0.36
Goats	8			8
Sheep	8			8
Beef – range, steer, bull, heifer	50			50
Horses	50			50

Definition and Calculation of Individual Terms used in the Irrigation Water Demand Equation

Growing Season Boundaries

There are three sets of considerations used in calculating the start and end of the irrigation season for each crop:

- temperature-based growing season derivations, generally using Temperature Sum (Tsum) or Growing Degree Day (GDD) accumulations
- the growing season overrides table
- the irrigation season overrides table

These form an order of precedence with later considerations potentially overriding the dates established for the previous rules. For example, the temperature-based rules might yield a growing season start date of day 90 for a given crop in a mild year. To avoid unrealistic irrigation starts, the season overrides table might enforce a minimum start day of 100 for that crop; at that point, the season start would be set to day 100. At the same time, a Water Purveyor might not turn on the water supply until day 105; specifying that as the minimum start day in the irrigation season overrides table would prevent any irrigation water demands until day 105.

This section describes the rules used to establish growing season boundaries based on the internal calculations of the Model. The GDD and Tsum Day calculations are described in separate sections. The *standard end of season* specified for several crops is the earlier of the end date of Growing Degree Day with base temperature of 5 ^{o}C (GDD_5) or the first frost.

1. ***Corn (silage corn)***
   - uses the corn_start date for the season start
   - season end: earlier of the killing frost or the day that the CHU2700 (2700 Corn Heat Units) threshold is reached

2. ***Sweetcorn, Potato, Tomato, Pepper, Strawberry, Vegetable, Pea***
   - corn_start date for the season start
   - corn start plus 110 days for the season end

3. ***Cereal***
   - GDD_5 start for the season start
   - GDD_5 start plus 130 days for the season end

4. ***AppleHD, AppleMD, AppleLD, Asparagus, Berry, Blueberry, Ginseng, Nuts, Raspberry, Sourcherry, Treefruit, Vineberry***
   - season start: (0.8447 x tsum600_day) + 18.877
   - standard end of season

5. ***Pumpkin***
   - corn_start date
   - standard end of season

6. Apricot

- season start: (0.9153 x tsum400_day) + 5.5809
- standard end of season

7. CherryHD, CherryMD, CherryLD

- season start: (0.7992 x tsum450_day) + 24.878
- standard end of season

8. Grape, Kiwi

- season start: (0.7992 x tsum450_day) + 24.878
- standard end of season

9. Peach, Nectarine

- season start: (0.8438 x tsum450_day) + 19.68
- standard end of season

10. Plum

- season start: (0.7982 x tsum500_day) + 25.417
- standard end of season

11. Pear

- season start: (0.8249 x tsum600_day) + 17.14
- standard end of season

12. Golf, TurfFarm

- season start: later of the GDD_5 start and the tsum300_day
- standard end of season

13. Domestic, Yard, TurfPark

- season start: later of the GDD_5 start and the tsum400_day
- standard end of season

14. Greenhouse (interior greenhouses)

- fixed season of April 1 – October 30

15. GH Tomato, GH Pepper, GH Cucumber

- fixed season of January 15 – November 30

16. GH Flower

- fixed season of March 1 – October 30

17. GH Nursery

- fixed season of April 1 – October 30

18. Mushroom

- all year: January 1 – December 31

19. Shrubs/Trees, Fstock, NurseryPOT

- season start: tsum500_day
- end: Julian day 275

20. Floriculture

- season start: tsum500_day
- end: Julian day 225

21. Cranberry

- season start: tsum500_day
- end: Julian day 275

22. Grass, Forage, Alfalfa, Pasture

- season start: later of the GDD_5 and the tsum600_day
- standard end of season

23. Nursery

- season start: tsum400_day
- standard end of season

Evapotranspiration (ET_o)

The ET_o calculation follows the FAO Penman-Montieth equation. Two modifications were made to the equation:

- Step 6 – Inverse Relative Distance Earth-Sun (d_r)
  Instead of a fixed 365 days as a divisor, the actual number of days for each year (365 or 366) was used.

- Step 19 – Evapotranspiration (ET_o)
  For consistency, a temperature conversion factor of 273.16 was used instead of the rounded 273 listed.

Availability Coefficient (AC)

The availability coefficient is a factor representing the percentage of the soil's total water storage that the crop can readily extract. The factor is taken directly from the crop factors table (crop_factors) based on the cropId value.

Rooting Depth (RD)

The rooting depth represents the crop's maximum rooting depth and thus the depth of soil over which the plant interacts with the soil in terms of moisture extraction. The value is read directly from the crop factors table.

Stress Factor (stressFactor)

Some crops, such as *grasses*, are often irrigated to a less degree than their full theoretical requirement for optimal growth. The *stress factor* (*crop_groups_and_factors*) reduces the calculated demand for these crops.

Available Water Storage Capacity (AWSC)

The available water storage capacity is a factor representing the amount of water that a particular soil texture can hold without the water dropping through and being lost to deep percolation. The factor is taken directly from the soil factors table (*soil_factors*).

Maximum Soil Water Deficit (MSWD)

The maximum soil water deficit is the product of the crop's availability coefficient, rooting depth, and the available water storage capacity of the soil:

$$MSWD = RD \times AWSC \times AC$$

Deep Percolation Factor (Soilpercfactor)

The soil percolation factor is used to calculate the amount of water lost to deep percolation under different management practices.

For greenhouse crops, the *greenhouse leaching factor* is used as the basic soil percolation factor. This is then multiplied by a greenhouse recirculation factor, if present, to reflect the percentage of water re-captured and re-used in greenhouse operations.

$$soilPercFactor = soilPercFactor \times (1 - recirculationFactor)$$

For Nursery Pot (Nursery POT) and Forestry Stock (Fstock) crops, the soil percolation factor is fixed at 35%. For other crops, the factor depends on the soil texture, the MSWD, the irrigation system, and the Irrigation Management Practices code. The percolation factors table (*soil_percolation_factors*) is read to find the first row with the correct management practices, soil texture and irrigation system, and a MSWD value that matches or exceeds the value calculated for the current land use polygon.

If the calculated MSWD value is greater than the index value for all rows in the percolation factors table, then the highest MSWD factor is used. If there is no match based on the passed parameters, then a default value of 0.25 is applied.

For example, a calculated MSWD value of 82.5 mm, a soil texture of sandy loam (SL) and an irrigation system of solid set overtree (Ssovertree) would retrieve the percolation factor associated with the MSWD index value of 75 mm in the current table (presently, there are rows for MSWD 50 mm and 75 mm for SL and Ssovertree).

Maximum Evaporation Factor (maxEvaporation)

Just as different soil textures can hold different amounts of water, they also have different depths that can be affected by evaporation. The factor is taken directly from the soil factors table.

Irrigation Efficiency (I_e)

Each irrigation system type has an associated efficiency factor (inefficient systems require the application of more water in order to satisfy the same crop water demand). The factor is read directly from the irrigation factors table (*irrigation_factors*).

Soil Water Factor (swFactor)

For the greenhouse "crop", the soil water factor is set to 1. For other crops, it is interpolated from a table (*soil_water_factors*) based on the MSWD. For Nurseries, the highest soil water factor (lowest MSWD index) in the table is used; otherwise, the two rows whose MSWD values bound the calculated MSWD are located and a soil water factor interpolated according to where the passed MSDW value lies between those bounds.

For example, using the current table with rows giving soil water factors of 0.95 and 0.9 for MSWD index values of 75 mm and 100 mm respectively, a calculated MSWD value of 82.5 mm would return a soil water factor of:

$$0.95 + \left\lfloor \frac{82.5 - 75}{100 - 75} \times (0.9 - 0.95) \right\rfloor$$
$$= 0.935$$

If the calculated MSWD value is higher or lower than the index values for all of the rows in the table, then the factor associated with the highest or lowest MSWD index is used.

