PROGRESS REPORT 2009
(Updated)

Climate and Feasibility Assessment of Growing Wine Grapes in the Lillooet-Lytton Area, British Columbia

Prepared by

BRITISH COLUMBIA GRAPEGROWERS' ASSOCIATION

"A taste of our own"

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Prepared for

Investment Agriculture Foundation of British Columbia

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Agriculture and Agri-Food Canada (AFFC) is pleased to participate in the delivery of this publication. AFFC 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 AFFC's.

Trade Names

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

This report contains an addendum with changes to the Minimum Winter Temperature data for 2008 in Table 22.

KEY ACTIVITIES IN PERIOD APRIL 2009 TO MARCH 2010

The progress report for 2007 and 2008 provide detailed outlines of this project. Updated and new information pertaining to 2009 is provided in this publication.

PROJECT DESCRIPTION

Project Timing

Planned Start Date: March 1st, 2007 Planned Completion Date: December 31st, 2009

The project will operate for 3 years. However, 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 industry building activities beyond the term of the Investment Agriculture Foundation of British Columbia funding where possible.

Concept / Goal

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

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 includes the date when grapes begin to grow (budbreak), bloom, veraison (start of ripening), reach ripeness and harvest. Information concerning these events is limited in 2009 due to the effects of low winter temperature to all test vineyards in December 2008, January and March 2009. Available phenology data is provided in Tables 10, 11 and 15 appendixed to this report.

   The quality of the grapes is monitored during the ripening season in a lab facility provided by Roshard Acres. Fruit quality is determined by measuring the amount of sugar, acid and pH of the grape juice. (Ideal fruit quality values are listed as a note in Table 12.) The amount of sugar is expressed as Brix, which is the percent of total soluble solids (sugar, minerals, proteins, amino acids, hormones and other solids) in the grape juice. Total acid is expressed as g/l of tartaric acid. PH indicates the grape ripeness. Limited grape maturity data is available due to damage from the 2008-2009 winter to all test vineyards. Available data is provided in Tables 12 and 13 appendixed to this report. Samples of grapes are collected and frozen at harvest and are sent to participants at PARC Summerland for final quality determination. Final quality information of grapes produced in 2009 is provided in Table 14 appendixed to this report.

   Maturity of vines at the end of the growing season provides an indication that shoot growth has ceased; the development of peridem has taken place and the vine has low water content in the tissue. It is a measure of the vines' preparedness for colder temperatures. Data concerning cane (wood) maturity buy October 5, 2009 is provided in Table 16 appendixed to this report.

Information concerning vine vigour, the number of vines planted in the participating vineyards at the beginning of the evaluation period in 2005 (Roshard Acres) and 2007 (Wonderland Farms and Pietila Vineyard) and an accounting of vines by the end of the 2009 growing season is provided in Tables 17, 18, and 19 appendixed to this report.

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 such as last spring and first fall frost dates, growing degree-days, extreme minimum temperatures, and rainfall via weather stations and supplemental temperature data loggers.

Climate information gathered to determine the suitability of the area for commercial grape production includes the length of the frost-free season, the amount of heat accumulated during the growing season and the minimum winter temperature. The frost free period is the consecutive number of days between the last frost (0º C) in the spring and the first frost (0º C) in the autumn. This is the time available to vines to begin growth and the maturation of the vine at the end of the growing season. A minimum of 150 days is generally required for early maturing European varieties and 180 days or more may be required for late maturing varieties. The amount of heat accumulated during the growing season is expressed as growing degree days or heat units. The number of growing degree days (or heat units) accumulated each month for the period April 1 to October 31 is indicative of the ripening potential of an area for a range of grape selections. Growing degree days means the sum of the accumulated mean monthly temperatures above 10º C multiplied by the number of days per month for the period April 1 to October 31. For example, if the mean monthly air temperature for the month of June is 17º C, then the number of growing degree days for June is 210 (7 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 may be required for late maturing varieties. Minimum winter temperatures of -23ºC to -25ºC or colder may severely injure or kill most European wine grape varieties grown in the Okanagan and Similkameen Valleys but hybrid varieties such as Foch or Chancellor may be less severely injured. Grape varieties susceptibility to low temperatures varies when grown in different areas. Rainfall information is important to determine the need for an irrigation system, the amount of rain that may occur at specific times of the year such as bloom (June) and harvest (September. to October) and to develop disease and pest control strategies. Climate data taken from Environment Canada weather stations at Lytton and Lillooet forms part of the climatic data collected for this project and is appendixed to this report in Tables 2 to 9. Climate data collected from project data loggers and project weather stations is provided in Table 22 as well as graphs on pages 30 and 31. A map outlining the project study area with locations of test vineyards, project climate stations and data loggers is appendixed to this report. Locations of project data loggers and weather stations can be viewed via Google Earth by following the procedure outlined with this attached map.

COMMUNICATIONS

Communication to create awareness about this project and provide the project progress occurs through the participation of the British Columbia Grape Growers Association, interest by wineries in the Okanagan, visits by government officials representing different levels of government, tours of Roshard Acres by various local interested individuals and people from

outside the Lillooet-Lytton area, participation by different levels of government, and by placing this progress report on the websites for the British Columbia Grape Growers' Association, Village of Lytton and District of Lillooet. A tour of the Roshard Acres vineyard May 19, 2009 was classified as a professional development day by the British Columbia Institute of Agrologists and together with a subsequent article in their newsletter represented a major communication about this project in 2009. A listing of articles and notice of field day is provided in Table 1 appendixed to this report.

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

Field Day 2009

Thirty members of the British Columbia Institute of Agrologists travelled from various parts of British Columbia to attend a professional development day tour of Roshard Acres on May 19, 2009. Vineyard owners Christ'l Roshard and Doug Robson (representing Roshard Acres), project participants Myles Bruns (Regional Manager Thompson-Okanagan Region, Ministry of Community and Rural Development), project technician Norm Vernon, consultant John Vielvoye, Jerry Sucharyna, (Economic Development officer for the District of Lillooet) and Robin Poon (Editor, The Bridge River Lillooet News) also attended. Project participants provided information concerning the project and were available to answer questions.

Discussion at test vineyard Roshard Acres

PROJECT OUTPUTS DURING PAST 12 MONTHS

Project outputs include:

- Awareness of the project is created through word of mouth, articles in the print media and posting 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.
- Five project weather stations collect year-round temperature data as well as wind speed and direction, relative humidity, solar radiation, and precipitation. All weather data collected by this project is provided to project participants at PARC - Summerland where the data is stored and climate data summaries are prepared. Temperatures, growing degree days and frost free periods calculated from this data are provided in Table 22 and accompanying graphs.
- On-line accessibility to weather records from the two Davis stations is available to growers, industry and the public via the Farmwest website www.Farmwest.com. These are accessed by following the link to climate, southwest interior, and selecting Diamond S or Halfway Ranch.
- Tensiometers installed at all vineyards at 30 and 60 cm depth to aid in irrigation management.
- Data collection from 87 iButtons (data loggers) at 59 properties. These data loggers contribute to the development of a climate profile for the region. Most iButtons require protection from livestock and wildlife.
- Hobo Pro data loggers installed at 12 selected sites
- All weather data collected by this project is stored and climate data summaries are prepared by project participants at PARC- Summerland (data in table 22 and graphs).
- Graphs illustrate the low winter temperatures December 2008, and in January and March, 2009 that resulted in the severe winter damage observed in test vineyards in the spring of 2009. A comparison of minimum winter temperatures at Lillooet and Lytton for these months with different Environment Canada weather station locations is provided in Table 9. Table 22 provides a listing of minimum winter temperatures at the locations of project data loggers and project weather stations.
- Graphs illustrate the warmest temperatures of the warmest month and the growing degree days.
- Observations regarding vine cane maturity at the end of the 2009 growing season are provided in Table 16. Cane (wood) maturity at this time of the year is an indication of vine acclimation prior to low winter temperatures and helps to assess the vine preparedness for low winter temperatures.
- Extensive winter damage as a result of the 2008-09 winter is reported from Okanagan and Similkameen Valleys vineyards. A provincial crop insurance program representative states that claims for vine and crop loss in the Okanagan area are at record high values exceeding $20 million.
- Phenology events for the Foch variety are provided in Table 15.

- A field day May 19, 2009 to show and discuss the project and the test panting at Roshard Acres.
- Results of final fruit quality analysis for 2009 harvest are provided in Table 14.
- Project outputs include on-going assessment and recording of the effects of low winter temperatures on dormant vines, recording of vineyard performance and condition, consultations with vineyard owners, regarding irrigation, spray programs, canopy management, cover crops, nutrition, and pruning.

