

PROGRESS REPORT 2010

Climatic Suitability and Feasibility Assessment of Growing Wine Grapes In the Lillooet-Lytton Area, British Columbia



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And



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For
**Investment Agriculture Foundation of
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Agriculture and Agri-Food Canada (AAFC) is pleased to participate in the delivery of this publication and is committed to working with our industry partners and the investment Agriculture Foundation of BC to increase public awareness of the importance to the agriculture and agr-food industry in Canada. Opinions expressed in this publication are those of the British Columbia Grapegrowers' Association and not necessarily AAFC's.

Trade Names

Trade (brand) names used in this publication are references only and other products with a similar function may be suitable. No endorsement of any kind is implied.

PROJECT CONCEPT/GOAL

To provide production and climatic information to better assess the feasibility and suitability of commercial grape production in the Lytton-Lillooet area.

KEY ACTIVITIES IN PERIOD APRIL 2010 TO MARCH 2011

An addendum with updated 2008 minimum winter temperatures was prepared December 2010 and is contained in updated 2008 and 2009 progress reports. However, corrected and updated Progress Reports for 2007, 2008 and 2009 dated April 2011 have replaced all previous Progress Reports and are posted on participating web sites listed in Table 1. These corrected and updated reports contain corrected data for several spring or fall frosts and accompanying frost free periods the 2007, 2008 and 2009 reports; updated December 2008 Minimum Winter Temperature data in the 2008 and 2009 reports; corrected Growing Degree Days for 2007, 2008 and 2009; updated climatic data on page 8 of the 2008 and 2009 Progress Reports. This report contains all of the corrected and updated data and new information.

PROJECT DESCRIPTION

Project Timing

Original Planned Start Date:	March 1 st , 2007	Original Planned Completion Date:	December 31 st , 2009
Project Extension		New completion Date	April 2012

Investment Agriculture Foundation of B.C. (IAF) has approved the use of funds previously approved by IAF to extend this project to April 2012. The extension will provide an opportunity to assess vineyard recovery following the damaging temperatures of the December 2008 winter and will permit the ongoing collection of year round climate data. Continued support by the project partners and agreement by vineyard owners to collect phenology observations and to analyze fruit quality prior to harvest during the terms of the project extension made financing of the project extension possible. The project partners are committed to the long-term nature of the demonstration/research project and will continue with information gathering, tours and/or other activities throughout the time provided by the project extension.

Objectives

- 1) **To test the suitability and performance of wine grape varieties in the Lytton-Lillooet region.**

Mechanism: Measure, compile and compare information relating to grape phenology and vineyard management, production, and fruit quality from 3 wine grape plantings established in 2005 and 2007.

Grape phenology studies natural events that recur periodically such as the date when grapes begin to grow (budbreak), bloom, veraison (start of ripening), reach ripeness, harvest date, vine development and performance. Information concerning some of these events is limited in 2010 due to low vine vigour and slower vine recovery than anticipated from low temperatures December 2008 in all test vineyards. Available phenology data is provided in Tables 10, 11, 12, 13 and 14.

The amount of sugar in the grape juice is expressed as Brix, which represents the percent of total soluble solids (sugar, minerals, proteins, amino acids, hormones and other solids). Total acid is expressed as grams/litre of tartaric acid and pH indicates the grape ripeness.

Fruit quality data prior to harvest is provided in Tables 12. Samples of grapes collected and frozen at harvest are provided to participants at PARC, Summerland, B.C. for more precise quality determination at harvest. Analysis of these grapes is provided in Table 13. Targets for fruit quality values are listed in Table 13.

Maturity (hardening) of vines at the end of the growing season provides an indication that shoot growth has ceased; the development of periderm (bark) has taken place and the vine has reduced water content in the tissue. It is a measure of the vine preparedness for colder temperatures. Data concerning cane (wood) maturity by October 1, 2010 is provided in Table 14.

2) To develop a detailed climatic profile of the area.

Mechanism: Compile agro - climatic events that help determine the suitability of an area for commercial grape production including the frost free period, growing degree-days (heat units), extreme minimum temperatures, and rainfall. This data is collected via weather stations and supplemental temperature data loggers.

The frost free period in this report represents the time (expressed as days) between the last frost (0° C) in the spring and the first frost (0° C) in the autumn. This is the time available to vines to begin growth, bloom, mature fruit and to mature the vine at the end of the growing season. A minimum of 150 frost free days is generally required for early maturing grape varieties and 180 days or more for late maturing varieties.

The total amount of heat accumulated during each month, generally from April 1 to October 31, is expressed as growing degree days or heat units. Table 16 includes a few growing degree days (GDD) from March in the calculation of total growing degree days. Growing degree days are indicative of the ripening potential of an area for a range of grape selections. Growing degree days refers to the sum of the accumulated mean monthly temperatures above 10° C multiplied by the number of days per month. For example, if the mean monthly temperature for the month of June is 17° C, then the number of growing degree days for June is $(17-10) \times 30 = 210$. If the growing degree days calculate to a negative number it is made equal to zero. A minimum of 1000 growing degree days are generally required for early maturing varieties while 1400 to 1600 or more are usually required for late maturing varieties.

Minimum winter temperatures of -23°C to -25°C or colder usually severely injures or kills most European wine grape varieties. Hybrid varieties such as Foch or Chancellor may be less severely injured by these temperatures. Grape variety susceptibility to low temperatures may vary when the same variety is grown in different areas. This variation in susceptibility to low temperatures may be influenced by differences in micro climates, site or differences in growing conditions.

Rainfall information is important to determine the need for an irrigation system. The amount of rain at specific times of the year impacts crop or vine development at bloom, fruit maturation, harvest, post harvest and the development of disease and pest control strategies.

Solar radiation has a major effect on soil and air temperatures which affect vine phenology, acid degradation in berries, sugar and aromatic contents of berries, vineyard transpiration and water requirements.

Data for 2008 is Climate data from Environment Canada (EC) weather stations at Lytton and Lillooet forms part of the climatic data collected and is listed in Tables 2 to 9. Data collected from project climate stations and data loggers are provided in Tables 16 and 17 as well as in graphs. A map showing the project study area and locations of climate stations and data loggers are attached to this report and can be viewed via Google Earth by following the instructions provided in this Progress Report or on web sites listed in Table 1.

COMMUNICATIONS

Communication and outreach to create awareness about this project and the project progress occurs through the participation of the British Columbia Grape Growers Association, interest by wineries, participation by government officials representing different levels of government, scheduled tours of Roshard Vineyard and by impromptu visits to Roshard Vineyard from interested local individuals and from people outside the Lillooet-Lytton area.

Recent articles related to this project and web sites hosting the progress reports are provided in Table 1.

Direct contact is maintained with the landowners, who are also the test vineyard managers, by the project technician Norm Vernon when he collects data from the data loggers and by project participant Myles Bruns when he collects data from the weather stations. Participants Doug Robson and Christ'l Roshard maintain contact with other participating vineyard managers. John Vielvoye P.Ag., vineyard consultant, provides pro bono consulting services, records vineyard observations and produces progress reports.

Field Day 2010

Fifteen UBC graduate students in Land Use Planning with their professors and local agriculture experts met at Roshard Vineyard Oct. 2, 2010 to view and discussed this project. Participants on the tour travelled from various parts of British Columbia and other countries. Vineyard owner Christ'l Roshard and project consultant John Vielvoye P.Ag. were present and provided information and answered questions concerning the project.



*Discussion at Roshard Vineyard with
UBC graduate students in Land Use Planning*

PROJECT OUTPUTS DURING 2010

Project outputs included the following:

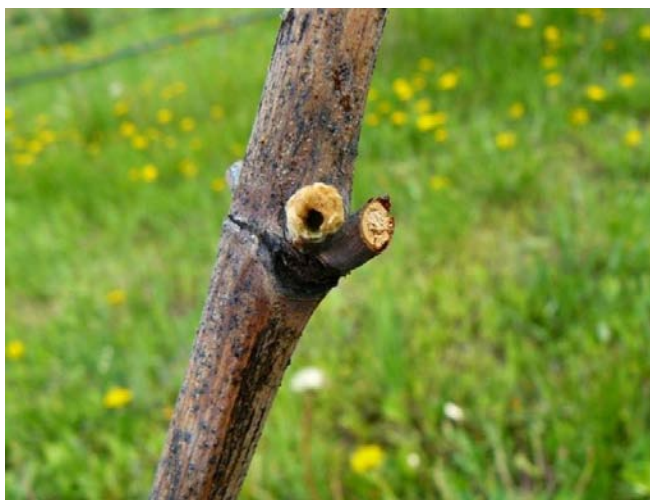
- Awareness of the project provided through word of mouth, articles in the print media as well as postings of project progress reports on the District of Lillooet, Village of Lytton, British Columbia Grapegrowers' Association, Fraser Basin Council and British Columbia Ministry of Agriculture and Lands websites.
- Climate data from five project weather stations and from 87 iButtons (data loggers) at 59 properties was collected at regular intervals. Data from Hobo Pro 2 data loggers is collected annually and was collected in February, 2011.
- Updated 2007, 2008 and 2009 Progress Reports that replaced previous Progress Reports for these years are posted on participating web sites listed in Table 1. These reports contain corrected data for several spring or fall frosts and accompanying frost free periods in Table 6 and 7 of the 2007 report and Tables 3 and 4 of the 2008 and 2009 reports; updated 2008 minimum temperature data for December 2008; and corrected Growing Degree Days for 2007, 2008 and 2009.
- All climate data collected by this project is provided to project participants at PARC – Summerland, BC where the data is stored and climate data summaries are prepared. Minimum winter temperatures, growing degree days and frost free periods calculated from this data by PARC participants is provided in Tables 16 and 17.
- Graphs illustrate the low temperatures recorded in November, total annual growing degree days (April 1 – Oct. 31) and frost free period in 2010.
 - On-line accessibility to weather records from the two Davis Vantage Pro 2 stations is available to growers, industry and the public via the Farmwest website www.farmwest.com. The Davis Vantage Pro stations at Diamond S or Halfway Ranch are accessible at <http://www.farmwest.com/index.cfm?method=climate.showclimate>.
- Minimum winter temperatures from Environment Canada weather stations at Lillooet and Lytton for the months of December 2009, January, November and December 2010 are compared with minimum temperatures at Environment Canada weather stations in other locations listed in Table 9.
- A field day October 2, 2010 to show and discuss the project and the test planting at Roshard Vineyard.
- Project outputs include on-going assessment and recording of the effects of low winter temperatures, growing degree days and frost free period, vine performance and condition, and consultations with vineyard owners regarding all aspects of vineyard management.
- The quality of the grapes is monitored during September and October in a lab facility provided by Roshard Vineyard. Fruit quality is determined by measuring the amount of sugar, acid and pH of the grape juice. Results of fruit quality analysis for 2010 immediately prior to harvest are provided in Table 12. Fruit quantity analysis for fruit at harvest is provided in Table 13.