Early Season Evaporation Factor (earlyEvaporationFactor)

The effective precipitation (precipitation that adds to the stored soil moisture content) can be different in the cooler pre-season than in the growing season. The early season evaporation factor is used to determine what percentage of the precipitation is considered effective prior to the growing season.

Crop Coefficient (K_c)

The crop coefficient is calculated from a set of fourth degree polynomial equations representing the crop's ground coverage throughout its growing season. The coefficients for each term are read from the crop factors table based on the crop type, with the variable equalling the number of days since the start of the crop's growing season. For example, the crop coefficient for Grape on day 35 of the growing season would be calculated as:

$$K_c = [0.0000000031 \times (35)^4] + [-0.0000013775 \times (35)^3] + (0.0001634536 \times (35)^2] + (-0.0011179845 \times 35) + 0.2399004137$$
$$= 0.346593241$$

Alfalfa crops have an additional consideration. More than one cutting of alfalfa can be harvested over the course of the growing season, and the terms used for the crop coefficient equation changes for the different cuttings. For alfalfa, the alfalfa cuttings table is first used to determine which cutting period the day belongs to (first, intermediate or last), and after that the associated record in the crop factors table is accessed to determine the terms.

There are two sets of polynomial coefficients used to calculate the crop coefficient; the first set is used for modelling time periods up to the year specified as the *crop curve changeover year*; and the second for modelling into the future. The changeover year will be modified as time goes on and new historical climate observations become available.

Growing Degree Days (GDD)

The Growing Degree Day calculations generate the start and end of GDD accumulation.

1. Start of GDD Accumulation

For each base temperature (bases 5 and 10 are always calculated, other base temperature can be derived), the start of the accumulation is defined as occurring after 5 consecutive days of T_{mean} matching or exceeding the base temperature (BaseT). The search for the start day gets reset if a killing frost (< –2 ^{o}C) occurs, even after the accumulation has started. The search also restarts if there are 2 or more consecutive days of $T_{min} \leq 0$ ^{o}C. The GDD start is limited to Julian days 1 to 210; if the accumulation has not started by that point, then it is unlikely to produce a reasonable starting point for any crop.

2. End of GDD accumulation

The search for the end of the GDD accumulation begins 50 days after its start. The accumulation ends on the earlier of 5 consecutive days where T_{mean} fails to reach BaseT (strictly *less than*) or the first killing frost (–2 ^{o}C).

During the GDD accumulation period, the daily contribution is the difference between T_{mean} and BaseT, as long as T_{mean} is not less than BaseT:

$$GDD = T_{mean} - BaseT; 0 \text{ if negative}$$

Frost Indices

Three frost indices are tracked for each year:

- the last spring frost is the latest day in the first 180 days of the year with a $T_{min} \leq 0$ ^{o}C
- the first fall frost is the first day between days 240 and the end of the year where $T_{min} \leq 0$ ^{o}C
- the killing frost is the first day on or after the first fall frost where $T_{min} \leq -2$ ^{o}C

Corn Heat Units (CHU)

The Corn Heat Unit is the average of two terms using T_{min} and T_{max}. Prior to averaging, each term is set to 0 individually if it is negative.

$$\text{term1} = [3.33 \times (T_{max} - 10)] - [0.084 \times (T_{max} - 10) \times (T_{max} - 10)]; 0 \text{ if negative}$$

$$\text{term2} = 1.8 \times (T_{min} - 4.44); 0 \text{ if negative}$$

$$\text{CHU} = \frac{(\text{term1} + \text{term2})}{2}$$

Corn Season Start and End

The corn season boundary derivations are similar to the GDD determinations. The start day is established by 3 consecutive days where $T_{mean} \geq 11.2\ ^{o}C$. As in the case of the GDD calculations, the search for the corn season start day gets reset if $T_{min} \leq -2\ ^{o}C$, or if there are 2 or more consecutive days of $-2\ ^{o}C \leq T_{min} \leq 0\ ^{o}C$.

The search for the silage corn season end begins 50 days after the start. The season ends on the earlier of a mean temperature dropping below 10.1 or a killing frost.

The end of the sweet corn season is defined as 110 days after the season start.

Tsum Indices

The Tsum day for a given number is defined as the day that the sum of the positive daily T_{mean} reaches that number. For example, the Tsum400 day is the day where the sum of the positive T_{mean} starting on January 1 sum to 400 units or greater.

Days where T_{mean} falls below $0\ ^{o}C$ are simply not counted; therefore, the Model does not restart the accumulation sequence.

Wet/Dry Climate Assessment

Starting with the Lower Mainland, some of the modelling calculations depend on an assessment of the general climatic environment as *wet* or *dry*. For example, when modelling the soil moisture content prior to the start of the crop's growing season, the reservoir can only be drawn down by evaporation except for *grass* crops in *wet* climates which can pull additional moisture out of the soil.

The assessment of wet or dry uses the total precipitation between May 1 and September 30. If the total is more than 125 mm during that period, the climate is considered to be *wet* and otherwise *dry*.

Groundwater Use

The Model generates water sources for irrigation systems. This is done by first determining which farms are supplied by a water purveyor, and then coding those farms as such. Most water purveyors use surface water but where groundwater is used, the farms are coded as groundwater use. The second step is to check all water licences and assign the water licences to properties in the database. The remaining farms that are irrigating will therefore not have a water licence or be supplied by a water purveyor. The assumption is made that these farms are irrigated by groundwater sources.

Land Use Results

A summary of the land area and the inventoried area of Electoral Area B are shown in Table 2. The primary agricultural use of the ARL area is shown in Table 3. Figures 8, 9 and 10 show the areas of water, ALR land and land parcels in the basin graphically. Figure 11 provides a schematic of the higher yielding aquifer areas in Electoral Area B.

Table 2 Overview of Land and Inventoried Area in SLRD Electoral Area B

Area Type	Area (ha)	Number of Parcels
Electoral Area Watershed		
Total Area	782,800	-
Area of Water Feature	19,769	-
Area of Land (excluding water features)	763,031	-
ALR Area	10,741	576
Area of First Nations Reserve	11,860	-
Inventoried Area		
Total Inventoried Area	22,785	825
Area of First Nations Reserve in ALR	1,322	-

Table 3 Summary of Primary Agricultural Activities of Inventoried Parcels where Primary Land Use is Agriculture in Electoral Area B	
Primary Agriculture Activity	**Total ALR Area (ha)**
Cereal	<1
Forage	1,031
Grape	10
Grass	364
Greenhouse	<1
Pasture	1,279
Tree Fruit	7
Turf Park	1
Vegetable	13
Yard	52
Total	**2,758**

