

PROGRESS REPORT 2008

(Updated)

**Climate and Feasibility Assessment of Growing Wine Grapes
in the Lillooet-Lytton Area.**



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Prepared for

**Investment Agriculture Foundation of
British Columbia**

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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.

<p>In addition to new and updated information, this Progress Report (Interim Report) contains corrected data in Table 3 "Lytton Frost Free Season and Extreme Minimum Temperatures" and Table 4 "Lillooet Frost Free season and Extreme Minimum Temperatures"; corrected climate data on page 8; corrected Minimum Winter Temperatures for Dec. 2008 and corrected Growing Degree Days for 2007 and 2008 in Table 22 on page 26-28; graph of Minimum Winter Temperatures Lillooet-Lytton area December 2008.</p>

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KEY ACTIVITIES IN PERIOD APRIL 2008 TO APRIL 2009

The progress report for 2007 provides a detailed outline of this project. A brief outline is provided in this report with updated and new information pertaining to 2008.

PROJECT DESCRIPTION

Project Timing Contents

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 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 2006.

Grape phenology includes the date when grapes begin to grow (budbreak), bloom, veraison (start of ripening), reach ripeness and harvest is provided in Tables 11, 12, 13, 14, 15, 16, 17 and 18 appended to this report. Data concerning vine maturity at the end of the 2008 growing season and the survival of grape buds and vines is provided in Tables 19 and 20 appended to this report. Fruit quality for wine production is determined by measuring the amount of sugar, acid and pH of the grape juice. 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 tartaric acid. PH indicates the grape ripeness.

Information concerning the quality of the grapes is monitored during the ripening season in a lab facility provided by Roshard Acres. Samples of grapes taken at harvest are sent to participants at PARC Summerland for final quality determination. Information concerning the quality of grapes produced in 2008 is provided in table 16, 17 and 18 appended to this report.

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

Mechanism: Compile climate data via weather stations and supplemental temperature data loggers (iButtons) such as calculate 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.

Climate information needed to determine the suitability of the area to commercial grape production includes the length of the frost-free season, the amount of heat accumulated during the growing season, the minimum winter temperature and rainfall. The frost free period is the time between the last frost (0° C) in the spring and the first frost on the autumn. This is the period of time grape vines have available between the start of growth and the maturation of the vine and fruit. The average amount of heat above 10 degrees C each day is accumulated through the period April 1 to October 31 and is expressed as growing degree-days (GDD) or heat units (HU). The number of growing degree-days accumulated is indicative of the ripening potential of an area for a range of grape selections. Minimum winter temperatures of - 25°C and colder will severely damage most wine grapes grown today. 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 and harvest and to develop disease and pest control strategies. A compilation of climate data taken from Environment Canada Atmospheric Environment Service (AES) weather stations at Lytton and Lillooet and supplemental data collected from project weather stations and data loggers is appended to this report in tables 2 to 10 and 21, 22 as well as graphs on pages 25, 26. A map outlining the project study area with locations of test vineyards and project climate stations and data loggers is appended to this report on page 27.

COMMUNICATIONS

Communication about this project to create awareness and provide the project progress occurs through the participation of the British Columbia Grape Growers Association, interest by several larger wineries in the Okanagan, tour of a participating vineyard, participation by various levels of government, interest by local individuals as well as people outside the Lillooet-Lytton area and by placing this progress report on the Lytton and Lillooet community websites. Articles concerning the project have appeared in local and other newspapers and various magazines. A listing of articles and notice of field day is provided in Table 1 appended to this report.

Direct contact is maintained with the landowners who are also the vineyard managers by the project technician Norm Vernon when he records observations and attends to the weather stations and iButtons. Doug Robson and Christ'l Roshard also maintain contact with other landowners and John Vielvoye provides pro bono consulting services and also records observations.

Field Day 2008

An open house to tour Roshard Acres on September 27, 2008, was attended by many local people, several prospective vineyard investors and a major winery representative as well as project participants Graham Strachan (Ministry of Agriculture & Lands), Myles Bruns

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(Regional Manager Ministry of Community Development), project technician Norm Vernon, Christ'l Roshard & Doug Robson (representing Roshard Acres), Eileen Pietila (representing Pietila Vineyards) and John Vielvoye (project vineyard consultant) who were available to answer questions.



Field day at Roshard's - Sept. 28, 2008

PROJECT OUTPUTS DURING PAST 12 MONTHS

Project outputs include:

- Awareness of the project created through word of mouth, articles in the print media and posting of project progress reports on the District of Lillooet and Village of Lytton websites.
- Five weather stations in the study area are collecting year-round temperature data as well as wind speed and direction, relative humidity, solar radiation, and precipitation.
- On-line accessibility to weather records from the two Davis stations are 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 are in locations to augment collection of temperature data from the 5 project weather stations and will contribute to the development of a climate profile for the region. Most iButtons are protected from livestock and wildlife.
- Collection of weather data from weather stations and all iButtons is provided to project participants at PARC- Summerland where the data is stored and climate data summaries are

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prepared. This data will be used to develop a detailed climatic profile of the area.