PROGRESS TOWARDS ACHIEVING PROJECT OBJECTIVES AND BENEFITS

Objectives

1) To test the suitability and performance of wine grape varieties in the Lytton-Lillooet region.

- Vineyards were visited to record phenological events, presence of diseases or insects, vine and vineyard conditions and to provide consultations to vineyard managers before pruning, during the growing season and in the autumn.
- Viticulture observations record phenology events and dates (Table 10, 11), monitoring fruit quality development (Table 12,) cane (or wood) maturity of vines by Oct. 1, 2010 (Table 14).
- Fruit quality analysis at Roshard Vineyard, Wonderland Farms and Pietila Vineyard immediately prior to harvest are provided in Table 12 Fruit quality analysis at harvest for Roshard Vineyard by PARC, Summerland is summarized in Table 13.
- Observations of grape varieties at Roshard Vineyard include the Foch variety established in a separate adjacent planting in 1972.
- Low temperatures October 11 and 12, 2009 in all test vineyards froze the foliage as well as immature shoots. A low of -5.9°C was recorded in the Roshard vineyard October 12 while the Pietila and Wonderland Farms recorded temperatures of -2.8°C . Wood maturity assessments October 17, 2009 suggest that dormant wood was generally well matured. Large numbers of fruit buds were destroyed by climbing cutworms in late winter-early spring 2010 at Roshard Vineyard. Growth in the spring of 2010 consisted primarily of secondary buds resulting in reduced bloom and reduced fruit production. Vineyards received more rain than normal during bloom and this negatively affected the set. The generally cooler growing season contributed to delayed fruit maturity although a warm autumn helped to ripen fruit.



Cutworms ate the centre of many buds at Roshard Vineyard in 2010

- A serious outbreak of powdery mildew in late August and early September occurred at Roshard Vineyard. Sulphur sprays to control the powdery mildew were moderately successful. Some bunch rot (*Botrytis*) was observed at Roshard Vineyard. Other diseases have not been observed at any of the participating vineyards. Weed control methods vary amongst participants from the use of herbicides to manual weed control.
- All participating vineyards are drip irrigated and have a permanent cover crop. Tensiometers were installed at all sites to monitor soil moisture and assist with irrigation scheduling.
- Participants continue to identify irrigation management and the lack of vine vigour as a major challenge.
- Parts of the Wonderland Farms and Pietila Vineyard plantings have not yet fully recovered from transplanting nursery stock during the summer of June, 2006. Injury caused by low temperatures December 2008 at all test sites resulted in a need to retrain vines of most varieties. All vineyards suffered from low vigour in 2010 despite increased irrigation and fertilization. A small quantity of fruit was produced at all sites.
- Regrowth predominantly from the lower trunk and root area continued in all vineyards in 2010. Retraining of vines trained on a cordon wire continued at Roshard Vineyard.
- Wildlife such as wasps, birds, deer and bears have become a problem. Pietila and Roshard Vineyard have deer fencing. Roshard Vineyard installed electric fencing to protect the grape crop from bears in 2009 and 2010. Modifications to the electric wire spacing were needed in 2010 to keep the bears from digging under the bottom wire to reach the grapes. None of the test vineyards are protected from birds.



These bears damaged the fruit trees and grapes at Roshard vineyard. A bear also visited Wonderland Farm in 2010

2) To develop a climate profile of the area.

- Climatic information from Environment Canada climate stations located near the Village of Lytton and in the District of Lillooet is a component of ongoing climate data collection (Tables 2 to 9).
- The project climate network consists of 3 Weatherhawk and 2 Davis Vantage Pro weather stations; 87 temperature data loggers (iButtons) and 12 Hobo Pro temperature data loggers added to the climate network in 2009.

- Project weather stations and data loggers are located on private property and range in location from approximately 15 km south of Lytton, into the adjacent Botany valley, north along both sides of the Fraser River to the vicinity of Big Bar, a distance of approximately 110 km. Data loggers are located at elevations ranging from 155m to 575m .
- Data from the 3 WeatherHawk and 2 Davis Vantage Pro 2 weather stations was collected every two months; data from the 87 iButtons was collected every 4 months and both sets of data are sent to PARC at Summerland, BC. The Davis Vantage Pro 2 station at Halfway Ranch malfunctioned during part of September and October in 2010. Data from the Hobo Pro 2 data loggers was collected early in 2011.
- Re-calculation of growing degree days for 2007, 2008, 2009 and 2010 was required as a result of more accurate data maximum temperature data available from the Hobo Pro 2 data loggers
- Table 16 and 17 provide a listing of climate data collected from project climate stations and data loggers in 2010 and indicates:
 - The range of Growing Degree Days (GDD) was from 888 to 1503 GDD.
 - The range in the frost free season was from 144 days (April 25 to Sept. 16) to 221 days (April 11 to Nov. 18).
 - The extreme minimum temperatures recorded during the coldest month, November, ranged from -14.00 °C to -22.86° C.
 - Extreme minimum temperatures that ranged from -14 °C to -15.96 ° C were recorded at 21 sites (approximately 20%)
 - Extreme minimum temperatures that ranged from -16.03 °C to -17.88° C were recorded at 56 sites (approximately 55%).
 - Extreme minimum temperatures that ranged from -18.05°C to -19.93° C were recorded at 20 sites (approximately 19 %)
 - Extreme minimum temperatures that ranged from -20 °C to 22.86 °C were recorded at 6 sites (approximately 6%)
 - Extreme minimum temperatures colder than -23° C did not occur.

Benefits

- This project is providing detailed viticulture and climate data for the study area. The data will help to determine if any wine grape varieties planted in the test plantings or other varieties not currently part of the testing program could be grown in the area.
- This project is providing technology transfer in grape production skills to the participants who in turn share their knowledge with interested people.
- Project viticulture and climate data is being studied by individuals interested in the feasibility of growing wine grapes in the study area. Several entrepreneurs have decided to establish vineyards in the Lillooet area. One winery has been established in Lillooet.
- Climate data generated by this project is useful as an assessment tool by producers for other crops.

- Some British Columbia Agrologists visited Roshard Vineyard in 2009 to learn about this project. This meeting has resulted in a Geographical Information System (GIS) project that has produced calculated solar radiation maps of the study area. A dedicated team of professionals have volunteered their time and talents for this project and are led by Mr. David Whiting. The maps should be completed in 2011 and will be posted on Mr. Whiting's web site www.davewhiting.ca/solar. The study area has been mapped at a scale of 1:50,000 and each map (36 in total) represent calculated solar radiation during each of twelve months. Maps will be available as portable document format (pdf) files for free downloads from Mr. Whiting's website. Solar radiation is important for all plant growth, but the maps can be used for any project that requires knowledge of the amount of calculated solar radiation in the area.



Discussion of calculated solar radiation maps Dec. 3, 2010

- In June 2010 participating vineyard owners added a small number of new ultra hardy wine grape varieties (reported hardy to between -30°C and -35°C). A small number of plants of these varieties were provided free of charge by an entrepreneur in Cache Creek. The variety Louise Swenson and Marquette were planted at Wonderland Farms, and at Pietila vineyards. The varieties Marquette, St. Pepin, Frontenac, Frontenac gris, Frontenac blanc, Louise Swenson, ES-5- 17 and a fresh market variety Sommerset were planted at Roshard Vineyard. The wine varieties are reported in Quebec to be competitive in quality with European varieties. While not part of this project, these grape selections may provide useful information for this study area in the future.

WORK PLAN FOR 2011

- The project participants plan to gather and analyze viticulture and climate data and will continue to provide the same level of support as in past years. Vineyard owners will continue to provide the same level of support and will collect phenological data and make vineyard observations.
- Project participants will continue to support the project to produce calculated solar radiation maps for the study area. Special observations will be made of bud survival in the spring of 2011. Some bud and cane damage has occurred in some Okanagan-Similkameen vineyards following low temperatures November 22 to 24, 2010.