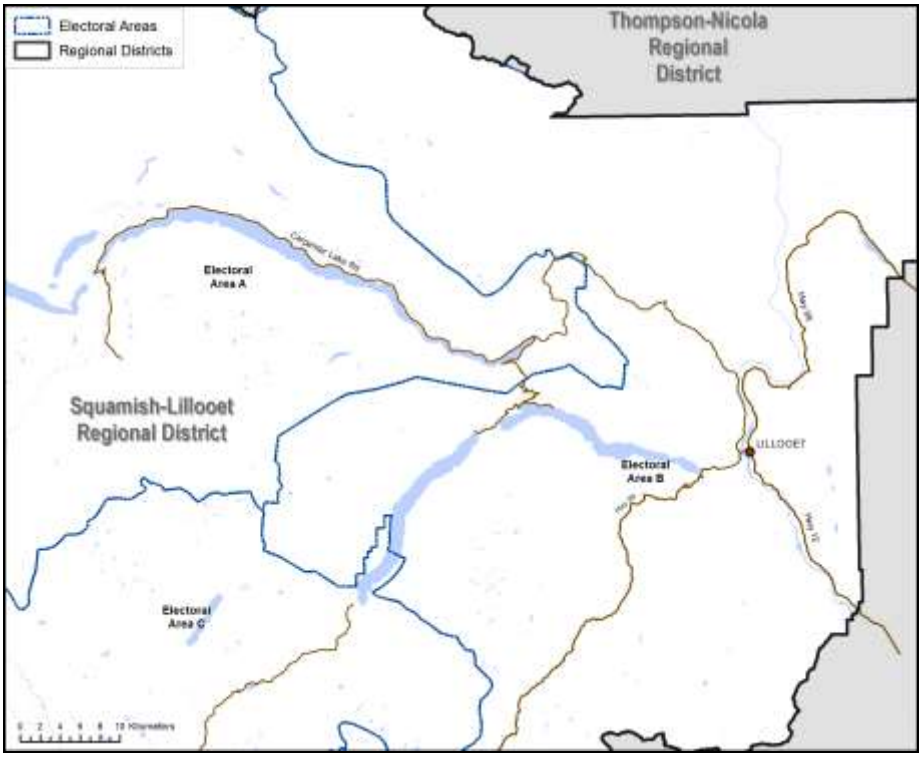

Figure 8 Water Areas in Electoral Area B

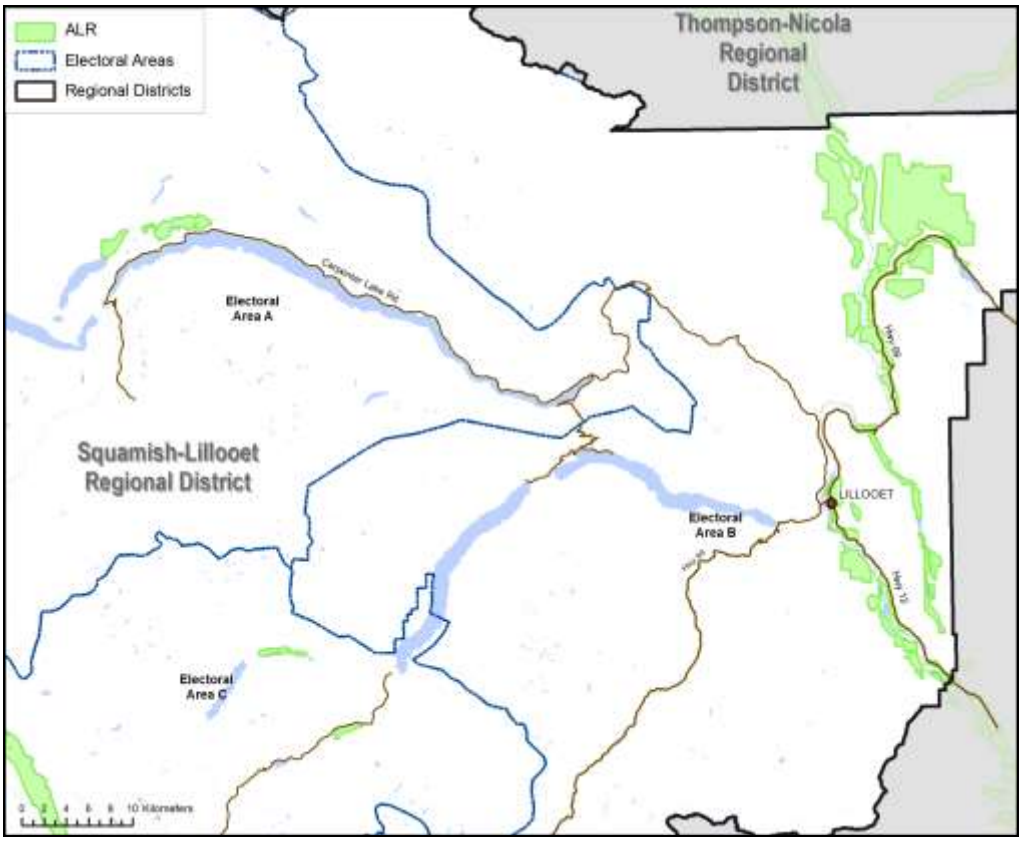

Figure 9 ALR Areas in Electoral Area B

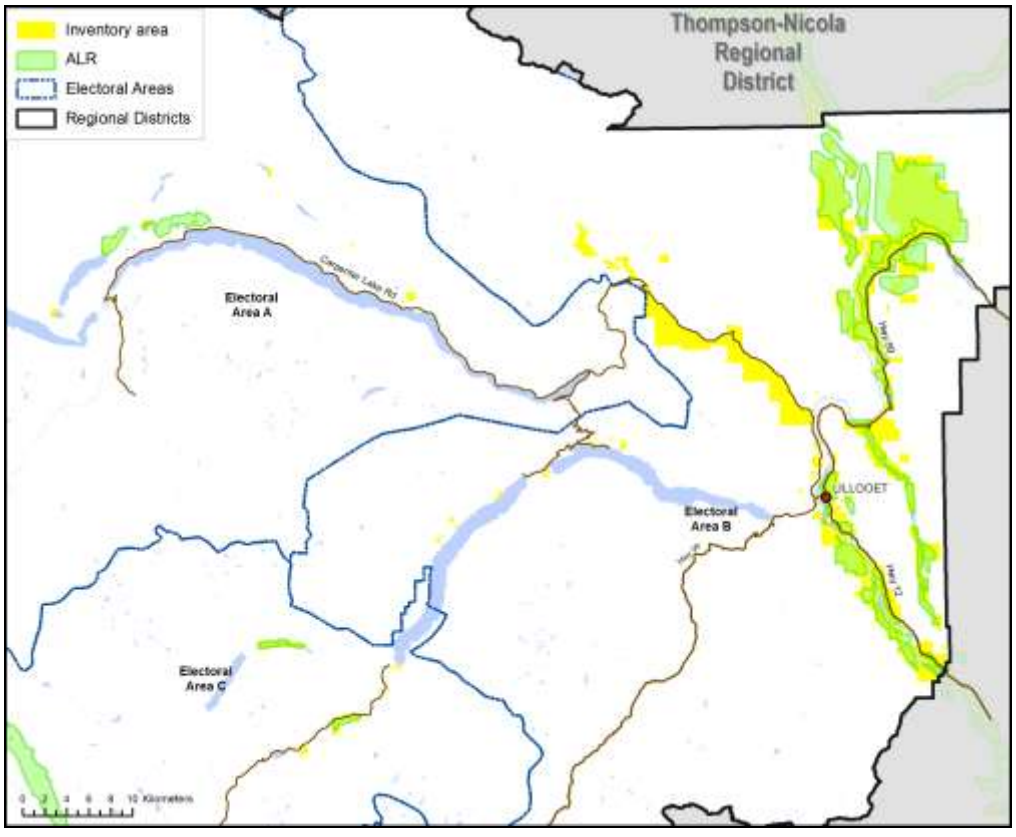

Figure 10 Land Parcels in Electoral Area B

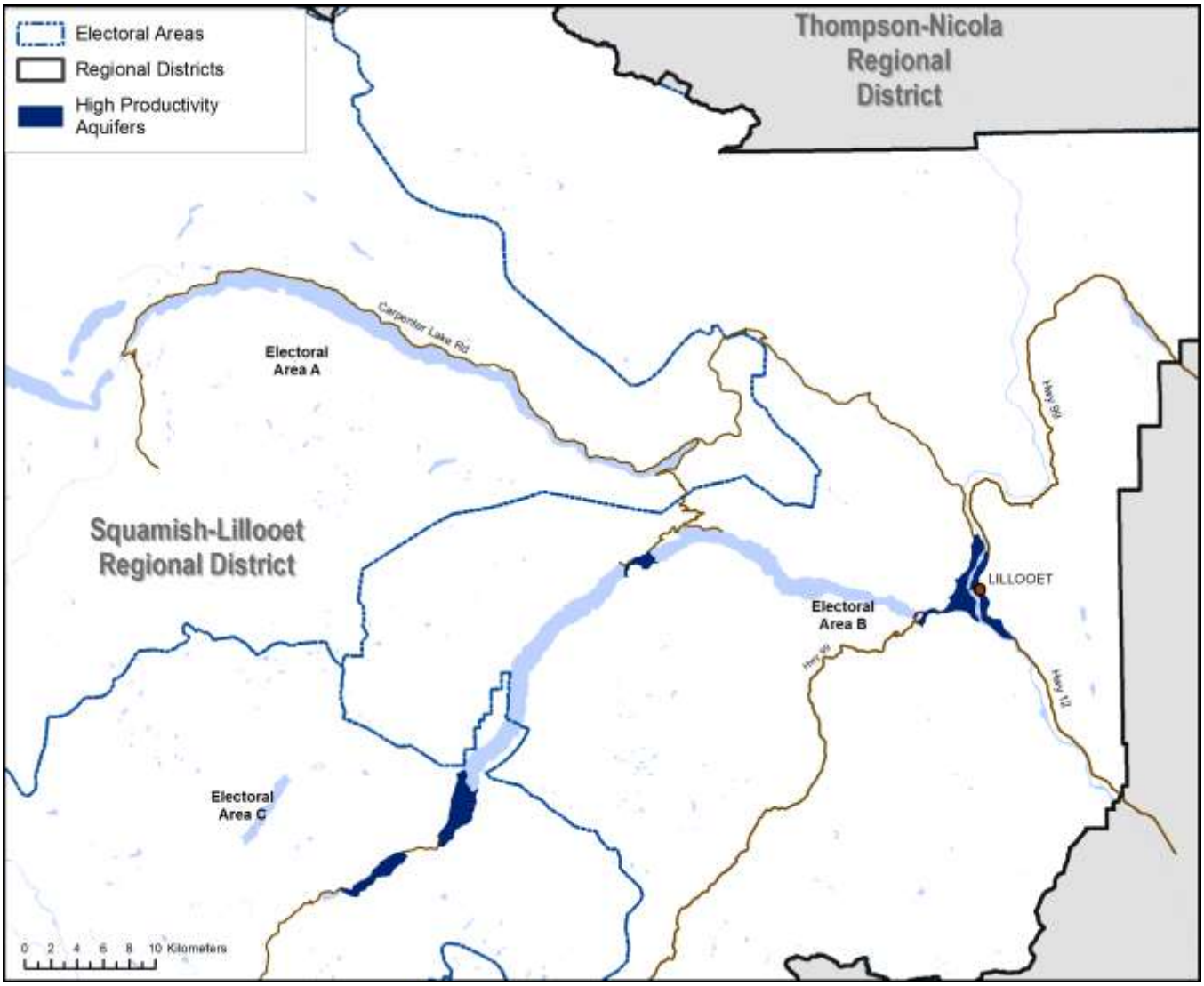

Figure 11 Higher Productive Groundwater Aquifers in Electoral Area B

Agricultural Water Demand Results

The Model has a reporting feature that can save and generate reports for many different scenarios that have been pre-developed. This report will provide a summary of the reported data in the Appendices. Climate data from 1997 and 2003 were chosen as they represent a relatively wet year and dry year respectively. Most reports are based on the 2003 data since the maximum current demand can then be presented.

Annual Crop Water Demand – Tables A and B

The Model can use three different irrigation management factors, good, average and poor. Unless otherwise noted, average management were used in the tables. Appendix Table A provides the annual irrigation water demand for current crop and irrigation systems used for the year 2003 using average irrigation management, and Table B provides the same data for 1997.

Where a crop was not established, the acreage was assigned a forage crop so that the Model could determine a water demand. The total irrigated acreage in Electoral Area B is 1,369 hectares (ha), predominantly in forage crops. In Electoral Area B, 1,369 ha (85%) is supplied by licensed surface water sources, and 204 ha (15%) is irrigated with groundwater.

The total annual irrigation demand was 12,815,466 m^3 in 2003, and was only 7,779,825 m^3 in 1997. During a wet year like 1997, the demand was 60% of a hot dry year like 2003.

The actual water demand used by an irrigation system may be less or more than the numbers calculated by the Model. The Model generates a demand based on crop, climate and soil but may not actually represent what is applied by a producer. For example, soil moisture studies have indicated that farmers usually under apply irrigation when using centre pivot systems. The AWDM calculations determine irrigation demand based on relatively good practices. Actual use may actually be higher or lower than what is calculated by the Model.

Annual Water Demand by Irrigation System – Table C

The crop irrigation demand can also be reported by irrigation system type as shown in Table C. Since the predominant crop type is forage handlines, wheelines, flood irrigation, and pivot are the predominant irrigation system type. There is potential to improve irrigation system efficiency by converting some of these systems on larger parcels to low pressure centre pivot.

Annual Water Demand by Soil Texture – Table D

Table D provides the annual water demand by soil texture. Where soil texture data is missing, the soil texture has been defaulted to sandy loam. The defaults are shown in Table D. It is anticipated that soil information will be digitized into the Model by Fall 2014. This report will be updated by then.

Water Demand by Local Government – Table E