Pietila Vineyard – August 17, 2009 – hillside vineyard

PROGRESS TOWARDS ACHIEVING THE OJECTIVES AND BENEFITS

Objectives

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

- Vineyards are visited to record observations and to provide consultations before pruning is started, during the growing season and in the autumn.
- Viticulture observations recorded phenology events and dates (Table 15), monitoring fruit quality development (Tables 12, 13, and 14) cane (or wood) maturity of vines by Oct. 5, 2009 (Table 16) and an assessment of vines in test vineyards at the end of the 2009 growing season (Tables 17,18, and 19)
- Phenology observations were limited to the Foch variety due to variable recovery rates of injured vines in test plantings. Data is provided in Table 15.

- Observations made of varieties at the Roshard Acres include the Foch variety established in a separate planting made in 1972.
- All participating vineyards are drip irrigated and have a permanent cover crop.
- Participants have identified irrigation management and the control of vine vigour as a major challenge to learning to grow grapes successfully.
- All of the vineyards are treated to prevent the development of powdery mildew. Other diseases have not been observed. Weed control methods vary from the use of herbicides to manual weed control.
- Parts of the Wonderland Farms and Pietila Vineyard plantings have not yet fully recovered from transplanting nursery stock during June of 2006. Injury caused by the 2008-09 winter in these vineyards resulted in a need to retrain many vines of most varieties. A small quantity of fruit was produced by some vines. Some vines that had not performed well to date (all Pinot Noir, some Merlot and some Cabernet Sauvignon) were removed from the Pietila vineyard and were replanted to new vines (Johannisberg Riesling, Pinot Gris and Merlot) grafted to the grape rootstock C-3309.
- Vines at Roshard Acres re-grew from the lower trunk and root area at will. Retraining of all vines in the test planting will be required at Roshard Acres in 2010. Several varieties produced a small crop. The Foch variety was slightly injured by the 2008-09 winter but produced a near normal crop. The Chancellor variety was more severely injured than Foch. Both Foch and Chancellor were much less severely injured compared to European selections in the test planting.
- Assessment of vine vigour and condition after the 2008-09 winter at participants test plantings is provided in Tables 17, 18, and 19.

Wonderland Farms vineyard Aug. 17, 2009 showing the variation in vine vigour in planting made in mid to late May 2007 (right) from planting made in late June 2007 (left).

2) To develop a climate profile of the area.

- Climatic information from Environment Canada climate stations located at 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 5 weather stations capable of recording a wide range of climate parameters hourly; 87 temperature data loggers (iButtons) capable of recording hourly temperature and 12 Hobo Pro temperature data loggers added to the climate network late in 2009.
- Project weather stations and data loggers are located on private property and range in location from just south of Lytton along both sides of the Fraser River to north and east of Lillooet along the Lillooet - Cache Creek Highway to West Pavilion.
- Data from the project 3 WeatherHawk and 2 Davis Vantage Pro 2 weather stations is downloaded every two months and data from the 87 iButtons is downloaded every 4 months and both sets of data are sent to PARC at Summerland. Data from the Hobo Pro 2 data loggers has been downloaded once to determine if they were functioning properly. It is intended that future data from these data loggers will be downloaded once per year and will also be sent to PARC at Summerland to continue development of the climate data base for the Lillooet-Lytton area started by this project.
- Low winter temperatures recorded at nine Environment Canada weather station locations for the months of December 2008, January and March 2009 is provided in Table 9. Tables 3, 4 and 5 provide historical climate data for Growing Degree Days, Frost Free Season and Extreme Minimum Temperatures reported from Environment Canada weather stations located at Lillooet and Lytton.

Table 22 provides a listing of climate data collected from project data loggers and weather stations in 2009 and shows:

- The range of Growing Degree Days (GDD) (not including site 2) was from 1126 to 1926 GDD.
- The range of the frost free season was from 152 to 189 days.
- The extreme minimum temperatures recorded ranged from -17.77 ºC to -27.3º C

In 2009, at 92 sites:

- Extreme minimum temperatures that ranged from -17 ºC to -19.99 º C were recorded at 47 sites (51%) *.
- Extreme minimum temperatures that ranged from -20 ºC to -25.9º C were recorded at- 40 sites (44 %)*.
- Extreme minimum temperatures that ranged from -26ºC to -30º C were recorded at 5 sites (5 %)*.

Extreme minimum temperatures colder than -30º C were not recorded

(* percentages are rounded to the nearest whole number)

Benefits

- This project is providing detailed viticulture and climate data for the study area.

- This project is providing technology transfer in grape production skills to the participants who in turn share their knowledge with interested people.
- The project provides data that 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.
- Visits to the test vinyards and information about the project was considered by entrepreneurs in their decision to develop a 20 acre vineyard with an estate winery in Lillooet and in the establishment of a three acre wine grape and a one acre fresh market grape variety evaluation planting at another location near Lillooet.
- The climate data generated by this project is useful as an assessment tool by producers for other crops including both traditional and specialty crops.
- The Davis Vantage Pro 2 weather stations have the capability of providing soil moisture data used to determine evapotranspiration (ET). This added feature is used by irrigators at one farm to improve the efficiency of water use with their existing hay production systems and the data is available to others who access the Farmwest network at: http://www.farmwest.com/index.cfm?method=climate.showclimate.

ANNUAL WORK PLAN FOR THE NEXT 12 MONTHS

- The project has operated for three years and is has reached the completion date for funding by the Investment Agriculture Foundation of British Columbia.
- A summary report will be prepared which will address the goals and objectives of this project.
- It is advisable to continue this project for 2 additional years to gather and analyze viticulture and climate data and relate these to phenological (dates of bud break, bloom, veraison, harvest) and growing season conditions (e.g. frost free period, growing degree days, winter temperatures, and rainfall) as well as potential climate related injury or damage to vines (e.g. spring, fall, winter injury or damage).

Norm Vernon collecting temperature data at iButton #27

APPENDICES

Table 1 Communications 2009

- Project progress reports posted on the District of Lillooet website: http:/www.lillooetbc.com and the Village of Lytton website: http://www.lytton.ca
- B.C. House 2008 at Beijing Olympics featured the video Gold Country which included the Roshard Acres grape test planting.
- Progress reports on District of Lillooet website: http://www.lillooetbc.com/business.aspx
- District of Lillooet website also contains a marketing and investment video which includes the promotion of grape production and winery development in Lillooet.
- Progress reports on the Village of Lytton website: http://www.lytton.ca/siteengine/activepage.asp?PageID=78
- Progress reports on the British Columbia Grapegrowers' Association website: http://www.grapegrowers.bc.ca
- British Columbia Institute of Agrology Newsletter, September 2009.
- Roshard, C. 2009. Fort Berens Estate Winery Opens It's Doors, and a Bottle or Two, In Lillooet.
- The Bridge River Lillooet News May 20, 2009. Lillooet Winery Becoming a Reality.
- The Bridge River Lillooet News. Oct. 14, 2009. Fort Berens Estate winery Opens.
- Fortems, Cam. Monday, June 29, 2009. The Kamloops Daily News. Enterprise, Section B. Holding the Fort.
- Fraser basin Council website: http://www.fraserbasin.bc.ca
- British Columbia Ministry of Agriculture and Lands website: http://www.al.gov.bc.ca/grape/factsheets.htm

British Columbia Institute of Agrologists' meeting at Roshard Acres for vineyard tour and lunch May 19, 2009

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

Lytton station	Latitude 50º 13.200'N	Longitude 121º 34. 800'W	Elevation 225m
Lillooet Station	Latitude 50º 40.800'N	Longitude 121º 55. 800'W	Elevation 235m

Table 3 Lytton Frost Free Season and Extreme Minimum Temperature

	Frost Free Period				
Year	**Last Spring Frost Temp. (ºC)**	**First fall Frost Temp. (ºC)**	**Frost Free Period (days)**	**Extreme Minimum Temperature (ºC)**	
1941-70	April 24	Oct. 24	183	Jan (-31.7)	26 year record
1951-80	April 20	Oct. 24	187	Jan (-31.7)	26 year record
1961-90	n/a	n/a		Dec 31 1984 (-27.1)	20 year record
				Nov 27 1985 (-27.7)	20 year record
1971-2000	n/a	n/a		Nov 27, 1985 (-27.7)	
				Dec 31, 1984 (-27.1)	
1995	April 20 (-1.3)	Oct. 29 (-0.9)	189	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	April 15 (-1.3)	Oct 27 (-1.1)	195	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. 26 (-3.7)	176	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)	
Average 1995-2009	April 24 (-1.0)	Oct. 27 (-1.4)	186	Extreme minimum -23.5ºC, Dec. 20 2008	