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Project technician Norm Vernon collecting climate data from iButton # 16 and 16 Hobo Pro 2



Climate data is provided to Istvan Losso at PARC, Summerland, BC for compilation, storage, and future use.

TABLES

Table 1 Communications 2010

Project progress reports are posted on the following websites:

- District of Lillooet: <http://www.lillooetbc.com/business.aspx>
- Village of Lytton: <http://www.lytton.ca/siteengine/activepage.asp?PageID=78>
- British Columbia Grapegrowers' Association: <http://www.grapegrowers.bc.ca>
- Fraser Basin Council: http://www.fraserbasin.bc.ca/publications/fbc_reports.html
- British Columbia Ministry of Agriculture:
<http://www.al.gov.bc.ca/grape/factsheets.htm>

Articles and solar radiation map web site related to this project:

- The Bridge River Lillooet News. May 5, 2010 'All that's missing is the grapes'.
- The Bridge River Lillooet News. September 22, 2010 "1st Annual Lillooet Beer & Wine Festival".
- John Schreiner on wine: Lillooet pioneering wine growers. Thursday Sept. 2, 2010
<http://johnschreiner.blogspot.com/2010/09/lillooets-pioneering-wine-growers.html>
- Calculated Solar Radiation Maps for the Lillooet-Lytton area www.davewhiting.ca/solar



Muscat Ottonel grape at Roshard Vineyard

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Table 2 Location of Environment Canada Weather Stations at Lytton and Lillooet

Active Environment Canada weather stations

Lytton station Latitude 50° 13'28.0 N Longitude 121° 34'55.00'W Elevation 225m
 Lillooet Station Latitude 50° 41'01.380N Longitude 121° 56'02.820'W Elevation 235m

Deactivated Environment Canada weather stations referred in Table 4, 5 and 7

Lillooet Seton BCHPA Latitude 50°40'24.000"N Longitude 121°55'27.000"W Elevation 198.1m
 Lillooet Russell St. Latitude 50°42'00.000"N Longitude 121°56'00.000"W Elevation 243.80m

Table 3 Lytton Frost Free Periods and Extreme Minimum Temperatures

Year	Date Last Spring Frost & Temp. (°C)	Date First Fall Frost & Temp. (°C)	Frost Free Periods (days)	Extreme Minimum Temperatures (°C)
1941-70	April 24	Oct. 24	183	Jan. (-31.7) (year n/a)
1951-80	April 20	Oct. 24	187	Jan. (-31.7) (year n/a)
1961-90	Not available	n/a	n/a	Dec. 31, 1984 (-27.1) Nov. 27, 1985 (-27.7)
1971-2000	Not available	n/a	n/a	Nov. 27, 1985 (-27.1) Dec. 31, 1984 (-27.1)
1995	April 20 (-1.3)	Oct. 28 (-0.3)	191	Dec 8 (-18.6)
1996	April 4 (-0.4)	Oct 20 (-1.4)	199	Jan 30 (-22.8)
1997	April 11 (-2.0)	Oct 20 (-0.6)	192	Jan 26 (-22.0)
1998	April 15 (-1.5)	Nov 10 (-0.6)	209	Jan 12 (-22.9)
1999	May 10 (-0.2)	Oct 27 (-1.1)	170	Jan 24 (-11.0)
2000	April 14 (-0.4)	Nov 6 (-0.8)	206	Jan 20(-14.3)
2001	April 15 (-0.8)	Oct 28 (-1.1)	196	Feb 7 (-10.0)
2002	April 25 (-0.8)	Oct 24 (-2.3)	182	Jan 28 (-17.1)
2003	April 6 (-0.6)	Oct 31 (-4.1)	208	Mar 8 (-12.7)
2004	April 2 (-2.0)	Oct 27 (-1.3)	208	Jan 5 (-20.4)
2005	April 9 (-0.2)	Nov.14 (-1.1)	219	Jan 15 (-22.3)
2006	May 3 (-0.2)	Oct. 30 (-3.8)	180	Nov. 29 (-20.0)
2007	April 11 (-0.8)	Nov. 2 (-0.4)	205	Jan 12 (-16.0)
2008	April 26 (-0.5)	Oct. 11 (-1.8)	168	Dec. 20 (-23.5)
2009	April 24 (-2.0)	Oct. 10 (- 1.7)	169	Dec. 14 (-18.8)
2010	April 11 (-2.2)	Nov. 11 (-0.5)	214	Nov. 24 (- 15.7)
Average 195-2010	April 17 (-1.0)	Oct. 28 (-1.4)	195	Extreme minimum 1995-2010, -23.5°C, Dec. 20, 2008

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Table 4 Lillooet Frost Free Periods and Extreme Minimum Temperatures

Year	Date Last Spring Frost & Temp. (°C)	Date First Fall Frost & Temp. (°C)	Frost Free Periods in Days	Extreme Minimum Temperatures(°C)
1968 (Russell St.)*	April 22 (-1.1)	Nov. 1 (-2.8)	193	Dec. 30 (-31.1°C)
1969(Russell St.)*	April 3 (-1.1)	Oct. 4 (-1.1)	184	Jan. 29 (-31.1°C)
1995 (BCHPA)*	April 20 (-1.0)	Oct. 18 (-2.0)	181	Dec. 9 (-24.5)
1996 (BCHPA)*	April 3 (-2.0)	Oct. 26 (-1.0)	206	Dec. 27 (-24.5)
1997 (BCHPA)*	April 11 (-2.0)	Nov. 10 (-1.5)	213	Jan. 26 (-23.5)
1998	April 15 (-1.1)	Oct 24 (-0.2)	192	Jan 12 (-25.1)
1999	May 10 (-0.1)	Oct 23 (-0.3)	166	Jan 20 (-11.2)
2000	April 17 (-0.1)	Oct 6 (-0.8)	172	Jan 20(-15.5)
2001	April 12(-3.3)	Oct 25 (-1.2)	196	Feb 7 (-10.4)
2002	April 25 (-0.4)	Oct 12 (-1.5)	170	Jan 28 (-17.7)
2003	April 18 (-0.1)	Oct 15 (-0.1)	180	Mar 8 (-14.4)
2004	April 3 (-0.5)	Oct 27 (-1.3)	207	Jan 6 (-22.7)
2005	April 14 (-0.6)	Oct. 27 (-0.8)	196	Jan 15 (-25.4)
2006	April 17 (-0.6)	Oct. 30 (-3.7)	196	Nov. 29 (-20.0)
2007	Missing	Oct. 26 (-1.0)	M	Dec 8 (-18.2)
2008	April 26 (-0.1)	Oct. 9 (-1.1)	166	Dec. 20 (-24.6)
2009	April 26 (-0.1)	Oct. 10 (-0.6)	167	Dec. 14 (-20.1)
2010	April 11 (-1.0)	Oct. 17 (-1.8)	189	Nov. 23 (-16.2)
Average 1995-2010	April 17 (-1.0)	Oct. 21 (-1.2)	186	Extreme minimum 1995-2010, -24.6°C Dec. 20 2008

* See Table 2



Location of iButton # 44

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Table 5 Lytton and Lillooet Growing Degree Days (GDD) April – October (base 10° C)

Year	Lytton	Lillooet
1951-80	1,368	1,266
1995	1,401	1,399 (BCHPA)*
1996	1,223	1,203 (BCHPA)*
1997	1,315	1,230 (BCHPA)*
1998	1,665	1,719
1999	1,179	1,229
2000	1,256	1,262
2001	1,407	1,379
2002	1,374	1,406
2003	1,580	1,562
2004	1,618	Missing
2005	1,450	1460
2006	1,578	Missing
2007	1,335	Missing
2008	1,301	1,333
2009	1,644	1,651
2010	1,285	1,351
Average GDD 1995 -2010	1,390	1399
* See Table 2		



Location of iButton # 33

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Table 6 Precipitation (mm) and Hours of Bright Sunshine (April-October) - Lytton

	Precipitation (mm)						May-Oct. Total	Total Annual Precipitation (mm)	Hours Bright Sunshine Apr.-Oct.
	May	June	July	Aug	Sept	Oct			
1941-70	15	21	12	19	23	50	140	335	n/a
1951-80	15	18	12	23	25	45	138	327	1584
1961-90	18	18	14	17	26	35	128	324	1529
1971-2000	18	19	14	23	27	36	137	339	1523
1997	18	15	3	11	17	60	124	297	n/a
1998	41	31	10	0.5	2	40	125	401	n/a
1999	14	10	58	27	20	40	169	646	n/a
2000	58	67	336	M	M	48	>509	>673	n/a
2001	17	M	M	2	23	25	>67	>302	n/a
2002	28	16	21	33	18	4	120	278	n/a
2003	6	20	M	13	8	137	>184	> 500	n/a
2004	27	9	27	17	42	33	155	357	n/a
2005	31	46	17	30	33	32	189	435	n/a
2006	25	33	3	10	18	24	113	599	n/a
2007	19	28	16	20	32	30	145	502	n/a
2008	25	35	29	40	31	15	175	374	n/a
2009	M	25	26	5	12	M	>68	>69	n/a
2010	53	30	32	53	51	22	241	> 542	n/a
1997-2010	28	28	48	20	24	39	>156	>432	n/a