Table E provides a breakdown of the agricultural irrigated areas within the boundaries of each local government within Electoral Area B with 85% of the areas located in the SLRD.

Irrigation Management Factors – Table F

The Model can estimate water demand based on poor, average and good irrigation management factors. This is accomplished by developing an irrigation management factor for each crop, soil and irrigation system combination. The Maximum Soil Water Deficit (MSWD) is the maximum amount of water that can be stored in the soil within the crop rooting zone. An irrigation system applying more water than what can be stored will result in percolation beyond the crop's rooting depth. Irrigation systems with high application rates will have a probability of higher percolation rates, a stationary gun for instance.

For each soil class, a range of four MSWD is provided, which reflect a range of crop rooting depths. An irrigation management factor, which determines the amount of leaching, is established for each of the MSWD values for the soil types (Table 4). The management factor is based on irrigation expertise as to how the various irrigation systems are able to operate. For example, Table 5 indicates that for a loam soil and a MSWD of 38 mm, a solid set overtree system has a management factor of 0.10 for good management while the drip system has a management factor of 0.05. This indicates that it is easier to prevent percolation with a drip system than it is with a solid set sprinkler system. For poor management, the factors are higher.

There are a total of 1,344 irrigation management factors established for the 16 different soil textures, MSWD and 21 different irrigation system combinations used in the Model.

Table 4 Irrigation Management Factors

Soil Texture	MSWD	Solid Set Overtree			Drip		
		Good	Average	Poor	Good	Average	Poor
Loam	38	0.10	0.15	0.20	0.05	0.10	0.15
	50	0.05	0.10	0.15	0.05	0.075	0.10
	75	0.05	0.10	0.15	0.05	0.075	0.10
	100	0.05	0.075	0.10	0.05	0.075	0.10
Sandy loam	25	0.20	0.225	0.25	0.10	0.15	0.20
	38	0.10	0.15	0.20	0.10	0.125	0.15
	50	0.05	0.10	0.15	0.05	0.10	0.10
	75	0.05	0.10	0.15	0.05	0.075	0.10

The management factors increase as the MSWD decreases because there is less soil storage potential in the crop rooting depth. For irrigation systems such as guns, operating on a pasture which has a shallow rooting depth, on a sandy soil which cannot store much water, the poor irrigation management factor may be as high as 0.50.

The management factor used in the Model assumes all losses are deep percolation while it is likely that some losses will occur as runoff as well.

Table F provides an overview of the impacts on the management factor and irrigation systems used. Management improvements could be more significant if irrigation systems were converted to more efficient systems.

Table F also provides percolation rates based on good, average and poor management using 2003 climate data. In summary, there is 1,826,329 m^3 of water lost to percolation on good management, 2,013,405 m^3 on average management, and 2,200,482 m^3 on poor management. Percolation rates for poor management are 20% higher than for good management.