Table 4 Lillooet Frost Free Season and Extreme Minimum Temperature				
	Frost Free Period			
Year	Last Spring Frost Temp. (ºC)	First Fall Frost Temp. (ºC)	Frost Free Period in Days	Extreme Minimum Temperature(ºC)
1941-1997	Long term temperature information not found for this location			
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 16 (-0.8)	182	Jan 20(-15.5)
2001	April 12(-3.3)	Oct 25 (-1.2)	196	Feb 7 (-10.4)
2002	April 23 (-2.2)	Oct 12 (-1.5)	172	Jan 28 (-17.7)
2003	April 6 (-2.2)	Oct 15 (-0.1)	192	Mar 8 (-14.4)
2004	April 2 (-2.0)	Oct 27 (-1.3)	208	Jan 6 (-22.7)
2005	April 14 (-0.1)	Oct. 27 (-1.5)	196	Jan 15 (-25.4)
2006	April 17 (-0.2)	Oct. 30 (-0.3)	196	Nov. 29 (-20.0)
2007	n/a	Oct. 26 (-0.2)		Dec 8 (-17.5)
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)
Average 1998-2009	April 18 (-1.0)	Oct. 20 (-0.8)	185	Extreme minimum – 25.4 C, Jan. 15, 2005

ibutton # 17 location

Table 5 Lytton and Lillooet Calculated Growing Degree Days (April - October)

Estimated Growing Degree Days (base 10º C) - April 1 to Oct. 31

Year	Lytton	Lillooet
1951-80	1,368.2	n/a
1961-90	n/a	n/a
1971-2000	1,361.3	n/a
1998-2003	1,387.7	1426
2000	1,256.2	1262
2001	1,407.2	1379
2002	1,373.7	1405.5
2003	1,580.0	1562
2004	1,617.7	Monthly & daily data report not available for August & September
2005	1,449.6	Monthly & daily data report not available.
2006	1,578.1	Monthly & daily data report not available.
2007	1,334.9	Daily data report resumes Aug. 3
2008	1301	1333
2009	1644	1651
Average 2000-2009	1454	1432

Location of iButton # 50 and new Hobo Pro on west side of Fraser River

Table 6 Lytton Precipitation (May - October) and Annual Hours of Bright Sunshine

Year	Total Precipitation (mm)								
	May	June	July	Aug	Sept	Oct	May-Oct. Total	Total Annual Precipitation (mm)	Bright Sunshine (Hrs.)
1941-70	14.7	20.6	12.2	18.8	23.4	49.5	139.2	334.5	n/a
1951-80	14.7	17.6	11.7	23.4	24.9	44.5	136.8	326.8	1987.4 hr.
1961-90	17.6	18.0	14.2	17.1	26.2	35.2	128.3	324.2	1923.3 hr.
1971-2000	18.2	18.8	14.4	22.9	27.3	36.4	138.0	338.7	1915.3 hr.
1997	18.4	14.5	3.2	10.9	16.6	59.8	123.4	297.0	
1998	41.1	30.9	9.9	0.5	2.1	40.0	124.5	401.4	
1999	13.5	10.0	57.5	26.5	20.0	40.0	167.5	645.5	
2000	57.5	67.5	335.5	M	M	47.5	>508.0	>673.0	
2001	16.5	M	M	2.0	22.5	24.5	>65.5	>301.5	
2002	27.5	15.5	20.5	32.5	17.5	3.5	117.0	277.5	
2003	6.0	20.0	M	12.5	7.5	137.0	>183.0	> 500.0	
2004	27.0	8.5	27.0	17.0	42.0	33.0	154.5	357.4	
2005	30.5	46.0	16.5	30.0	33.0	32.0	188.0	434.5	
2006	24.5	33.0	2.5	9.5	17.5	24.0	111.0	599.0	
2007	18.5	28.0	15.5	19.5	32.0	29.5	143.0	501.5	
2008	24.5	35.0	28.5	39.5	30.5	15.0	173.0	373.5	
2009	M	24.6	26.4	4.8	12.0	M	>68.8	>68.6	

M = missing data Hours of bright sunshine not available 1997-2009.

Table 7 Precipitation (April - October) - Lillooet

Year	Rainfall (mm) May	June	July	Aug	Sept	Oct	May-Oct. Total	Total Annual Precipitation (mm)	
1941-1970	21.1	28.4	25.4	25.9	32.8	46.0	179.6	341.5	Russell Street
1951-2000	Long term temperature information not found for this location								
1998	15.0	29.4	44.0	3.6	24.4	29.6	146.0	334.4	
1999	7.2	13.0	81.4	14.8	13.8	3.2	133.4	297.0	
2000	51.8	14.0	37.2	20.6	16.2	52.0	191.8	265.4	
2001	6.2	34.6	40.2	7.8	9.2	30.6	128.6	298.4	
2002*	32.4	9.4	13.8	18.6	M	0.8	>75.0	>165.6	
2003	16.0	24.0	0.6	8.6	22.4	57.8	129.4	319.2	
2004*	23.6	22.2	32.4	9.2	30.2	M	>117.6	>173.2	
2005*	M	M	18.6	30.6	72.6	M	>122.0	>122.0	
2006	Missing data						M	M	
2007*	M	M	M	17.6	44.0	M	>61.6	>61.6	
2008	31.8	39.2	7.6	21.6	32.2	M	>132.4	>132.4	
2009	7.0	5.8	1.6	7.6	M	M	>22.0	>22.0	

Table 8 Selected Environment Canada (EC) Weather Stations Compared to EC Stations at Lillooet and Lytton in Table 9

Name	Latitude	Longitude	Elevation (m)	Elevation (feet)
Kamloops A	50º 42.000´ N	120º 26.400´ W	345.3	1133
Kelowna AWOS	49º 57.600´ N	119º 22.800´ W	429.5	1409
Lillooet	50º 40.800´ N	121º 55.800´ W	235.0	771
Lytton	50º 13.200´ N	121º 34.800´ W	225.0	738
Lytton RCS	50º 13.200´ N	121º 34.800´ W	225.0	738
Penticton A	49º 27.600´ N	119º 36.000´ W	334.1	1129
Summerland CS	49º 33.600´ N	119º 38.400´ W	454.2	1490
Osoyoos CS	49º 1.8000´ N	119º 26.400´ W	282.9	928

Table 9 Minimum Temperatures (°C) January, March and December 2009 at Selected Environment Canada (EC) Weather Stations Compared to EC Stations at Lillooet and Lytton in Table 8

Stations	Dates Jan. 26	Mar. 10	Dec. 14	Other Dec. 2009
Kamloops A	-23.7	-15.8	-22.7	
Kelowna AWOS	-24.3	-20.9	-15.0	-16.5 (Dec. 7)
Lillooet	-19.0	-14.5	-20.1	
Lytton	-17.0	-15.1	-18.8	
Lytton RCS	-12.6	-15.0	-18.7	
Penticton	-13.6	-12.9	-12.0	-12.8 (Dec. 12)
Summerland CS	-16.8	-14.2	-12.4	-13.4 (Dec. 8)
Osoyoos CS	-16.4	-11.4	-10.0	-14.0 (Dec. 11 &12)

Table 10 Approximate Date Grape Varieties in Test Vineyards Reached Woolly Bud Stage-2009

	Vineyard and observed date		
Grape Variety	Roshard Acres	Wonderland Farms*	Pietila Vineyard*
Cabernet Franc	May 2	May 1	
Cabernet Sauvignon	May 8	Apr. 30	Apr. 30
Chancellor	Apr. 30	Apr. 28	
Chardonnay	May 8	Apr. 28	Apr. 30
Göcseji Zamatos	May 8	Apr. 30	Apr. 30
Foch	Apr. 26		
Gewurztraminer	May 7	Apr. 18	Apr. 30
Johannisberg Riesling	May 8	May 2	Apr. 30
Limberger	May 5	Apr. 28	
Tinta Madeira	May 2	May 5	Apr. 30
Merlot	Apr. 29	Apr. 28	Apr. 30
Muscat Ottonel	May 2	Apr. 28	
Petite Verdot	May 7		
Pinot Blanc	May 5	Apr. 28	May 1
Pinot Gris	Apr. 30	Apr. 28	
Pinot Noir	May 2	May 1	May 2
Riesling Muscat	May 8	Apr. 30	
Sauvignon Blanc	May 8	May 1	
Syrah	May 7	Apr. 30	Apr. 30
Viognier	May 7		
Zweigeltrebe	May 5	*All varieties are not planted at all sites.	