M= Missing data. n/a means not available



Pinot Blanc at budbreak in Pietila vineyard May 5, 2010

Table 7 Precipitation (mm) - Lillooet

	Precipitation (mm)						May-Oct. Total	Total Annual Precipitation (mm)
	May	June	July	Aug	Sept	Oct		
1941-1970	21	28	25	26	33	46	179	327
1951-1980	16	30	21	26	26	31	276	276
1995	5	28	32	28	11	40	144	> 276 (BCHPA)*
1996	35	9	9	25	47	43	168	> 252 (BCHPA)*
1997	30	39	9	11	18	35	142	321 (BCHPA)*
1998	15	29	44	4	24	30	146	334
1999	7	13	81	15	14	3	133	297
2000	52	14	37	21	16	52	192	265
2001	6	35	40	8	9	31	129	298
2002	32	9	13	19	M	1	>74	>166
2003	16	24	1	9	22	58	130	319
2004	24	22	32	9	30	M	>117	>173
2005	M	M	18	31	73	M	>122	>122
2006	M	M	M	M	M	M	M	M
2007	M	M	M	18	44	M	>62	>62
2008	32	39	8	22	32	M	>133	>133
2009	7	6	2	8	M	M	>23	>23
2010	68	17	13	21	50	M	> 169	>169
1995-2010	25	22	25	17	30	33	>148	>303

M means missing data. * See Table 2

Table 8 Location of Selected Environment Canada (EC) Weather Stations Used to Compare Minimum Winter Temperatures at Stations at Lillooet and Lytton in Table 9

Name	Latitude	Longitude	Elevation (m)	Elevation (feet)
Kamloops Airport	50°42'08.00 N	120°26'31.00 W	345.3	1133
Kelowna AWOS	49°57'26.00 N	119°22'40.00 W	433.1	1421
Lillooet	50°44'01.38 N	121°56'23.00 W	235.0	771
Lytton	50°13'28.00 N	121°34'55.00 W	225.0	738
Lytton RCS	50°13'28.00 N	121°34'55.00 W	225.0	738
Penticton Airport	49°27'47.00 N	119° 36'08.00 W	334.1	1129
Summerland CS	49°33'49.40 N	119°36'18.20 W	454.2	1490
Osoyoos CS	49°01'42.00 N	119°26'28.00 W	282.9	928

Table 9 Minimum Temperatures (°C) December 2009, January, November and December 2010 at Selected Environment Canada Weather Stations

Stations	Dates			
	Dec. 2009	Jan. 2010	Nov. 2010	Dec. 2010
Kamloops A	-22.7	-15.4	-20.0	-14.3
Kelowna	-19.3	-14.0	-21.0	-16.7
Lillooet	-20.1	-15.0	-16.2	-11.6
Lytton	-18.8	-11.1	-15.7	-11.3
Lytton RCS	-18.7	-11.1	-15.9	-11.5
Penticton A	-14.1	-10.5	-17.5	-12.6
Summerland CS	-13.4	-9.3	-17.7	-13.4
Osoyoos CS	-14.0	-12.0	-17.5	-12.1

Table 10 Approximate Date Grape Varieties in Test Vineyards Reached Woolly Bud or Bud Break Stages in 2010

Grape Variety	Vineyard and observed date				
	Roshard Vineyard Woolly Bud	Bud Break	Wonderland Farms Woolly Bud	Bud Break	Pietila Vineyard Bud Break
Cabernet Franc	April 19	April 28	April 27	April 27	
Cabernet Sauvignon	April 28	May 10	April 27		May 5
Chancellor	April 20	May 10	April 24	April 27	
Chardonnay	April 25	May 1	April 27		May 5
Foch	April 16	April 23	April 27		
Gewurztraminer	April 20	April 28	April 27	May 4	May 5
Göcseji Zamatós	April 20	May 3	April 27		May 5
Johannisberg	April 25	May 4	April 27		
Riesling					May 5
Limberger	April 20	April 28	April 24	April 27	
Merlot	April 18	May 12			May 5
Muscat Ottonel	April 25	May 4	April 27	May 4	
Petite Verdot	April 25	May 1			
Pinot Blanc	April 25	April 29	April 27	May 4	May 5
Pinot Gris	April 25	May 1	April 27		
Pinot Noir	April 25	May 3	April 27	May 4	May 5
Riesling Muscat	April 27	May 8	April 27		
Sauvignon Blanc	April 25	May 1	May 4		
Syrah	April 28	May 12	April 27		May 5
Tinta Madeira	April 25	May 3	April 27	May 4	
Viognier	April 19	April 29			
Zweigeltrebe	April 19	April 28			

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Table 11 Approximate Bloom Date of Primary Clusters of Grape Varieties in Test Vineyards - 2010

Grape Variety	Vineyard		
	Roshard Vineyard	Wonderland Farm	Pietila Vineyard
Cabernet Franc	June 6	May 31	
Cabernet Sauvignon	June 8		
Chancellor	June 6	May 22	
Chardonnay	June 6	May 31	
Foch			
Gewurztraminer		May 4	
Göcseji Zamatos	June 8		
Johannisberg Riesling	June 6	May 22	June 25 (Secondary)
Limberger	June 8	May 31	
Merlot	June 8	May 31	
Muscat Ottonel	June 8	May 31	
Petite Verdot	June 8		
Pinot Blanc	June 6	May 31	June 25 (Secondary)
Pinot Gris	June 8		
Pinot Noir	June 8	May 22	
Riesling Muscat	June 8	May 31	
Sauvignon Blanc			
Syrah	June 8	May 31	
Tinta Madeira	June 6	May 31	
Viognier	June 6		
Zweigeltrebe	June 6		

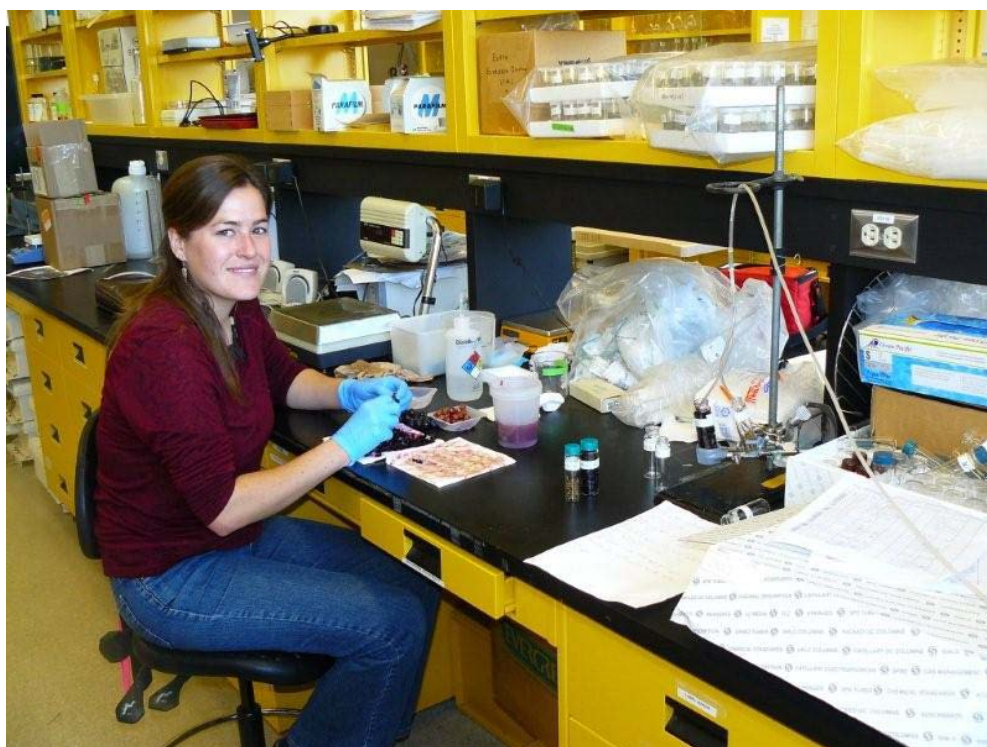


Secondary Chancellor cluster in bloom at Wonderland farm June 25, 2010

Table 12 Final Pre Harvest Analysis of Grapes from Participating Vineyards - 2010				
Vineyard and Variety	Analysis Date	% Brix	Harvest Date	Yield (Kg)
Pietila Vineyard				
Riesling	October 1	17.0	Oct. 5	n/a
Pinot Blanc	October 1	19.2	Oct. 5	n/a
Cabernet Sauvignon	October 1	18.0	Oct. 5	n/a
Wonderland Farm				
Chancellor	October 1	15.5	Oct. 5	n/a
Chardonnay	October 1	17.0	Oct. 5	n/a
Limberger	October 1	15.5	Oct. 5	n/a
Muscat Ottonel	October 1	22.0	Oct. 5	n/a
Riesling Muscat	October 1	18.0	Oct. 5	n/a
n/a means not available				
Roshard Vineyard				
Cabernet Franc	October 16	17.4	Oct. 17	10.9
Cabernet Sauvignon	October 16	21.0	Oct. 17	5.0
Chancellor	October 16	15.8	Oct. 17	15.9
Chardonnay	October 16	20.0	Oct. 17	4.5
Foch	October 1	24.8	Oct. 3	535.0
Gewurztraminer	October 9	23.0	Oct. 10	2.2
Göcseji Zamatós	October 16	23.2	Oct. 17	5.5
Johannisberg Riesling	October 16	17.8	Oct. 17	5.5
Limberger	October 16	20.4	Oct. 17	10.9
Merlot	October 16	22.8	Oct. 17	2.2
Muscat Ottonel	October 16	22.8	Oct. 10	5.5
Petite Verdot	October 16	18.0	Oct. 17	2.7
Pinot Blanc	October 16	22.0	Oct. 17	8.1
Pinot Gris	October 16	20.8	Oct. 17	6.8
Pinot Noir	October 16	21.2	Oct. 17	7.7
Riesling Muscat	October 9	20.0	Oct. 9	6.4
Sauvignon Blanc	October 16	22.4	Oct. 17	6.8
Syrah	October 16	18.6	Oct. 17	4.0
Tinta Madeira	October 16	18.6	Oct. 17	4.0
Viognier	October 16	13.2	Oct. 17	6.8
Zweigeltrebe	October 16	22.8	Oct. 17	4.5
Malfunctioning pH meter prevented calculation of pH and Total Acid				