Deep Percolation – Table G

The percolation rates vary by crop, irrigation system type, soil and the management factor used. Table G shows the deep percolation amounts by irrigation system type for average management. The last column provides a good indication of the average percolation per hectare for the various irrigation system types.

Improved Irrigation Efficiency and Good Management – Table H

There is an opportunity to reduce water use by converting irrigation systems to a higher efficiency for some crops. In Electoral Area B, irrigation efficiency could be improved if all forage crops switched to low pressure centre pivot systems for all field sizes larger than 10 ha. In addition, using better management such as irrigation scheduling techniques will also reduce water use. Table H provides a scenario of water demand if all sprinkler systems on fields larger than 10 ha were converted to low pressure centre pivot systems, using good irrigation management. The water demand for 2003 would then reduce from 12,815,466 m^3 to 9,496,904 m^3. This is a 35% reduction in water demand.

Livestock Water Use – Table I

The Model provides an estimate of water use for livestock. The estimate is based on the number of animals in Electoral Area B as determined by the latest census, the drinking water required for each animal per day and the barn or milking parlour wash water. Values used are shown in Table I. For Electoral Area B, the amount of livestock water demand is estimated at 46,165 m^3.

Climate Change Water Demand for 2050 – Table J

The Model also has access to climate change information until the year 2100. While data can be run for each year, three driest years in the 2050's were selected to give a representation of climate change. Figure 12 shows the climate data results which indicate that 2053, 2056, and 2059 generate the highest annual ET_o and lowest annual precipitation. These three years were used in this report.

Table J provides the results of climate change on irrigation demand for the three years selected using current crops and irrigation systems. Current crops and irrigation systems are used to show the increase due to climate change only, with no other changes taking place.

Figure 13 shows all of the climate change scenario runs for the Okanagan using 12 climate models from 1960 to 2100. This work was compiled by Denise Neilsen at the Agriculture and Agri-Food Canada – Summerland Research Station. There is a lot of scatter in this figure, but it is obvious that there is a trend of increasing water demand.

The climate change model used in this report is RCP85. Running the climate change model on three selected future years in Electoral Area B is not sufficient to provide a trend like in Figure 13. What the results do show is that in an extreme climate scenario, it is possible to have an annual water demand that is 29% higher than what was experienced in 2003 based on the RCP85 climate model in 2053. More runs of the climate change models will be required to better estimate a climate change trend for the region.