Grapes usually begin to grow when pears are in bloom. Pear trees began to bloom at Airport Gardens across the Fraser River from Roshard Acres, April 29, 2009

Table 11 Date of Bud Break or Start of Regrowth of Grape Varieties in Test Vineyards - 2009

	Vineyard and Observed Date		
Grape Variety	**Roshard Acres**	**Wonderland Farm**	**Pietila Vineyard**
Cabernet Sauvignon	May 20; root shoots	May 14	May 10
Chancellor	May 12	May 7	
Chardonnay		May 13	May 12
Foch	May 12		
Göcseji Zamatos		May 15	May 11
Gewurztraminer		May 7	May 12
Cabernet Franc	May 18; root shoots	May 13	
Johannisberg Riesling		May 15	May 10
Limberger	May 20; root shoots	May 12	
Tinta Madeira		May 15	May 15
Merlot		May 13	May 8
Muscat Ottonel		May 12	
Petite Verdot			
Pinot Blanc		May 12	May 8
Pinot Gris		May 15	
Pinot Noir		May 15	May 8
Riesling Muscat		May 15	
Sauvignon Blanc	May 19; root shoots	May 15	May 10
Syrah		May 15	May 11
Viognier	May 20; root shoots		
Zweigeltrebe			

NOTE: Additional bud break did not occur at Roshard Acres . Shoots emerged from lower trunks or roots from most varieties over several months. All varieties are not planted at all sites.

Roshard Acres test vineyard May 19, 2009. Photo by James Klukas, P.Ag

Roshard Acres, August 17, 2009 – re-growth from the trunk and root areas occurred with most vines providing a potential crop in 2010

Table 12 First Sampling and Analysis at Participating Vineyards - Sept. 11, 2009

Vineyard and Variety	Brix	pH	Total Acid	Comments
Pietila Vineyard				
Cabernet Sauvignon	19.1	2.7	16.65	Very small crop. Seed green-tan.
Pinot Blanc	21.5	3.1	6.375	Very small crop. Seed tan.
Johannisberg Riesling	20.0	2.64	17.32	Very small crop. Seed tan.
Roshard Acres				
Chancellor	18.1	2.79	11.6	Light crop. Seed green-tan.
Foch	23.75	3.04	10.8	Normal crop. Seed tan.
Limberger	22.0	2.77	8.4	Very light crop. Seed tan.
Wonderland Farms				
Chancellor	19.5	2.9	10.35	Light crop. Seed green-tan.
Johannisberg Riesling	17.0	3.03	8.85	Very small crop. Seed green-tan.
Pinot Blanc	18.4	2.92	11.55	Very small crop. Seed tan.
Pinot Noir	22.8	3.04	8.85	Very small crop. Seed tan-brown.
Riesling Mosel	18.6	3.12	7.275	Very small crop. Seed green-tan.
Syrah	16.0	2.7	15.75	Very small crop. Seed green-tan.

Note: Ideal fruit quality values. Generally Brix 24 or greater.(Riesling Mosel matures at lower values); pH 3.2 to 3.8 ; Total Acid 6.0 to 8.0. Seed colour changes from light green (immature) to brown (mature) as the fruit matures.

Near Spray Creek Ranch on Texas Creek Road. Bear may have knocked down iButton. iButtons required protection from domestic animals such as horses, donkeys and cattle and wildlife such as bear, deer, big horn sheep.

Table 13 Last Field Analysis of Grapes From Participating Vineyards - 2009

Vineyard and Variety	Sample & Analysis Date	Brix	pH	Total Acid	Harvest Date
Pietila Vineyard					
Cabernet Sauvignon	September 16	20	2.88	13.5	September 25
Pinot Blanc	September 11	21.5	3.1	6.375	September 11
Johannisberg Riesling	September 24	18.6	3.12	7.3	September 25
Roshard Acres					
Chancellor	September. 24	20.1	3.2	9.45	October 2
Foch	September 11	23.7	3.04	10.8	September 12
Limberger	September 24	22.1	3.05	9.3	October 2
Wonderland Farms					
Chancellor	September 30	23.9	3.27	9.0	October 5
Johannisberg Riesling	September 24	21.2	2.95	12.45	September 30
Pinot Blanc	September 30	22.4	3.4	7.5	September 30
Pinot Noir	September 16	23.9	3.13	6.75	September 16
Riesling Mosel	September 11	18.6	3.12	7.27	September 11
Syrah	September 11	16	2.7	15.75	September 11

Foch Aug. 17 at Roshard Acres.

Table 14 Analysis of Final Grape Samples Taken From Roshard Acres Conducted at the Pacific Agri-Food Research Centre (PARC) Summerland - Nov. 9, 2009

#	Variety	Sample Size	wt. 30 berries (gm)	pH	Brix	Total Acid	Harvest Date
1	Syrah	2 clusters	41.38	3.43	24.9	5.4	02-Oct.-09
2	Pinot noir	1 tiny cluster (2nd?)	26.68	3.17	16.2	10.9	02-Oct.-09
3	Zweigeltrebe	2 clusters	36.40	3.21	19.8	7.1	02-Oct.-09
4	Cabernet Sauvignon	4 tiny clusters (2nd?)	13.31	3.27	17.9	7.7	02-Oct.-09
5	Cocseji Zamatos	2 small clusters	30.32	3.65	25.9	3.9	02-Oct.-09
6	Chancellor	45 berries	30.80	3.46	21.1	6.5	02-Oct.-09
7	Merlot	65 berries	16.55	3.57	26.0	4.1	02-Oct.-09
8	Limberger	40 berries	31.62	3.43	24.3	4.2	02-Oct. 09
9	Petite Verdot	3 small clusters	20.31	3.26	20.5	10.5	02-Oct. 09
10	Cabernet Franc	1 tiny cluster (2nd ?)	18.60	3.09	18.2	10.2	02-Oct.-09
11	Tinta Madeira	3 small clusters	24.78	3.30	22.4	7.2	02-Oct.-09
12	Foch	2 clusters	35.09	3.94	26.5	8.0	02-Oct.-09

Table 15 Phenological Events for the Foch Variety at Roshard Acres - 2009

Stage of Development	Calendar date	Day of the Year	Comments
Fuzzy Bud	Apr-26	Day 116	
Bud Break	May-12	Day 132	
Bloom	Jun-24	Day 175	
Veraison	n/a	n/a	Not Available
Harvest	Sept. 12 *	Day 256	Harvest date before ideal fruit quality due to fruit losses to birds. (Table 12)
	Oct. 2**	Day 275	Harvest date when fruit quality was ideal (Table 14).

* Time required from bud break (May 12) to harvest (Sept. 12) was 124 days.
** Time required from bud break (May 12) to harvest (Oct. 2) was 143 days.

Table 16 Percent Cane (Wood) Maturity in Participating Vineyards October 5, 2009

	Vineyard		
Grape Variety	**Roshard Acres**	**Pietila Vineyard**	**Wonderland Farms**
Cabernet Franc	85		60
Cabernet Sauvignon	70	90	90
Chancellor	85		90
Chardonnay	65	90	75
Göcseji Zamatos	80	85	85
Foch	70		
Gewurztraminer	70	80	75
Johannisberg Riesling	80	85	70
Limberger	85		90
Merlot	80	80	60
Muscat Ottonel	70		60
Petit Verdot	70		
Pinot Blanc	65	85	85
Pinot Gris	80		90
Pinot Noir	85	90	80
Riesling Muscat	65		70
Sauvignon Blanc	60	85	60
Syrah	50	90	85
Tinta Madeira	60	80	70
Viognier	75		
Zweigeltrebe	85		

All varieties are not planted at all sites.

Table 17 Assessment of Vine Vigour and Condition of Vines at Roshard Acres at the end of the 2009 Growing Season

Variety	Number of Vines Planted in 2005	Number of Vines With Approximately 60 cm or More Growth *	Number of Vines With Less Than 60 cm Growth*	Number of Missing Vines	Number of Dead Vines
Cabernet Franc	50	47	0	2	1
Cabernet Sauvignon	50	41	6	0	3
Chancellor	50	50	0	0	0
Chardonnay	50	48	1	0	1
Cocseji Zamatos	50	44	5	0	1
Gewürztraminer	50	46	3	0	1
Johannisberg Riesling	50	43	6	0	1
Limberger	50	40	9	0	1
Merlot	50	42	7	0	1
Muscat Ottonel	50	27	15	0	8
Petit Verdot	75	65	6	2	2
Pinot Blanc	50	39	5	0	6
Pinot Gris	50	36	6	0	8
Pinot Noir	50	36	7	0	7
Riesling Muscat	50	40	9	0	1
Sauvignon Blanc	50	40	5	1	4
Syrah	50	38	8	0	4
Tinta Madeira	50	47	2	0	1
Viognier	75	66	8	0	1
Zweigeltrebe	50	40	6	0	4

* All vineyards suffered top loss to most varieties as a result of the 2008-09 winter. An arbitrary 60cm height was used to assess the vigour of vines and root shoots at the end of the 2009 growing season. This height measurement provides a comparison between varieties to the relative ability to recover from severe winter damage. The measurement provides information that may be useful to consider when it may be economically feasible to retain the vine to produce a crop the following year.