Doug Robson checks grape quality prior to harvest at Roshard Vineyard



Emmanuelle Jean prepares grape samples for analysis at PARC, Summerland, BC

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Table 13 Analysis of Harvested Grape Samples from Roshard Vineyard Conducted at the Pacific Agri-Food Research Centre (PARC), Summerland BC - Dec. 8, 2010

Sample	Variety	Berry Weight (gm)	Brix %	pH	Total Acid (mg/l)	Harvest Date
1	Okanagan Riesling	1.36	19.3	3.42	8.6	17 Oct.
2	Pinot gris	0.85	20.1	3.63	4.3	17 Oct.
3	Viognier	0.80	15.1	3.20	8.4	17 Oct.
4	Johannesburg Riesling	0.69	17.5	3.19	8.7	17 Oct.
5	Merlot	0.80	22.9	3.39	4.7	17 Oct.
6	Sauvignon blanc	1.09	20.7	3.32	7.1	17 Oct.
7	Pinot blanc	1.13	21.1	3.46	6.4	17 Oct.
8	Chardonnay	0.92	18.7	3.57	7.4	17 Oct.
9	Muscat Ottonel	1.11	15.5	3.33	5.7	10 Oct.
10	Cocseji Zamos	1.09	15.2	3.17	7.3	17 Oct.
11	Tinta Madeira	1.00	18.8	3.30	8.1	17 Oct.
12	Syrah	0.96	18.0	3.15	8.3	17 Oct.
13	Chancellor	1.12	17.6	3.32	8.2	17 Oct.
14	Zweigeltrebe	0.88	18.7	3.46	4.8	17 Oct.
15	Petit Verdot	0.89	16.4	3.37	10.5	17 Oct.
16	Cabernet Franc	0.87	18.3	3.25	7.0	17 Oct.
17	Cabernet Sauvignon	0.79	19.3	3.19	7.0	17 Oct.
18	Limberger	1.23	20.1	3.37	4.9	17 Oct.
19	Pinot noir	0.86	18.5	3.65	6.0	17 Oct.
20	Gewurztraminer	0.90	21.0	3.60	3.5	10 Oct.
21	Riesling Muscat	0.72	18.2	3.69	2.4	17 Oct.
22	Foch	0.90	25.5	3.81	6.9	3 Oct.
23	Riesling Muscat	0.79	19.4	3.79	2.4	17 Oct.
24	Gewurztraminer	0.70	21.4	3.51	3.7	17 Oct.

Fruit quality at harvest strives for a balance of 22 % Brix or higher, 3.2 pH or higher, Total Acid 6 to 8. These targets are not always met for various reasons and require adjustments by the winemaker.

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Table 14 Estimated Percent Cane Maturity in Participating Vineyards October 1, 2010

Grape Variety	Vineyard		
	Roshard Vineyard	Pietila Vineyard	Wonderland Farms
	%	%	%
Cabernet Franc	95		85
Cabernet Sauvignon	60	85	85
Chancellor	80		90
Chardonnay	50	75	85
Göcseji Zamatós	50	80	70
Foch	70		
Gewurztraminer	50	75	75
Johannisberg Riesling	55	90	95
Limberger	70		85
Merlot	85	80	80
Muscat Ottonel	40		90
Petit Verdot	70		
Pinot Blanc	50	80	85
Pinot Gris	65		80
Pinot Noir	90	85	95
Riesling Muscat	45		90
Sauvignon Blanc	15		70
Syrah	70	85	90
Tinta Madeira	75		80
Viognier	30		
Zweigeltrebe	65		

All varieties are not planted at all sites.



Limberger Oct. 1, 2010 at Roshard Vineyard

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Table 15 Type of Weather Station, Data Loggers and Elevation at Project Locations		
Property Name	Station Elevation (m)	Type of Weather Station
Diamond S Ranch	445	Davis Vantage Pro 2 & iButton # 83
Grossler Farm	304	Weather Hawk & iButton # 84
Halfway Ranch	308	Davis Vantage Pro 2 & iButton # 86
Wonderland Farms	348	iButton # 9
Pietila Vineyard	349	iButton # 12
Roshard Vineyard	210	Weather Hawk & iButton # 85
Ruddock Ranch	400	Weather Hawk & iButton # 87
Hobo Pro 2 Data Loggers are located at the following iButton locations and are referred to in Tables 16 & 17 by the same iButton number. There are no iButtons at 88 & 89 Hobo Pro 2.		
Ibutton 9	340	9 Hobo Pro 2
Ibutton 16	265	16 hobo Pro 2
Ibutton 38	243	38 Hobo Pro 2
Ibutton 44	520	44 Hobo Pro 2
Ibutton 49	200	49 Hobo pro 2
Ibutton 50	190	50 Hobo Pro 2
Ibutton 74	400	74 hobo Pro 2
Ibutton 83	445	83 hobo Pro 2
Ibutton 86	308	86 Hobo Pro 2
Ibutton 87	400	87 hobo Pro 2
35 km north of Lillooet on West Pavillion Rd	540	88 Hobo Pro 2
19 km south of Lillooet on Texas Creek Rd.	393	89 Hobo Pro 2



Pruning the Pietila vineyard March 2010

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Table 16 Extreme Minimum Winter Temperatures (° C) at iButton; Hobo Pro 2 and Weather Station Locations								
I Button Number (No), Hobo Pro 2 and Elevation (m)		Dec.	Jan.	Dec.	Jan.	Dec.	Jan.	Nov.
No.	m	2007	2008	2008	2009	2009	2010	2010
1	340	-17.25	-19.40	-24.09	-18.96	-20.99	-13.91	-16.62
2	190	-18.11	-17.73	-22.79	-18.30	-18.93	-14.51	-15.33
3	217	-17.64	-18.78	-23.65	-18.34	-19.92	-14.49	-15.43
4	341	-17.98	-19.37	-23.55	-18.86	-19.87	-14.44	-16.08
5	336	-18.30	-19.38	-23.87	-19.50	-20.45	-15.65	-16.53
6	328	-19.48	-21.44	-24.10	-19.86	-19.92	-13.73	-16.89
7	309	-17.78	-19.87	-26.34	-19.87	-22.41	-15.44	-18.10
8	424	-21.38	-21.45	-28.95	-22.83	-23.84	-18.42	-20.12
9	340	-17.69	-20.15	-26.52	-19.96	-22.36	-14.98	-17.50
9 Hobo Pro 2	340	n/a	n/a	n/a	n/a	-22.73	-15.02	-17.68
10	315	-18.47	-19.03	-25.48	-20.30	-20.87	-15.18	-17.58
11	225	-16.43	-18.38	-24.17	-18.19	-20.14	-15.11	-17.12
12	349	-17.78	-19.62	-25.71	-19.87	-21.27	-14.17	-16.39
13	300	-20.36	-19.41	-25.30	-20.42	-20.29	-16.05	-16.94
14	271	-18.17	-18.11	-22.21	-18.74	-18.86	-14.70	-15.33
15	297	-17.98	-18.23	-22.41	-18.23	-19.18	-14.19	-15.26
16	263	-19.20	-18.76	-23.75	-18.95	-20.09	-13.91	-16.93
16 Hobo Pro 2	265	n/a	n/a	n/a	n/a	-20.07	-14.55	-16.70
17	297	-19.27	-18.76	-23.52	-18.95	-19.39	-14.51	-17.17
18	339	-17.71	-19.10	-23.21	-18.59	-19.42	-14.55	-16.89
19	316	-17.72	-18.80	-23.49	-18.73	-19.68	-14.11	-16.64
20	241	-17.67	-17.99	-22.62	-17.99	-18.62	-13.86	-15.94
21	267	-17.03	-18.37	-23.64	-18.62	-19.64	-14.18	-15.89
22	284	-20.09	-20.53	-26.28	-20.72	-20.91	-15.48	-17.19
23	200	-18.15	-18.85	-24.16	-18.72	-19.60	-14.61	-16.13
24	369	-17.15	-18.92	-23.67	-18.86	19.93	-12.97	-16.71
25	375	-17.29	-19.57	-24.44	-19.25	-20.51	-13.69	-16.66
26	352	-17.76	-18.77	-23.46	-18.52	-19.47	-13.46	-16.49
27	318	-17.55	-18.69	-23.41	-18.62	-19.88	-13.90	-16.55
28	375	-22.54	-21.78	-29.06	-22.54	-21.66	-16.04	-22.86
29	385	-21.91	-21.91	-28.61	-22.10	-21.78	-15.09	M
30	405	-18.62	-20.90	-27.63	-21.28	-23.19	-15.71	-18.68
Continued								