- Assessment of the effect of low winter temperatures December 19 to 23, 2008 and January 2 to 4 and January 26, 2009.
- Observations at participating vineyards February 25-27, 2008 to assess the grape bud and vine survival after the 2007-2008 winter. Results of those observations are as follows:

Wonderland Farms: no bud damage

Pietila vineyard: 50% bud damage to Gösceji Zamos and 25% bud damage to Gewurztraminer, Johannisberg Riesling and Pinot Blanc 25%

Roshard Acres: 25% bud damage to Petite Verdot and 50% bud damage to Tinta Madeira.

Ruddock Ranch: 70% bud damage to Cabernet Franc, Limberger, and Syrah; 50% bud damage to Cabernet Sauvignon, Merlot, Muscat Ottonel, Pinot Blanc, Syrah and 75% bud damage to Chardonnay, Pinot Noir and Tinta Madeira.

- Observations at participating vineyards regarding wood maturity and bud or wood damage from the 2009 winter are provided in Table 19 and 20.
- Anecdotal 2009 winter temperature reports from the Okanagan and Similkameen Valleys suggests that the minimum temperature during December 2008 reached -29°C in east Kelowna and -24°C in vineyard areas of the upper benches in Oliver and Osoyoos. Colder temperatures are reported for low lying areas in the Oliver-Osoyoos area with reports that many young vineyards have suffered severe wood injury and bud kill. The least damage to vineyards is reported from the Naramata and Okanagan Centre areas where the moderating influence of Okanagan Lake is believed to have kept minimum temperatures near -17°C. Reports of 30 to 60% bud damage to Okanagan-Similkameen vineyards in general are not unusual.
- Detailed phenology events by variety is provided in Tables 11, 12, 13, 14, 15, 16, 17, 18
- An open house and field day September 27, 2008 to show and discuss the test panting at Roshard Acres.
- Harvest at Roshard Acres in 2008 experienced wasp damage and extensive bird damage resulting in plans to use wasp traps and acquire bird netting to protect the crop in 2009. Electric fencing to deter bear damage was effective in 2008.
- Results of final sampling and analysis of fruit quality of the 2008 harvest are provided in tables 16, 17 and 18.
- Data showing minimum winter temperatures for December 2008 and January 2009 is provided in Tables 9 and 10.
- 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, pruning.



**iButton temperature data logger
weather shield**

PROGRESS TOWARDS ACHIEVING THE OBJECTIVES AND BENEFITS

Objectives

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

- Vineyards are visited before pruning is started, during the growing season and in the autumn to record observations and to provide consultations.
- Observations were recorded and much data was collected, for example, assessment of winter damage to vines (Table 20), phenology (Tables 11, 12, 13, 14, 15, 16, 17, 18), grape maturity (Table 14, 15), harvest at Roshard Acres (Table 16, 18), wood maturity of vines by Oct. 17, 2008 (Table 19) and bud and vine survival by Feb. 24, 2009 in Table 20.
- Observations made of varieties at the Roshard Acres include varieties established in a separate planting of Foch and Okanagan Riesling vines made in 1972, plus those vines established in 2005 and 2006.
- All participating vineyards are drip irrigated.
- Participants have identified irrigation management and the control of vine vigour through irrigation as a challenge to learning to grow grapes successfully.
- All vineyards have a permanent cover crop.
- All of the vineyards are treated to prevent the development of powdery mildew and other diseases were not observed. Some leaves infested with leafhopper and with Erineum mite were found at Wonderland farms and Roshard Acres. Weed control methods vary.
- Growth of vines at Ruddock Ranch vineyard came to an end in July, 2009 as a result of an accidental but fatal application of a weed killer not registered for use in vineyards to the entire vineyard except for 6 rows of red grapes. An attempt to maintain these 6 rows was not successful and all vines are now dead. Some phenological data was collected at this site in 2008. Ruddock Ranch continues to be an important participant for the collection of climate data.
- The limited use of fertilizer at Wonderland Farm resulted in more vigorous growth. However, part of this planting is still recovering from transplanting nursery stock during the summer of 2006. Owners decided to remove all flower clusters from all varieties in 2008 to assist vine vigour.
- Vine vigour in 2008 at the Pietila Vineyard was generally low despite increased irrigation plus use of fertilizer. Some, but not all vines responded to these efforts. The vineyard still resembles a new planting with a range of vine vigour.
- Retraining of some GÖcseji Zamos, Limberger, Merlot, Petite Verdot, Sauvignon Blanc, Syrah and Viognier was required at Roshard Acres in 2008. All varieties produced a crop. Effects of drought conditions during the 2007 growing season were noticeable as vine vigour was generally low in 2008.
- A full crop was produced at Roshard Acres in 2008 on 18 varieties and a part crop on 2 new varieties. However, wasps harvested most of the Riesling Muscat and birds harvested approximately one-half to one-third of the Foch and most of the red grapes in the test

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planting. Grapes used to make white wine were not damaged by birds. Total yield per variety is not available, but the number of clusters required to fill a 22 L (5 gal) bucket and the full bucket weight was recorded and cluster weights were calculated using this data.