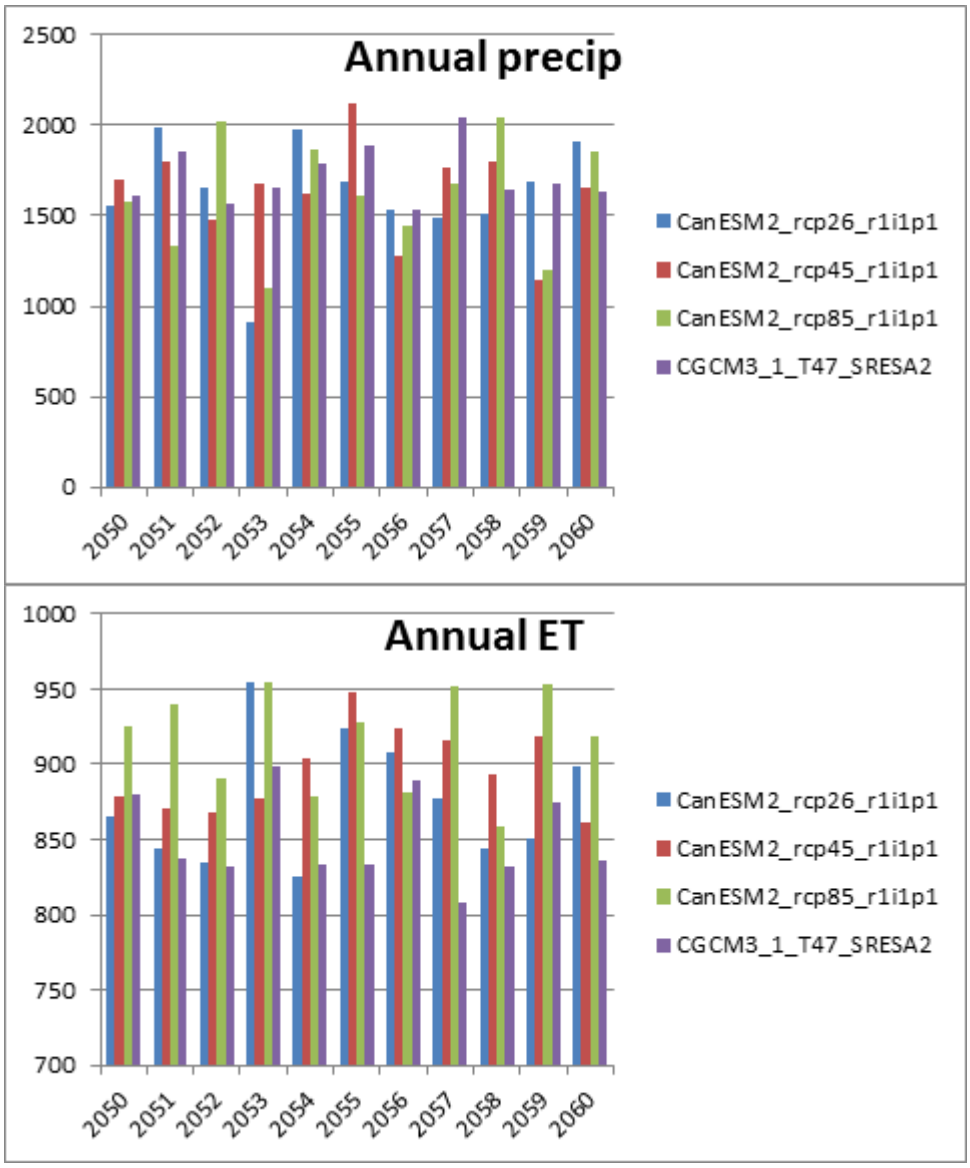

Figure 12 Annual ET and Effective Precipation in 2050's

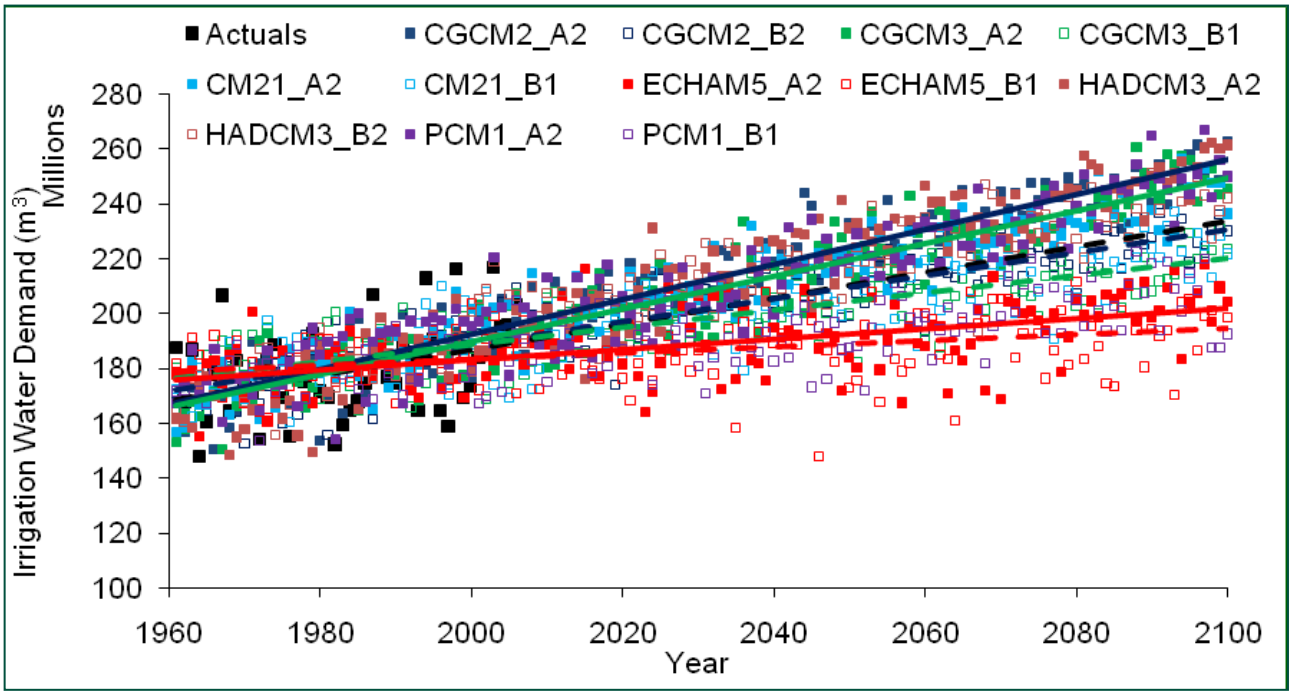

Figure 13 Future Irrigation Demand for All Outdoor Uses in the Okanagan in Response to Observed Climate Data (Actuals) and Future Climate Data Projected from a Range of Global Climate Models

Agricultural Buildout Crop Water Demand Using 2003 Climate Data – Table K

An agricultural buildout scenario was developed that looked at potential agricultural lands that could be irrigated in the future. The rules used to establish where potential additional agricultural lands were located are as follows:

- within 1,000 m of water supply (lake)
- within 1,000 m of water supply (water course)
- within 1,000 m of water supply (wetland)
- within 1,000 m of high productivity aquifer
- within 1,000 m of water purveyor
- with Ag Capability class 1-4 only where available
- must be within the ALR
- below 800 m average elevation
- must be private ownership
- for surface water source, the maximum elevation from the water source to the property is ±125 m
- soils could also be organic (classes 1-4)

For the areas that are determined to be eligible for future buildout, a crop and irrigation system need to be applied. Where a crop already existed in the land use inventory, that crop would remain and an irrigation system assigned. If no crop existed, then a crop and an irrigation system are assigned as per the criteria below:

- 75% grass with sprinkler irrigation or low pressure pivot
- 25% alfalfa with sprinkler irrigation or low pressure pivot

For alfalfa or forage irrigated areas equal to or over 10 ha, the irrigation system type will be changed from sprinkler to low-pressure pivot (if not already using a low-pressure pivot). It is anticipated that current irrigation systems will be replaced by more efficient systems like low-pressure pivots in the future to reduce water demand when water resources are more stretched.

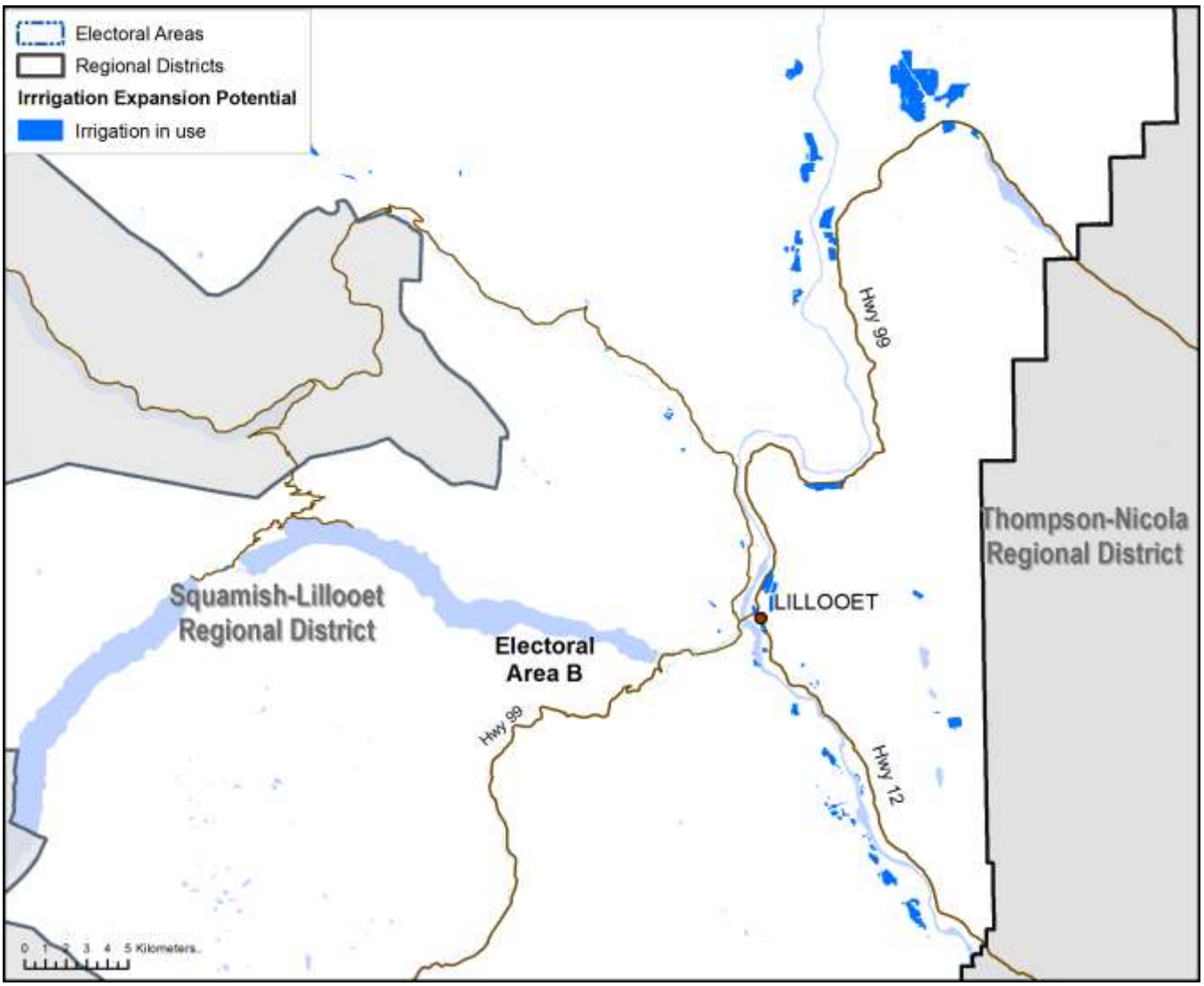

Figure 14 Irrigation Expansion Potential in Electoral Area B

Figure 14 indicates the location of agricultural land that is currently irrigated (blue). This figure would have shown in red for land that can be potentially irrigated, but there are none in Electoral Area B. The water demand for a year like 2003 is about 10,847,637 m^3 (18% decrease) assuming efficient irrigation systems and good management. The overall decrease in water demand is because the is zero potential irrigation expansion area, and the water use savings through converting forage irrigation systems to low-pressure pivot.

Agricultural Buildout Crop Water Demand for 2003 WITHOUT Improved Irrigation System Efficiency – Table L

Table L provides the water demand *without* improved irrigation system efficiency for the buildout scenario in the previous example. Without improving efficiency through low-pressure pivot conversion, the water demand increases from 12,815,466 m^3 to 14,027,357 m^3 (9% increase) using 2003 data. This was done only for comparison to Table L with conversion. Converting to more efficient irrigation systems in the future is recommended, and therefore conversion was assumed in the rest of the buildout Tables M to O.

Agricultural Buildout Crop Water Demand for 2050 – Table M

The same irrigation expansion and cropping scenarios used to generate the values in Table J is used to generate the climate change water demand shown in Table M. See discussion under Table J. When climate change is added to the buildout scenario, the water demand increases from 12,815,466 m^3 to 14,031,889 m^3 (9% increase) based on climate change model RCP85 in 2053.