Table 18 Assessment of Vine Vigour and Condition of Vines at Wonderland Farms at the end of the 2009 Growing Season

Variety	Number of Vines Planted in 2007	Number of Vines With Approximately 60 cm or More Growth*	Number of Vines With Less Than 60 cm Growth*	Number of Missing Vines	Number of Dead Vines
Cabernet Franc	50	19	15	14	2
Cabernet Sauvignon	25	10	10	4	1
Chancellor	25	24	1	0	0
Chardonnay	25	22	3	0	0
Cocseji Zamatos	25	8	7	12	0
Gewürztraminer	25	11	4	10	0
Johannisberg Riesling	50	37	9	0	4
Limberger	25	6	11	8	0
Merlot	25	22	3	0	0
Muscat Ottonel	25	13	2	4	1
Pinot Blanc	25	19	2	2	0
Pinot Gris	25	12	10	3	0
Pinot Noir	25	9	1	1	14
Riesling Muscat	25	22	0	2	1
Sauvignon Blanc	25	25	0	0	0
Syrah	25	7	7	11	0
Tinta Madeira	25	21	2	1	1

* This vineyard also suffered top loss to many varieties as a result of the 2008-09 winter. Regrowth from the lower trunk and root areas provided renewed top growth and new cropping potential for some varieties.

Table 19 Assessment of Vine Vigour and Condition of Vines at Pietila Vineyard at the end of the 2009 Growing Season

Variety	Number of Vines Planted in 2007	Number of Vines With Approximately 60 cm or More Growth*	Number of Vines With Less Than 60 cm Growth*	Number of Missing Vines	Number of Dead Vines
Cabernet Sauvignon	50	27	16	0	7
	Note: Replanted 7 vines with 18 Johannisberg Riesling				
Chardonnay	50	14	30	2	4
Cocseji Zamatos	50	12	27	6	5
Gewürztraminer	50	22	19	3	6
Johannisberg Riesling	50	40	8	0	2
Merlot	50	12	3	17	18
	Note: Replanted 33 vines with Pinot Gris				
Pinot Blanc	50	21	4	9	16
Pinot Noir	50	All vines replanted with Merlot			
Sauvignon Blanc	50	25	23	0	2
Syrah	50	24	24	0	2
Tinta Madeira	50	5	11	30	4

* This vineyard suffered top loss to some varieties as a result of the 2008-09 winter. Regrowth from the lower trunk and root areas provided renewed top growth and new cropping potential.

Table 20 Station Elevation and Type of Weather Station at Selected 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 Acres	210	Weather Hawk & iButton # 85
Ruddock Ranch	400	Weather Hawk & iButton # 87

Table 21 Hobo Pro Weather Data Logger Locations	
Hobo Pro Located at iButton Number	**Elevation (m) of Hobo Pro**
9	340 m
16	265 m
38	243 m
44	520 m
49	200 m
50	190 m
74	400 m
83	445 m
86	308 m
87	400 m
No iButton at this location. 35 km north of Lillooet on West Pavillion Rd.	540 m
No iButton at this location. 19 km south of Lillooet on Texas Creek Rd.	393 m

New Hobo Pro data logger at Wonderland Farms.

Table 22 Selected Climatic Events at iButton and Weather Station Locations

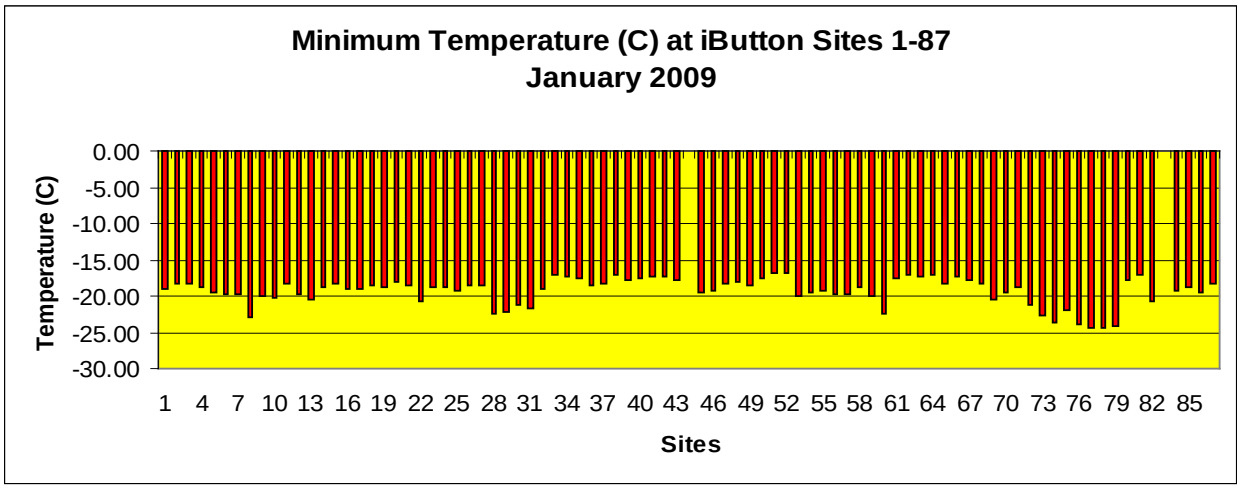
Ibutton Number (No.) and Elevation (m)		Minimum Winter Temperatures(°C)			Growing Degree Days (Base 10°C) April-Oct.			Length of Frost Free Season (Days)		
No.	m	Dec. 2007	Dec. 2008	Dec. 2009	2007*	2008	2009	2007	2008	2009
1	340	-17.25	-24.09	-20.99	502	1313	1690	188	169	169
2	190	-18.11	-22.79	-18.93	372	1027	1217	188	166	169
3	217	-17.64	-23.65	-19.92	432	1220	1428	188	169	169
4	341	-17.98	-18.36	-19.87	436	1090	1375	188	169	169
5	336	-18.3	-23.87	-20.45	403	1091	1316	188	169	167
6	328	-19.48	-18.03	-19.92	371	1016	229	188	166	169
7	309	-17.78	-18.54	-22.41	475	1369	1624	188	171	178
8	424	-21.38	-22.14	-23.84	413	1124	1393	187	158	158
9	340	-17.69	-18.26	-22.36	459	1264	1525	187	169	169
10	315	-18.47	-25.42	-20.87	469	1194	1465	187	160	167
11	225	-16.43	-17.44	-20.14	479	1203	1429	188	166	165
12	349	-17.78	-25.14	-21.27	497	1319	1598	188	166	169
13	300	-20.36	-18.27	-20.29	378	1149	1449	188	166	152
14	271	-18.17	-17.98	-18.86	395	1216	1504	188	166	169
15	297	-17.98	-17.79	-19.18	397	1199	1439	188	166	166
16	263	-19.20	-17.69	-20.09	M	1118	1417	M	166	167
17	297	-19.27	-18.7	-19.39	391	1181	1411	188	166	167
18	339	-17.71	-18.91	-19.42	397	1215	1434	188	166	169
19	316	-17.72	-19.30	-19.68	374	1153	1416	188	166	169
20	241	-17.67	-18.49	-18.62	405	1197	1485	188	166	169
21	267	-17.03	-23.64	-19.64	397	1268	1535	188	169	167
22	284	-20.09	-26.28	-20.91	384	1200	1450	188	160	165
23	200	-18.15	-23.97	-19.60	423	1278	1543	188	166	167
24	369	-17.15	-17.91	16.93	397	1239	1517	188	169	169
25	375	-17.29	-18.62	-20.51	M	1234	1446	M	166	169
26	352	-17.76	-17.76	-19.47	M	1183	1426	M	169	169
27	318	-17.55	-17.62	-19.88	394	1013	1437	188	169	169
28	375	-22.54	-23.68	-21.66	218	1105	1340	175	160	159
29	385	-21.91	-23.61	-21.78	207	1059	1328	175	159	160
30	405	-18.62	-19.19	-23.19	240	1136	1391	188	166	169