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Table 16 Extreme Minimum Winter Temperatures (° C) at iButton; Hobo Pro 2 and Weather Station Locations								
I Button Number (No), Hobo Pro 2 and Elevation (m)		Dec.	Jan.	Dec.	Jan.	Dec.	Jan.	Nov.
No.	m	2007	2008	2008	2009	2009	2010	2010
31	413	-18.81	-21.27	-28.17	-21.59	-23.49	-15.52	-18.74
32	238	-17.16	-18.62	-24.75	-19.12	-20.58	-14.77	-16.79
33	255	-16.58	-17.27	-22.18	-17.08	-18.61	-14.17	-15.19
34	264	-16.26	-17.02	-22.47	-17.40	-18.34	-13.43	-15.00
35	310	-16.33	-17.59	-23.22	-17.47	-19.17	-13.48	-15.57
36	415	-16.94	-19.22	-24.10	-18.53	-19.98	-13.53	-17.51
37	352	-16.48	-18.57	-23.47	-18.26	-19.46	-12.87	-17.18
38	243	-14.63	-17.36	-24.09	-17.17	-19.20	-10.70	-17.23
38 Hobo Pro 2	243	n/a	n/a	n/a	n/a	-19.19	-10.93	-17.00
39	265	-14.79	-17.63	-24.31	-17.82	-19.14	-11.01	-17.31
40	266	-15.27	-16.85	-24.25	-17.54	-18.81	-11.48	-15.96
41	287	-15.23	-17.25	-23.69	-17.25	-19.58	-10.69	-17.88
42	255	-15.33	-16.91	-23.36	-17.29	-19.06	-13.31	-16.03
43	240	-15.30	-16.87	-23.93	-17.88	-18.70	-11.71	-16.43
44	520	-17.64	-21.63	-23.28	0.00	-24.17	-14.03	-21.63
44 Hobo Pro 2	520	n/a	n/a	n/a	n/a	-23.78	-13.77	-22.37
45	412	-17.98	-20.00	-24.29	-19.56	-20.82	-13.19	-16.34
46	285	-18.14	-19.34	-24.59	-19.27	-20.66	-14.47	-15.93
47	256	-16.96	-18.86	-23.36	-18.23	-19.62	-13.55	-15.63
48	210	-16.85	-18.05	-23.15	-17.98	-19.18	-13.95	-14.96
49	196	-17.68	-18.56	-23.61	-18.56	-19.13	-13.89	-15.22
49 Hobo Pro 2	200	n/a	n/a	n/a	n/a	-19.20	-14.00	-15.14
50	190	-15.94	-16.96	-22.66	-17.46	-18.42	-10.19	-17.08
50 Hobo Pro 2	190	n/a	n/a	n/a	n/a	-18.61	-10.48	-16.28
51	175	-16.14	-17.59	-23.41	-16.90	-19.36	-13.17	-16.58
52	157	-16.25	-17.45	-23.33	-16.88	-19.10	-12.21	-16.57
53	348	-18.89	-20.02	-25.39	-19.96	-20.66	-16.37	-16.37
54	353	-18.16	-19.87	-24.68	-19.43	-20.63	-15.00	-16.52
55	364	-17.61	-19.94	-24.76	-19.18	-21.08	-14.87	-16.77
56	364	-17.30	-20.01	-25.31	-19.81	-21.46	-14.52	-16.47
57	416	-17.39	-20.11	-25.12	-19.86	-21.31	-13.27	-16.50
58	382	-17.26	-20.15	-24.57	-18.89	-20.91	-13.48	-16.56
59	302	-19.95	-19.45	-24.80	-19.95	-19.58	-15.49	-17.75
Continued								

2010 PROGRESS REPORT

Table 16 Extreme Minimum Winter Temperatures (° C) at iButton; Hobo pro 2 and Weather Station Locations

I Button Number (No), Hobo Pro 2 and Elevation (m)		Dec.	Jan.	Dec.	Jan.	Dec.	Jan.	Nov.
No.	m	2007	2008	2008	2009	2009	2010	2010
60	402	-22.54	-22.92	-28.91	-22.41	-23.42	-17.19	-19.20
61	158	-15.09	-17.35	-24.13	-17.60	-19.42	-14.46	-16.66
62	250	-16.15	-16.59	-22.48	-17.16	-18.30	-13.44	-15.20
63	275	-16.21	-17.10	-22.80	-17.22	-18.43	-13.30	-15.71
64	250	-16.26	-17.59	-23.36	-16.96	-19.81	-10.57	-16.13
65	274	-17.25	-19.40	-24.09	-18.33	-21.43	-12.77	-18.20
66	200	-16.57	-16.69	-22.88	-17.26	-18.77	-13.35	-15.75
67	275	-16.91	-17.73	-22.92	-17.73	-18.74	-13.37	-16.03
68	302	-16.66	-17.98	-23.61	-18.36	-19.12	-13.88	-16.03
69	288	M	-19.17	-25.44	-20.56	-19.87	-16.70	-18.28
70	277	-18.42	-19.12	-24.37	-19.62	-19.43	-17.53	-17.03
71	318	-17.07	-19.08	-23.57	-18.89	-19.71	-13.77	-16.05
72	407	-19.75	-21.78	-28.04	-21.14	-23.61	-15.27	-19.50
73	572	-20.17	-24.56	-29.07	-22.65	-25.57	-16.11	-22.08
74	400	-21.08	-22.85	-30.08	-23.55	-26.02	-16.90	-19.17
74 Hobo Pro 2	400	n/a	n/a	n/a	n/a	-26.25	-16.74	-19.93
75	285	-19.94	-21.78	-29.12	-21.97	-24.88	-15.96	-17.60
76	490	-20.33	-22.98	-31.36	-23.99	-26.88	-16.93	-19.70
77	510	-22.60	-23.93	-30.26	-24.31	-27.16	-16.66	-20.70
78	465	-20.81	-22.96	-31.12	-24.41	-27.13	-16.77	-19.74
79	428	-21.69	-22.51	-30.42	-24.03	-27.32	-16.70	-19.35
80	222	-17.44	-17.31	-22.05	-17.82	-18.51	-13.65	-15.54
81	182	-17.33	-16.83	-21.38	-17.14	-17.77	-13.48	-14.99
82	300	-17.05	-19.37	-24.65	-20.63	-20.69	-16.29	-18.68
83	445	-19.39	-21.47	-20.02	M	-24.19	-15.23	-19.20
83 Hobo Pro 2	445	n/a	n/a	n/a	n/a	-24.54	-15.67	-19.01
84	304	-17.97	-18.86	-24.88	-19.24	-20.76	-15.19	-18.16
85	210	-16.41	-18.06	-24.03	-18.76	-19.27	-14.77	-16.16
86	308	-19.17	-18.91	-24.79	-19.48	-19.55	-14.12	-17.15
86 Hobo Pro 2	308	n/a	n/a	n/a	n/a	-19.84	-15.06	-17.51
87	400	-16.72	-18.88	-23.90	-18.18	-19.96	-12.16	-18.05
87 Hobo Pro 2	400	n/a	n/a	n/a	n/a	-17.81	-12.42	-16.66

Continued

2010 PROGRESS REPORT

Table 16 Extreme Minimum Winter Temperatures (° C) at iButton; Hobo Pro 2 and Weather Station Locations

I Button Number (No), Hobo pro 2 and Elevation (m)		Dec.	Jan.	Dec.	Jan.	Dec.	Jan.	Nov.
No.	m	2007	2008	2008	2009	2009	2010	2010
88 Hobo Pro 2	540	n/a	n/a	n/a	-20.40	n/a	-15.22	-16.37
89 Hobo Pro 2	393	n/a	n/a	n/a	-14.79	n/a	-4.44	-14.00
		Project and Environment Canada Weather Stations						
Grossler	304 m	-19.67	-19.71	-26.02	-19.92	-21.19	-16.57	-18.80
Ruddock	400 m	-18.00	-19.59	-24.51	-18.98	-20.57	-13.95	-18.58
Roshard	210 m	-18.28	-19.16	-24.83	-18.96	-19.91	-15.70	-17.07
Diamond S	445 m	-19.33	-14.39	-27.39	M	-23.60	-14.70	-18.40
Halfway Ranch	308 m	-17.94	-18.61	M	-19.48	-19.67	M	-16.40
Lillooet	235 m	-17.50	-18.50	-24.60	-19.00	-20.10	-15.00	-16.2
Lytton	225 m	-16.00	-16.70	-23.50	-17.30	-18.80	-11.10	-15.7