Irrigation Systems Used for the Buildout Scenario for 2003 – Table N

Table N provides an account of the irrigation systems used by area for the buildout scenario in the previous two examples. Note that the model generated a large area for centre pivot systems as the most efficient system was selected.

Water Demand for the Buildout Area by Local Government 2003 Climate Data – Table O

Table O provides the future water demand within local government boundaries using previous scenarios. Comparing these values with the result in Table E will provide information on the possible increased water demand within local governments if the buildout scenarios actually occurred in the future.

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Appendix Tables

Appendix Table A 2003 Water Demand by Crop with Average Management

Water Source	Surface Water			Reclaimed Water			Groundwater			Total		
Agriculture Crop Group	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)
Apple	3.1	21,972	710	-	-	-	2.7	22,894	835	5.8	**44,865**	769
Forage	1,156.9	11,276,732	975	-	-	-	183.8	1,384,417	753	1,340.8	**12,661,149**	944
Grape	0.9	3,277	371	-	-	-	8.8	32,822	375	9.6	**36,099**	375
Vegetable	4.3	29,090	676	-	-	-	8.7	44,263	509	13.0	**73,353**	564
TOTALS	1,165.2	**11,331,071**	972	-	-	-	204.0	**1,484,396**	727	1,369.3	**12,815,466**	936

Appendix Table B 1997 Water Demand by Crop with Average Management

Water Source	Surface Water			Reclaimed Water			Groundwater			Total		
Agriculture Crop Group	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)
Apple	3.1	12,364	400	-	-	-	2.7	12,986	474	5.8	**25,350**	434
Forage	1,156.9	6,882,288	595	-	-	-	183.8	810,482	441	1,340.8	**7,692,770**	574
Grape	0.9	1,267	143	-	-	-	8.8	13,205	151	9.6	**14,472**	150
Vegetable	4.3	18,312	426	-	-	-	8.7	28,920	332	13.0	**47,233**	363
TOTALS	1,165.2	**6,914,232**	593	-	-	-	204.0	**865,594**	424	1,369.3	**7,779,825**	568

Appendix Table C 2003 Water Demand by Irrigation System with Average Management

Water Source	Surface Water			Reclaimed Water			Groundwater			Total		
Agriculture Irrigation System	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**
Drip	0.1	482	439	-	-	-	4.3	18,397	427	4.4	**18,878**	427
Flood	394.2	4,546,226	1,153	-	-	-	-	-	-	394.2	**4,546,226**	1,153
Gun	20.0	187,366	935	-	-	-	-	-	-	20.0	**187,366**	935
Handline	311.7	2,749,344	882	-	-	-	87.8	725,823	826	399.5	**3,475,167**	870
Landscapesprinkler	1.2	9,046	747	-	-	-	0.1	422	785	1.3	**9,468**	749
Overtreedrip	0.9	3,277	371	-	-	-	8.8	32,822	375	9.6	**36,099**	375
Pivot	25.1	244,779	976	-	-	-	-	-	-	25.1	**244,779**	976
PivotLP	140.2	1,099,280	784	-	-	-	0.2	1,501	778	140.4	**1,100,782**	784
SDI	-	-	-	-	-	-	3.6	20,108	553	3.6	**20,108**	553
Sprinkler	17.7	139,393	786	-	-	-	1.8	15,410	851	19.5	**154,803**	792
Sssprinkler	1.3	11,247	857	-	-	-	6.3	52,023	825	7.6	**63,270**	830
Ssundertree	1.0	5,990	583	-	-	-	-	-	-	1.0	**5,990**	583
Travgun	4.1	42,478	1,039	-	-	-	-	-	-	4.1	**42,478**	1,039
Wheelline	247.7	2,292,162	925	-	-	-	91.2	617,890	678	338.9	**2,910,052**	859
TOTALS	1,165.2	**11,331,071**	972	-	-	-	204.0	**1,484,396**	727	1,369.3	**12,815,466**	936

Appendix Table D 2003 Water Demand by Soil Texture with Average Management

Water Source	Surface Water			Reclaimed Water			Groundwater			Total		
Agriculture Soil Texture	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**
Sandy Loam (defaulted)	1,165.2	11,331,071	972	-	-	-	204.0	1,484,396	727	1,369.3	**12,815,466**	936
TOTALS	1,165.2	**11,331,071**	972	-	-	-	204.0	**1,484,396**	727	1,369.3	**12,815,466**	936

Appendix Table E 2003 Water Demand by Local Government with Average Management

Water Source	Surface Water			Reclaimed Water			Groundwater			Total		
Agriculture Local Government	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)
Bridge River First Nation	16.2	133,666	826	-	-	-	0.2	1,551	791	16.4	**135,217**	826
Lillooet	84.0	819,735	975	-	-	-	31.7	208,130	657	115.7	**1,027,865**	888
Squamish-Lillooet Regional District	1,048.6	10,255,390	978	-	-	-	122.4	810,566	662	1,171.0	**11,065,956**	945
Titqet First Nation	-	-	-	-	-	-	5.7	49,856	868	5.7	**49,856**	868
Xaxlip First Nation	16.4	122,279	746	-	-	-	44.0	414,292	941	60.4	**536,571**	888
TOTALS	1,165.2	**11,331,071**	972	-	-	-	204.0	**1,484,396**	727	1,369.3	**12,815,466**	936

Appendix Table F 2003 Management Comparison on Irrigation Demand and Percolation Volumes

Water Source	Surface Water				Reclaimed Water				Groundwater				Total				
Agriculture Management	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Deep Percolation (m^3)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Deep Percolation (m^3)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Deep Percolation (m^3)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Deep Percolation (m^3)	Percolation (m^3/ha)
Poor	1,165.2	11,482,769	985	2,010,423	-	-	-	-	204.0	1,519,774	745	190,059	1,369.3	13,002,543	950	2,200,482	1,607
Avg	1,165.2	11,331,071	972	1,858,725	-	-	-	-	204.0	1,484,396	727	154,681	1,369.3	12,815,466	936	2,013,405	1,470
Good	1,165.2	11,179,373	959	1,707,027	-	-	-	-	204.0	1,449,017	710	119,302	1,369.3	12,628,390	922	1,826,329	1,334

Appendix Table G 2003 Percolation Volumes by Irrigation System with Average Management

Water Source	Surface Water			Reclaimed Water			Groundwater			Total			
Agriculture Irrigation System	Irrigated Area (ha)	Irrigation Demand (m^3)	Deep Percolation (m^3)	Irrigated Area (ha)	Irrigation Demand (m^3)	Deep Percolation (m^3)	Irrigated Area (ha)	Irrigation Demand (m^3)	Deep Percolation (m^3)	Irrigated Area (ha)	Irrigation Demand (m^3)	Deep Percolation (m^3)	Percolation (m^3/ha)
Drip	0.1	482	50	-	-	-	4.3	18,397	1,909	4.4	**18,878**	**1,960**	445
Flood	394.2	4,546,226	1,135,005	-	-	-	-	-	-	394.2	**4,546,226**	**1,135,005**	2,879
Gun	20.0	187,366	27,906	-	-	-	-	-	-	20.0	**187,366**	**27,906**	1,395
Handline	311.7	2,749,344	319,585	-	-	-	87.8	725,823	77,141	399.5	**3,475,167**	**396,726**	993
Landscapesprinkler	1.2	9,046	1,347	-	-	-	0.1	422	61	1.3	**9,468**	**1,408**	1,083
Overtreedrip	0.9	3,277	192	-	-	-	8.8	32,822	1,924	9.6	**36,099**	**2,115**	220
Pivot	25.1	244,779	20,842	-	-	-	-	-	-	25.1	**244,779**	**20,842**	830
PivotLP	140.2	1,099,280	92,051	-	-	-	0.2	1,501	126	140.4	**1,100,782**	**92,176**	657
SDI	-	-	-	-	-	-	3.6	20,108	2,121	3.6	**20,108**	**2,121**	589
Sprinkler	17.7	139,393	17,569	-	-	-	1.8	15,410	1,999	19.5	**154,803**	**19,568**	1,003
Ssprinkler	1.3	11,247	1,420	-	-	-	6.3	52,023	7,014	7.6	**63,270**	**8,434**	1,110
Ssundertree	1.0	5,990	666	-	-	-	-	-	-	1.0	**5,990**	**666**	666
Travgun	4.1	42,478	4,439	-	-	-	-	-	-	4.1	**42,478**	**4,439**	1,083
Wheelline	247.7	2,292,162	237,653	-	-	-	91.2	617,890	62,388	338.9	**2,910,052**	**300,041**	885
TOTALS	1,165.2	**11,331,071**	**1,858,725**	-	-	-	204.0	**1,484,396**	**154,681**	1,369.3	**12,815,466**	**2,013,405**	1,470