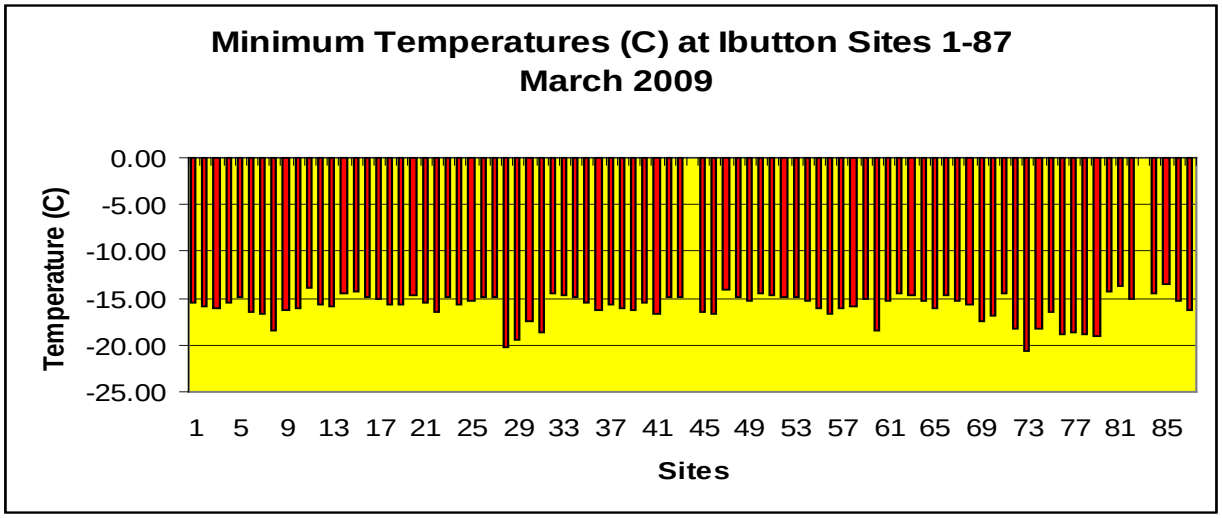
Ibutton Number (No.) and Elevation (m)		Minimum Winter Temperatures(ºC)			Growing Degree Days (Base 10ºC) April-Oct.			Length of Frost Free Season (Days)		
No.	m	Dec. 2007	Dec. 2008	Dec. 2009	2007*	2008	2009	2007	2008	2009
31	413	-18.81	-20.2	-23.49	262	1237	1468	188	169	169
32	238	-17.16	-23.93	-20.58	291	1256	1520	175	166	165
33	255	-16.58	-16.96	-18.61	297	1199	1457	175	168	169
34	264	-16.26	-16.89	-18.34	314	1267	1519	188	168	169
35	310	-16.33	-17.59	-19.17	314	1275	1585	175	169	169
36	415	-16.94	-18.46	-19.98	278	1182	1396	188	169	169
37	352	-16.48	-18.00	-19.46	285	1186	1468	188	169	169
38	243	-14.63	-18.12	-19.20	288	1345	1578	188	166	169
39	265	-14.79	-18.76	-19.14	289	1328	1601	175	166	169
40	266	-15.27	-18.24	-18.81	276	1251	1538	189	172	169
41	287	-15.23	-18.57	-19.58	289	1314	1490	188	172	170
42	255	-15.33	-17.23	-19.06	294	1221	1492	188	166	169
43	240	-15.3	-18.57	-18.70	M	1195	1444	M	169	169
44	520	-17.64	-23.28	-24.17	212	908	1126	188	159	M
45	412	-17.98	-24.29	-20.82	247	1162	1432	188	169	169
46	285	-18.14	-24.59	-20.66	257	1226	1514	188	166	167
47	256	-16.96	-17.09	-19.62	300	1312	1580	188	171	169
48	210	-16.85	-16.91	-19.18	215	1266	1555	188	171	167
49	196	-17.68	-16.98	-19.13	209	1226	1462	188	166	167
50	190	-15.94	-18.99	-18.42	225	1226	1453	188	160	167
51	175	-16.14	-20.5	-19.36	203	1088	1344	187	160	167
52	157	-16.25	-20.23	-19.10	225	1140	1416	187	160	160
53	348	-18.89	-25.39	-20.66	220	1110	1432	188	166	165
54	353	-18.16	-24.68	-20.63	228	1100	1925	188	166	169
55	364	-17.61	-24.76	-21.08	216	1210	1581	188	166	169
56	364	-17.3	-25.31	-21.46	217	355	1483	188	166	169
57	416	-17.39	-25.12	-21.31	226	1144	1364	188	169	169
58	382	-17.26	-24.57	-20.91	167	1179	1500	188	169	189
59	302	-19.95	-24.80	-19.58	158	1084	1331	188	166	160
60	402	-22.54	-28.91	-23.42	137	1030	1278	187	158	160
61	158	-15.09	-20.36	-19.42	129	1211	1443	188	160	160
62	250	-16.15	-17.99	-18.30	127	1180	1446	188	166	169
63	275	-16.21	-18.36	-18.43	122	1176	1428	188	169	169

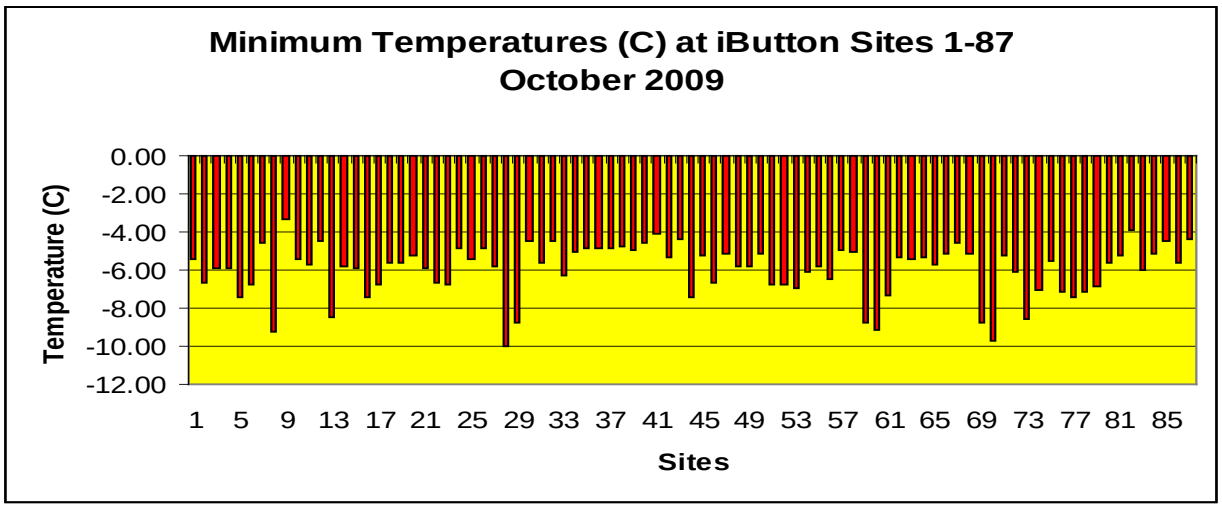
Ibutton Number (No.) and Elevation (m)		Minimum Winter Temperatures(ºC)			Growing Degree Days (Base 10ºC) April-Oct.			Length of Frost Free Season (Days)		
No.	m	Dec. 2007	Dec. 2008	Dec. 2009	2007*	2008	2009	2007	2008	2009
64	250	-16.26	-18.03	-19.81	150	1276	1562	188	166	167
65	274	-17.25	-24.09	-21.43	502	1313	1519	188	169	169
66	200	-16.57	-17.13	-18.77	125	1076	1565	188	122	169
67	275	-16.91	-18.05	-18.74	134	1229	1476	188	169	169
68	302	-16.66	-18.49	-19.12	61	186	1427	188	169	169
69	288	M	-25.44	-19.87	51	1159	1408	188	166	160
70	277	-18.42	-24.37	-19.43	59	1081	1327	142	160	165
71	318	-17.07	-23.57	-19.71	61	244	1487	188	169	169
72	407	-19.75	-28.04	-23.61	35	1202	1412	175	169	169
73	572	-20.17	-29.07	-25.57	23	1010	1251	187	162	162
74	400	-21.08	-30.08	-26.02	55	1292	1506	188	171	189
75	285	-19.94	-29.12	-24.88	73	1364	1586	188	171	169
76	490	-20.33	-31.36	-26.88	62	1272	1443	188	171	164
77	510	-22.60	-30.26	-27.16	74	1223	1420	188	171	178
78	465	-20.81	-31.12	-27.13	61	1274	1451	188	171	177
79	428	-21.69	-30.42	-27.32	70	1310	1523	188	171	169
80	222	-17.44	-17.25	-18.51	39	1302	1577	188	166	169
81	182	-17.33	-16.76	-17.77	38	1271	1522	188	171	169
82	300	-17.05	-24.65	-20.69	77	1294	1609	175	161	160
83	445	-19.39	-20.02	-24.19	M	1264	1444	M	171	M
84	304	-17.97	-24.43	-20.76	M	1215	1484	M	160	160
85	210	-16.41	-24.03	-19.27	M	1201	1476	M	160	167
86	308	-19.17	-18.16	-19.55	M	1206	1495	M	166	169
87	400	-16.72	-18.44	-19.96	M	1218	1492	M	166	169
Project and Environment Canada Weather Stations										
Grossler		-19.67	-26.02	-21.19	1236	1215 **	1574	M	160	160
Roshard		-18.28	-24.83	-19.91	1261	1201**	1597	166	160	162
Ruddock		-18.00	-24.51	-20.57	980	1218**	1667	M	160	169
Diamond S		-19.33	-27.39	-23.60	129	1264**	1503	M	171	189
Halfway Ranch		-17.94	n/a	-19.67	136	1206**	1517	M	166	169
Lillooet		-17.50	-24.60	-20.10	M	1333	1651	M	166	166
Lytton		-16.00	-23.50	-18.80	1335	1301	1644	205	168	168