n/a means not available. M means missing data



86 Hobo Pro 2 and iButton 86 at Halfway Ranch

2010 PROGRESS REPORT

Table 17 Total Growing Degree Days (GDD) ¹ and Length of Frost Free Season at iButton; Hobo Pro 2 and Weather Station Locations									
I Button Number (No), Hobo Pro 2 and Elevation (m)		Growing Degree Days ¹ Corrected Data (Base 10°C)				Length of Frost Free Season (Days)			
No.	m	2007*	2008	2009	2010	2007*	2008	2009	2010
1	340	475	1310	1708	1420	188	169	169	189
2	190	364	1055	1302	1088	188	166	169	189
3	217	411	1206	1492	1196	188	169	169	189
4	341	414	1148	1458	1179	188	169	169	189
5	336	403	1108	1398	1131	188	169	167	177
6	328	362	1065	1338	1015	188	166	169	189
7	309	463	1403	1682	1381	188	171	178	189
8	424	425	1244	1550	1261	187	158	158	160
9	340	457	1320	1621	1310	187	169	169	190
9 Hobo Pro 2	340	n/a	n/a	1610	1312	n/a	n/a	169	190
10	315	472	1282	1579	1239	187	160	167	188
11	225	471	1306	1586	1299	188	166	165	188
12	349	463	1306	1612	1271	188	166	169	190
13	300	357	1175	1526	1203	188	166	152	160
14	271	388	1286	1604	1312	188	166	169	189
15	297	404	1289	1580	M	188	166	166	189
16	263	M	1131	1450	1153	M	166	167	189
16 Hobo Pro 2	265	n/a	n/a	1394	1152	n/a	n/a	167	189
17	297	383	1197	1493	1176	188	166	167	189
18	339	392	1247	1528	1170	188	166	169	189
19	316	381	1229	1522	1205	188	166	169	190
20	241	416	1295	1654	M	188	166	169	189
21	267	376	1278	1615	1288	188	169	167	164
22	284	358	1220	1530	1221	188	160	165	189
23	200	376	1252	1573	1341	188	166	167	189
24	369	385	1296	1596	1264	188	169	169	189
25	375	M	1291	1563	1230	M	166	169	189
26	352	M	1266	1546	1223	M	169	169	189
27	318	392	M	1589	1282	188	169	169	160
28	375	206	1141	1423	1135	175	160	159	160
29	385	201	1131	1442	1124	175	159	160	163
30	405	227	1202	1493	1165	188	166	169	189
Continued									

2010 PROGRESS REPORT

Table 17 Total Growing Degree Days (GDD) ¹ and Length of Frost Free Season at iButton; Hobo Pro 2 and Weather Station Locations									
I Button Number (No) Hobo Pro 2 and Elevation (m)		Growing Degree Days ¹ Corrected Data (Base 10°C)				Length of Frost Free Season (Days)			
No.	m	2007*	2008	2009	2010	2007*	2008	2009	2010
31	413	250	1291	1557	1283	188	169	169	160
32	238	277	1324	1639	1354	175	166	165	190
33	255	291	1247	1534	1243	175	168	169	175
34	264	305	1321	1605	1321	188	168	169	189
35	310	301	1318	1613	1272	175	169	169	189
36	415	269	1222	1471	1218	188	169	169	189
37	352	280	1249	1537	1218	188	169	169	189
38	243	263	1352	1630	1333	188	166	169	189
38 Hobo Pro 2	243	n/a	n/a	1577	1356	n/a	n/a	169	189
39	265	256	1315	1598	1274	175	166	169	189
40	266	271	1280	1569	1259	189	172	169	221
41	287	286	1364	1582	1288	188	172	170	190
42	255	275	1308	1603	1305	188	166	169	189
43	240	M	1236	1495	1198	M	169	169	215
44	520	205	921	1190	888	188	159	M	148
44 Hobo Pro 2	520	n/a	n/a	1179	909	n/a	n/a	M	148
45	412	240	1184	1477	1180	188	169	169	189
46	285	229	1166	1510	1181	188	166	167	189
47	256	275	1285	1609	1310	188	171	169	189
48	210	190	1220	1549	1261	188	171	167	189
49	196	202	1311	1642	1379	188	166	167	189
49 Hobo Pro 2	200	n/a	n/a	1593	1436	n/a	n/a	167	189
50	190	235	1308	1565	1312	188	160	167	188
50 Hobo Pro 2	190	n/a	n/a	1499	1292	n/a	n/a	167	189
51	175	225	1233	1526	1263	187	160	167	188
52	157	247	1298	1590	1286	187	160	160	144
53	348	203	1089	1439	1066	188	166	165	174
54	353	201	1130	1698	1252	188	166	169	189
55	364	215	1164	1579	1162	188	166	169	189
56	364	210	338	1516	1163	188	166	169	189
57	416	218	1166	1450	1160	188	169	169	190
58	382	161	1225	1561	1259	188	169	189	189
59	302	151	1154	1476	1127	188	166	160	190
Continued									

2010 PROGRESS REPORT

Table 17 Total Growing Degree Days (GDD) ¹ and Length of Frost Free Season at iButton; Hobo Pro 2 and Weather Station Locations									
I Button Number (No), Hobo Pro 2 and Elevation (m)		Growing Degree Days ¹ Corrected Data (Base 10°C)				Length of Frost Free Season (Days)			
No.	m	2007 *	2008	2009	2010	2007*	2008	2009	2010
60	402	132	1128	1423	1073	187	158	160	160
61	158	139	1321	1599	1310	188	160	160	174
62	250	133	1272	1566	1240	188	166	169	189
63	275	128	1250	1537	1240	188	169	169	189
64	250	136	1278	1575	1311	188	166	167	214
65	274	475	1310	1586	1293	188	169	169	188
66	200	136	1315	1609	1323	188	122	169	189
67	275	127	1258	1579	1344	188	169	169	189
68	302	62	M	1540	1346	188	169	169	189
69	288	50	1224	1555	1206	188	166	160	160
70	277	51	1160	1449	1105	142	160	165	163
71	318	52	M	1594	1253	188	169	169	189
72	407	39	1318	1554	1256	175	169	169	189
73	572	24	1085	1356	1017	187	162	162	163
74	400	58	1397	1656	1380	188	171	189	190
74 Hobo Pro 2	400	n/a	n/a	1552	1333	n/a	n/a	189	190
75	285	76	1468	1729	1503	188	171	169	190
76	490	62	1361	1570	1314	188	171	164	166
77	510	55	1312	1544	1255	188	171	178	166
78	465	63	1383	1577	1353	188	171	177	189
79	428	67	1393	1646	1359	188	171	169	166
80	222	35	1345	1668	1359	188	166	169	189
81	182	34	1302	1611	1306	188	171	169	189
82	300	66	1240	1578	1266	175	161	160	160
83	445	0	1304	1524	1254	M	171	M	190
83 Hobo Pro 2	445	n/a	n/a	1444	1250	n/a	n/a	M	190
84	304	0	1304	1613	1323	M	160	160	160
85	210	0	1268	1607	1312	M	160	167	189
86	308	0	1292	1621	1248	M	166	169	189
86 Hobo Pro 2	308	n/a	n/a	1551	1274	n/a	n/a	169	189
87	400	0	1269	1553	1225	M	166	169	160
87 Hobo Pro 2	400	n/a	n/a	1519	1241	n/a	n/a	169	189
Continued									