Appendix Table H 2003 Crop Water Demand for Improved Irrigation System Efficiency and Good Management

Water Source	Surface Water			Reclaimed Water			Groundwater			Total		
Agriculture Crop Group	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)
Apple	3.1	13,418	434	-	-	-	2.7	14,358	524	5.8	**27,775**	476
Forage	1,156.9	8,122,301	702	-	-	-	183.8	1,267,374	689	1,340.8	**9,389,675**	700
Grape	0.9	2,408	273	-	-	-	8.8	24,102	275	9.6	**26,510**	275
Vegetable	4.3	16,477	383	-	-	-	8.7	36,467	419	13.0	**52,944**	407
TOTALS	1,165.2	**8,154,603**	700	-	-	-	204.0	**1,342,300**	658	1,369.3	**9,496,904**	694

Appendix Table I 2003 Water Demand by Animal Type

Animal Type	Demand (m^3)
Beef	40,223
Dairy - dry	1,177
Dairy - milking	2,001
Horses	2,683
Poultry - broiler	7
Poultry - laying	4
Sheep	70
TOTALS	**46,165**

Appendix Table J Climate Change Water Demand Circa 2050 for High Demand Year with Good Management Using Current Crops and Irrigation Systems

Water Source	Surface Water			Reclaimed Water			Groundwater			Total		
Year	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)
2053	1,165.2	14,666,315	1,259	-	-	-	204.0	1,849,769	907	1,369.3	16,516,083	1,206
2056	1,165.2	9,450,788	811	-	-	-	204.0	1,126,196	552	1,369.3	10,576,985	772
2059	1,165.2	13,872,557	1,191	-	-	-	204.0	1,688,705	828	1,369.3	15,561,262	1,136

Appendix Table K Buildout Crop Water Demand for 2003 Climate Data with Good Management

Water Source	Surface Water			Reclaimed Water			Groundwater			Total		
Agriculture Crop Group	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)
Apple	3.1	20,787	672	-	-	-	2.7	21,687	791	5.8	**42,473**	728
Forage	1,283.8	9,106,900	709	-	-	-	224.2	1,582,869	706	1,508.0	**10,689,770**	709
Grape	0.9	3,213	364	-	-	-	8.8	32,181	368	9.6	**35,394**	367
Recreational Turf	1.0	8,252	790	-	-	-	-	-	-	1.0	**8,252**	790
Vegetable	4.5	28,644	633	-	-	-	8.7	43,103	495	13.2	**71,747**	542
TOTALS	1,293.4	**9,167,797**	709	-	**-**	-	244.4	**1,679,840**	687	1,537.8	**10,847,637**	705

Appendix Table L Buildout Crop Water Demand for 2003 Climate Data with Good Management - WITHOUT Improved Irrigation Efficiency

Water Source	Surface Water			Reclaimed Water			Groundwater			Total		
Agriculture Crop Group	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)
Apple	3.1	20,787	672	-	-	-	2.7	21,687	791	5.8	**42,473**	728
Forage	1,283.8	12,184,408	949	-	-	-	224.2	1,685,083	752	1,508.0	**13,869,490**	920
Grape	0.9	3,213	364	-	-	-	8.8	32,181	368	9.6	**35,394**	367
Recreational Turf	1.0	8,252	790	-	-	-	-	-	-	1.0	**8,252**	790
Vegetable	4.5	28,644	633	-	-	-	8.7	43,103	495	13.2	**71,747**	542
TOTALS	1,293.4	**12,245,304**	947	-	**-**	-	244.4	**1,782,053**	729	1,537.8	**14,027,357**	912

Appendix Table M Buildout Crop Water Demand for Climate Change Circa 2050 and Good Management

Water Source	Surface Water			Reclaimed Water			Groundwater			Total		
Year	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)	Irrigated Area (ha)	Irrigation Demand (m^3)	Avg. Req. (mm)
2053	1,293.4	11,907,932	921	-	-	-	244.4	2,123,957	869	1,537.8	14,031,889	912
2056	1,293.4	7,769,611	601	-	-	-	244.4	1,315,138	538	1,537.8	9,084,748	591
2059	1,293.4	11,432,671	884	-	-	-	244.4	1,969,254	806	1,537.8	13,401,925	872

Appendix Table N Buildout Irrigation System Demand for 2003 Climate Data and Good Management

Water Source	Surface Water			Reclaimed Water			Groundwater			Total		
Agriculture Irrigation System	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**
Drip	0.1	472	430	-	-	-	4.3	18,015	418	4.4	**18,486**	418
Handline	185.0	1,552,803	839	-	-	-	61.7	560,555	908	246.7	**2,113,357**	857
Landscapesprinkler	1.2	8,469	699	-	-	-	0.1	396	737	1.3	**8,865**	701
Overtreedrip	0.9	3,213	364	-	-	-	8.8	32,181	368	9.6	**35,394**	367
Pivot	1.3	13,070	977	-	-	-	-	-	-	1.3	**13,070**	977
PivotLP	989.7	6,651,427	672	-	-	-	135.0	784,475	581	1,124.7	**7,435,902**	661
SDI	-	-	-	-	-	-	3.6	19,684	541	3.6	**19,684**	541
Sprinkler	14.5	105,853	728	-	-	-	1.8	14,680	811	16.3	**120,533**	738
Sssprinkler	1.5	11,861	773	-	-	-	6.3	48,799	774	7.8	**60,660**	773
Ssundertree	1.0	5,591	544	-	-	-	-	-	-	1.0	**5,591**	544
Wheelline	98.1	815,038	831	-	-	-	22.8	201,055	881	120.9	**1,016,093**	840
TOTALS	1,293.4	**9,167,797**	709	-	-	-	244.4	**1,679,840**	687	1,537.8	**10,847,637**	705

Appendix Table O Buildout Water Demand by Local Government for 2003 Climate Data and Good Management

Water Source	Surface Water			Reclaimed Water			Groundwater			Total		
Agriculture Local Government	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**	**Irrigated Area (ha)**	**Irrigation Demand (m^3)**	**Avg. Req. (mm)**
Bridge River First Nation	16.2	112,831	698	-	-	-	18.3	129,319	708	34.4	**242,149**	703
Cayoose Creek First Nation	3.9	28,525	727	-	-	-	-	-	-	3.9	**28,525**	727
Lillooet	84.0	755,701	899	-	-	-	31.7	202,997	641	115.7	**958,698**	828
Seton Lake First Nation	0.2	1,315	595	-	-	-	-	-	-	0.2	**1,315**	595
Squamish-Lillooet Regional District	1,089.7	7,550,347	693	-	-	-	127.6	760,621	596	1,217.2	**8,310,968**	683
Titqet First Nation	4.9	51,985	1,054	-	-	-	5.7	47,803	832	10.7	**99,789**	935
Xaxlip First Nation	94.4	667,092	707	-	-	-	61.2	539,099	882	155.6	**1,206,192**	775
TOTALS	1,293.4	**9,167,797**	709	-	-	-	244.4	**1,679,840**	687	1,537.8	**10,847,637**	705