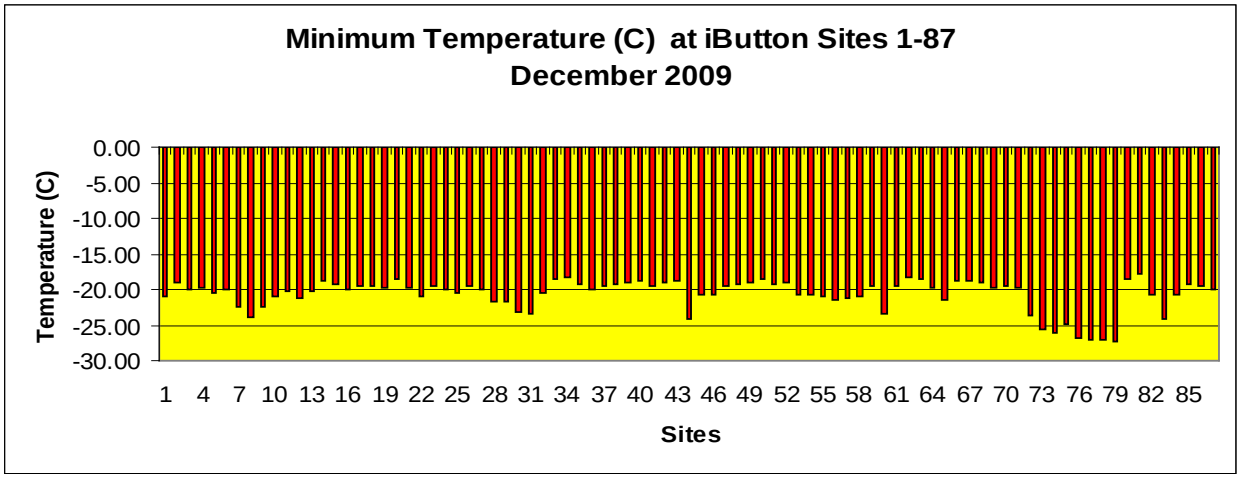
*Missing data iButtons installed from August to December. ** Missing data. iButton data used.

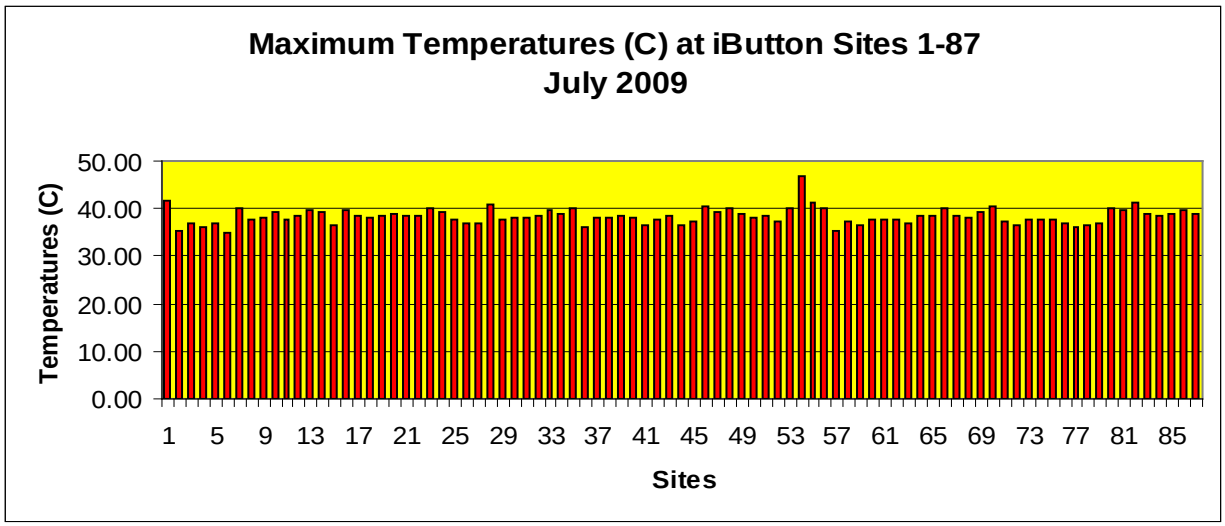
GRAPHS

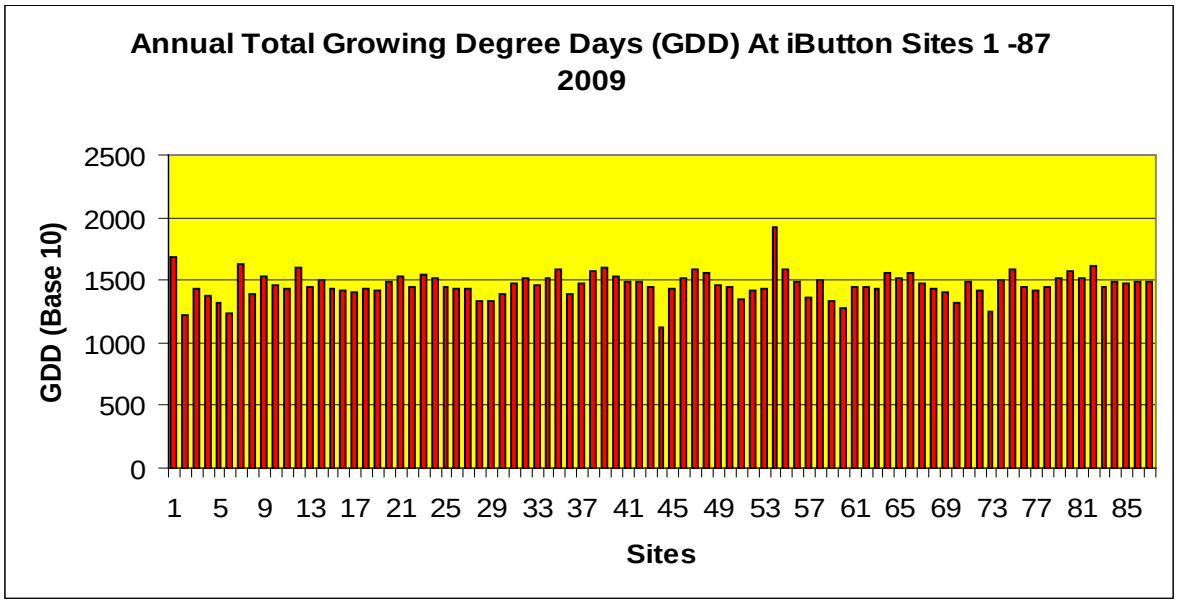

Minimum Temperature (C) at iButton Sites 1-87
January 2009
Temperature (C)
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
Sites


Minimum Temperatures (C) at Ibutton Sites 1-87
March 2009
Temperature (C)
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85
Sites


Minimum Temperatures (C) at iButton Sites 1-87
October 2009
Temperature (C)
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85
Sites


Minimum Temperature (C) at iButton Sites 1-87
December 2009
Temperature (C)
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
Sites


Maximum Temperatures (C) at iButton Sites 1-87
July 2009
Temperatures (C)
50.00
40.00
30.00
20.00
10.00
0.00
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85
Sites