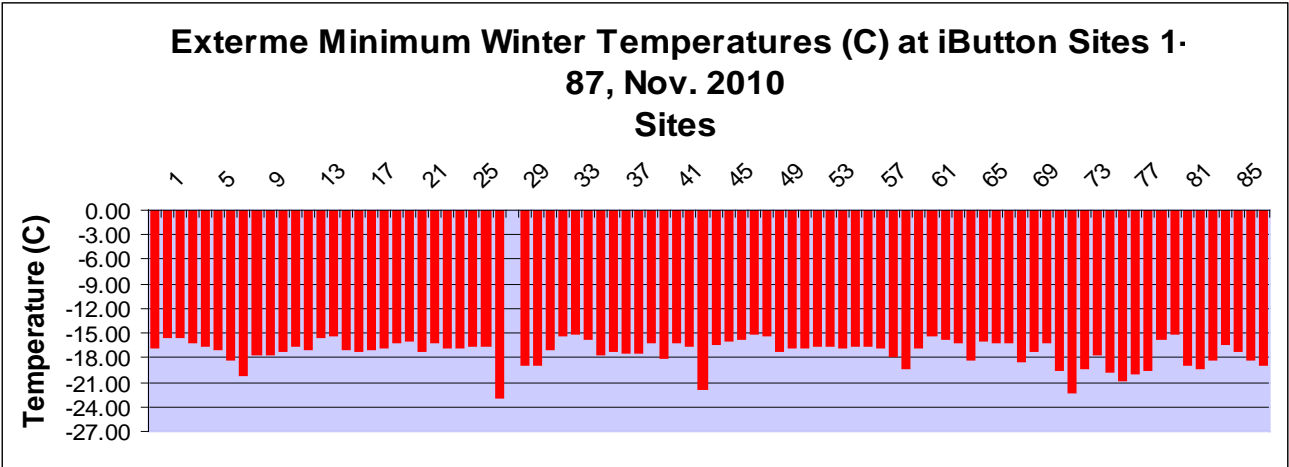
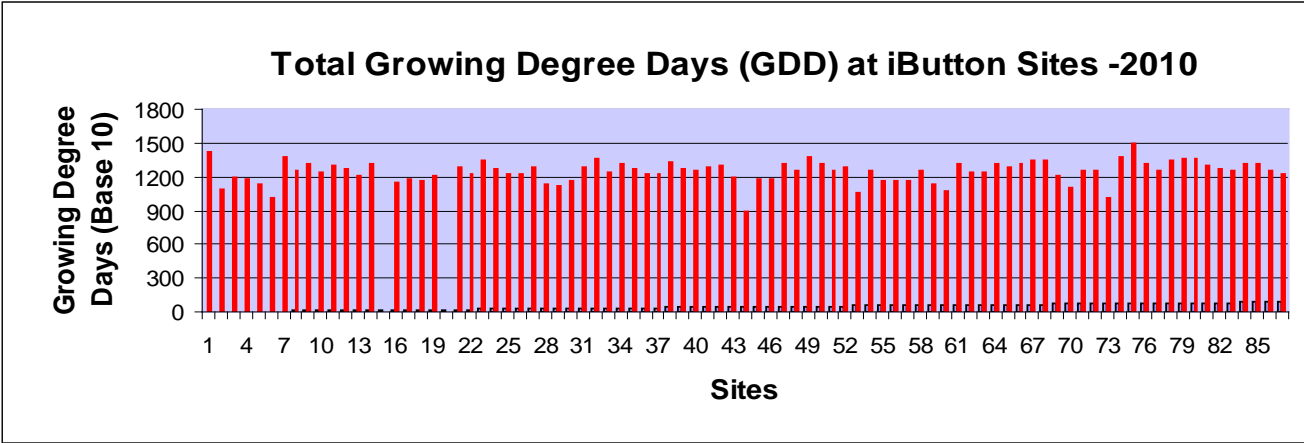
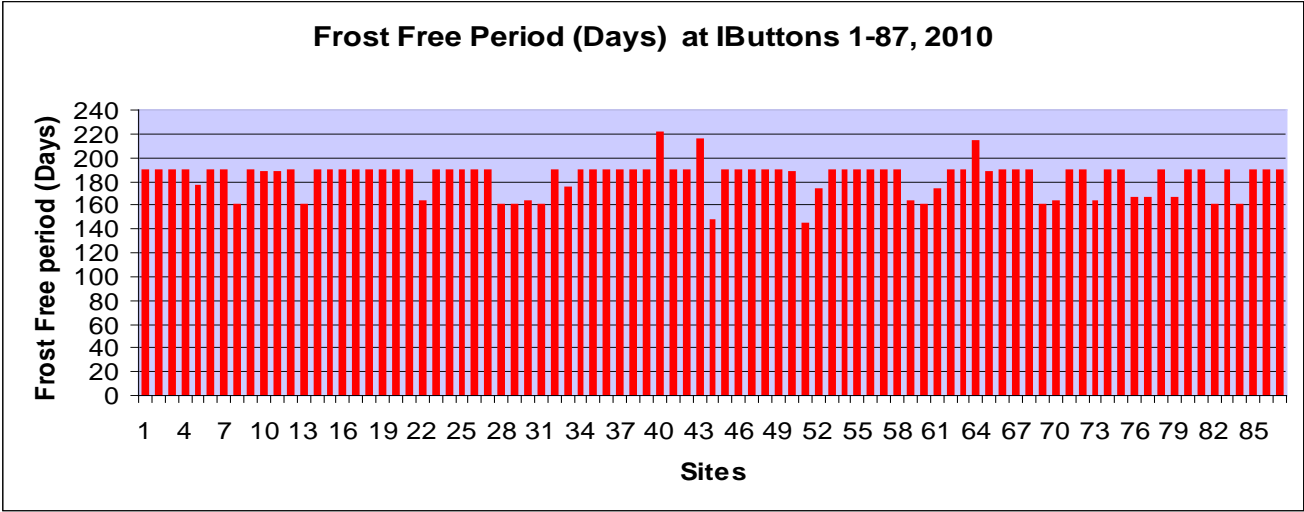
2010 PROGRESS REPORT

Table 17 Total Growing Degree Days (GDD) ¹ and Length of Frost Free Season at iButton; Hobo Pro 2 and Weather Station Locations									
I Button Number (No), Hobo Pro 2 and Elevation (m)		Growing Degree Days ¹ Corrected Data (Base 10°C)				Length of Frost Free Season (Days)			
No.	m	2007*	2008	2009	2010	2007*	2008	2009	2010
88 Hobo Pro 2	540	n/a	n/a	1393	1084	n/a	n/a	M	189
89 Hobo Pro 2	393	n/a	n/a	1342	1106	n/a	n/a	M	163
Project and Environment Canada Weather Stations									
Grossler	304	1236	1215 **	1573	1351	M	160	160	160
Ruddock	400	1261	1218**	1667	1328	166	160	162	175
Roshard	210	980	1201**	1597	1286	M	160	169	189
Diamond S	445	129	1264**	1503	1255	M	171	189	190
Halfway Ranch	308	136	1206**	1517	1231	M	166	169	189
Lillooet	235	M	1333	1651	1351	M	166	167	189
Lytton	225	1335	1301	1644	1285	205	168	169	214
* Partial data. IButtons installed in late 2007. ** Missing data. iButton data used. M means missing data. n/a means not available.									
¹ Includes a few GDD from March.									
Note: Length of Frost Free Season in 2007 reflects the number of days between the last spring frost at the Lytton EC station and the first date of fall frost at project iButtons.									



Ranch at the northern portion of the study area where 74 Hobo Pro 2 recorder and iButton # 74 are located.

GRAPHS

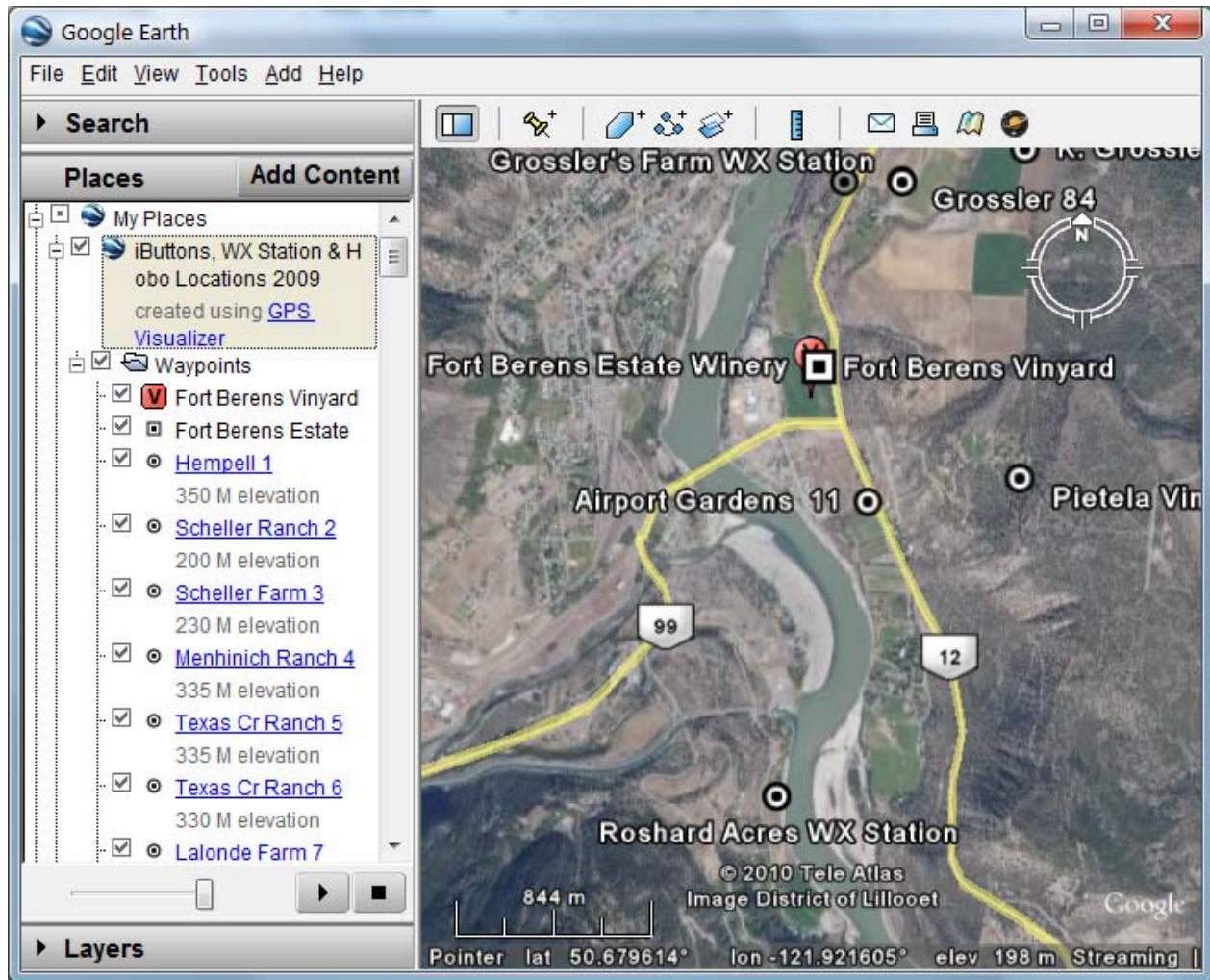


MAP OF PROJECT STUDY AREA

IButton and Weather Station locations – Google Earth Maps

A data set has been created that allows users of Google Earth to interactively view the weather stations, Hobo & iButton temperature data loggers, and test vineyard locations. Using Google Earth you are able to see the locations, find the latitude, longitude and elevation of a point of interest, and better understand the topography and geography of the area. To download and install Google Earth click on this link <http://earth.google.com/download-earth.html> and follow the instructions.

Once you have Google Earth running on your computer, open the file “iButtons.kmz” (which can be downloaded from either the Village of Lytton or District of Lillooet websites) with Google Earth. In “My Places” expand the icon titled “iButtons, WX Station & Hobo Locations 2009”, expand the “Waypoints” folder and then click on the iButton number or weather station location of interest.



Project Study Area in the Lillooet-Lytton Area