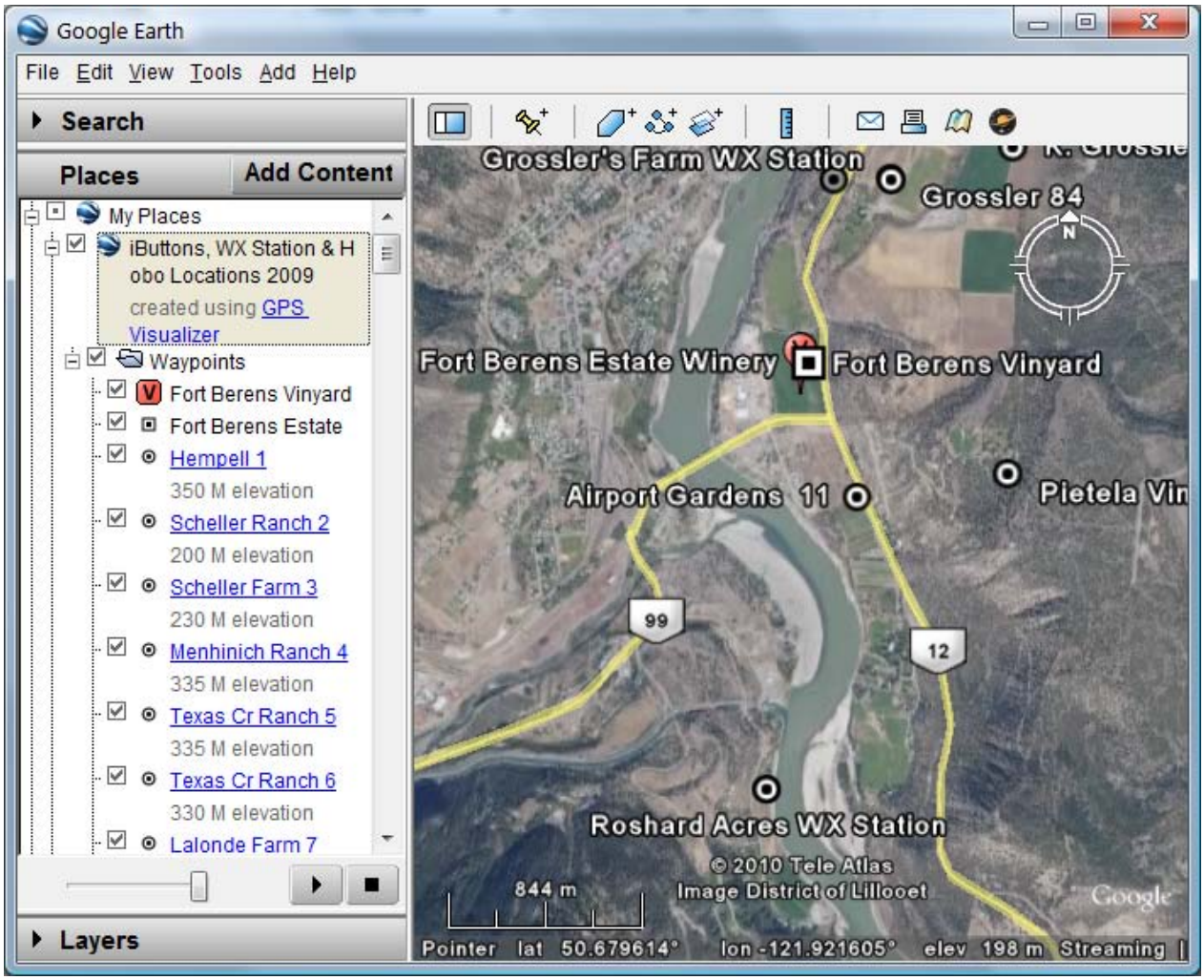

Annual Total Growing Degree Days (GDD) At iButton Sites 1 -87
2009
GDD (Base 10)
2500
2000
1500
1000
500
0
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85
Sites

MAPS

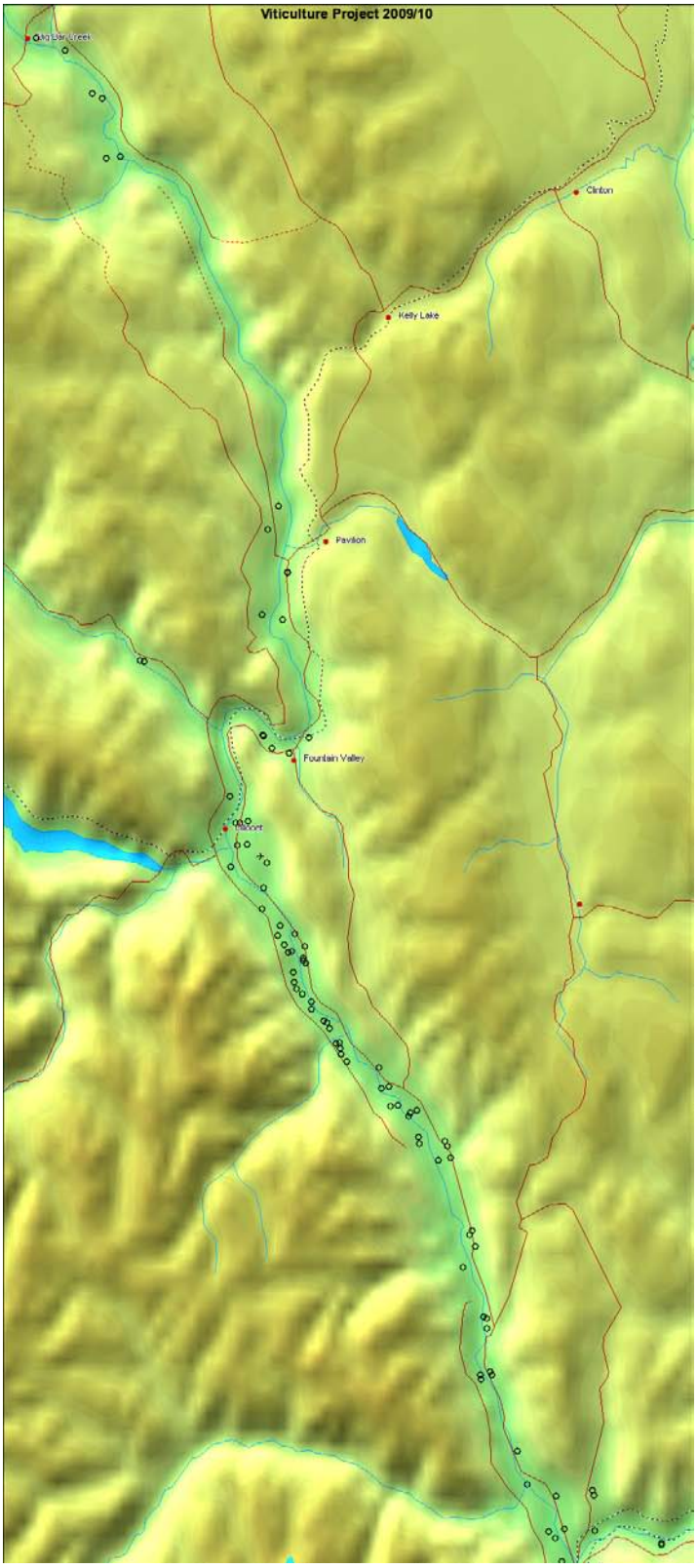
iButton and Weather Station locations – Google Earth Maps

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.



Location of Project Test Vineyards and Project Study Area in the Lillooet-Lytton Area



ADDENDUM

A review of Minimum Winter Temperatures (ºC) data provided in Table 22 of the Progress Report for 2008 and 2009 has identified the use of incomplete data for the month of December 2008 which is corrected in this addendum.

Corrections to Table 22 2008 Selected Climatic Events at iButton and Weather Station Locations			
Site & iButton Number	**Corrected Dec.2008 Minimum Winter Temperatures (ºC)**	**Site & iButton Number**	**Corrected Dec.2008 Minimum Winter Temperatures (ºC)**
1	-24.09	48	-23.15
2	-22.79	49	-23.61
3	-23.65	50	-22.66
4	-23.55	51	-23.41
5	-23.87	52	-23.33
6	-24.10	53	-25.39
7	-26.34	54	-24.68
8	-28.95	55	-24.76
9	-26.52	56	-25.31
10	-25.48	57	-25.12
11	-24.17	58	-24.57
12	-25.71	59	-24.80
13	-25.30	60	-28.91
14	-22.21	61	-24.13
15	-22.41	62	-22.48
16	-23.75	63	-22.80
17	-23.52	64	-23.36
18	-23.21	65	-24.09
19	-23.49	66	-22.88
20	-22.62	67	-22.92
21	-23.64	68	-23.61
22	-26.28	69	-25.44
23	-24.16	70	-24.37
24	-23.67	71	-23.57
25	-24.44	72	-28.04
26	-23.46	73	-29.07
27	-23.41	74	-30.08
28	-29.06	75	-29.12
29	-28.61	76	-31.36
30	-27.63	77	-30.26
31	-28.17	78	-31.12
32	-24.75	79	-30.42
33	-22.18	80	-22.05
34	-22.47	81	-21.38
35	-23.22	82	-24.65
36	-24.10	83	-20.02

Corrections to Table 22 2008 Selected Climatic Events at iButton and Weather Station Locations			
Site & iButton Number	**Corrected Dec.2008 Minimum Winter Temperatures (ºC)**	**Site & iButton Number**	**Corrected Dec.2008 Minimum Winter Temperatures (ºC)**
37	-23.47	84	-24.88
38	-24.09	85	-24.03
39	-24.31	86	-24.79
40	-24.25	87	-23.90
41	-23.69	***Weather Station Locations***	
42	-23.36	**Grossler**	-26.02
43	-23.93	**Roshard**	-24.83
44	-23.28	**Ruddock**	-24.51
45	-24.29	**Diamonds**	-27.39
46	-24.59	**Halfway**	n/a
47	-23.36	**Lillooet EC**	-24.60
		Lytton EC	-23.50