Weight of some fruit clusters at harvest at Roshard acres		
Variety	weight per cluster	
	(grams)	(ounces)
Chardonnay	91	3.2
Göcseji Zamatós	113	4
Gewürztraminer	79	2.8
Muscat Ottonel	125	4.4
Pinot Blanc	91	3.2
Pinot Gris	113	4
Sauvignon Blanc	125	4.4
Viognier	79	2.5

Gewürztraminer – Sept. 2008

- Despite a cooler than normal growing season (see Tables 3 to 6 and Table 22 to compare temperatures, frost free season and growing degree days)) most of the grapes at Roshard Acres were ready for harvest by October 10, 2008. Varieties not ready for harvest by Oct. 10 were; Cabernet Franc, Chancellor, Johannisberg Riesling, Limberger, Sauvignon Blanc and Viognier. A limited quantity of fruit from Roshard Acres was brought to the research station at PARC Summerland for chemical analysis (see Table 18)



- Phenology observations (bud burst, bloom dates, veraison, harvest dates) are provided in tables 11, 12, 13, 14, 15, 16, 17, 18

2) To develop a climate profile of the area.

- Climatic information from Environment Canada (AES) climate stations located above the Village of Lytton and in the District of Lillooet is a component of ongoing climate data collection that will be used to determine if grape production is feasible in the area. (Table 2 to 10). Potential vineyard areas are located on both sides of the river.
- Project weather stations and iButtons are located on private property including Reserve Land and range in location from just south of Lytton to east of Lillooet along the Lillooet – Cache creek Highway to West Pavilion.

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- The project climate network consists of five weather stations capable of recording a wide range of climate parameters hourly plus 87 supplementary temperature data loggers (iButtons) capable of recording hourly temperature.
- Data from the WeatherHawk and Davis weather stations is downloaded every two months and data from the iButtons is downloaded every 4 months and both sets of data are sent to PARC, Summerland.
- Assessment of vine condition after the 2008/09 winter at participants test plantings is provided in Table 20.
- Climate data for periods of low winter temperatures December 2008 and January 2009 is provided in tables 9, 10 and 22.

An analysis of some of the climate data generated by this project shows:

- The range of Growing Degree Days (GDD) in 2008 was 338 to 1468, however, when the 2 sites (56, 44) with the lowest GDD are not included, the range of GDD is from 1055 to 1369. GDD data for 2007 is incomplete but ranged from 1346 at the Lillooet EC station to 1450 at the Lytton EC station.
- The range of the frost free season in 2007 was from 142 days to 189 days.
- The range of the frost free season in 2008 was from 122 days to 172 days.
- In 2007 extreme minimum temperatures recorded ranged from -15° C to -23° C
- In 2008 extreme minimum temperatures recorded ranged from -20.02° C to -31° C

In 2008, at 91 sites:

- Extreme minimum temperatures that ranged from -20°C to -23° C were recorded at 14 sites (15 %) *.
- Extreme minimum temperatures that ranged from - 23 °C to -26° C were recorded at 58 sites (64%)*.
- Extreme minimum temperatures that ranged from -26 °C to -30° C were recorded at 14 sites (15%)*.
- Extreme minimum temperatures colder than - 30 °C were recorded at 5 sites
- (6 %)*.

(* percentages are rounded to the nearest whole number)

Benefits

- This project is providing data and operational experience to individuals and businesses that will assist to determine whether commercial grape and wine production is feasible from a climatic, agronomic and financial perspective.
- This project is providing technology transfer in grape production skills to the participants. One participant is learning how to propagate grape plants from cuttings.
- The project will provide data that will show if any wine grape varieties planted in the test plantings or others not currently part of the testing program are suited to the area.
- The project has been instrumental in purchase of a 150 acre property in the Lillooet area for a 3 acre wine grape and a 1 acre fresh market grape variety evaluation planting and possible

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expansion to larger commercial wine grape acreage in the future. The project has also influenced the purchase of a 20 acre property in Lillooet for vineyard development in the spring of 2009.

- This project will provide detailed weather and viticulture data. It is advisable to continue gathering and analyzing weather records to establish a relationship between the five project climate stations and the iButtons and local AES climate stations. It is advisable to continue to gather and analyze viticulture data and relate it to levels of potential climate related injury to vines (e.g. spring, fall, winter damage), phenological and growing season conditions (e.g. frost free period, growing degree days) and rainfall.
- The application of a climate profile generated by this project and its use 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 to improve the efficiency of water use with their existing systems.

ANNUAL WORK PLAN FOR THE NEXT 12 MONTHS

The project partners are committed to an on-going process to collect and evaluate information from the climate network and established vines in test vineyards. Twelve new Hobo data loggers capable of recording temperatures for a year without needing downloading will be added to the climate network in 2009. Climate and vineyard data will be collected in 2009 in the same manner as in 2008.



Grape Project Planning Committee
(From left) Doug Robson, Connie Bielert, Christ'l Roshard, Myles Bruns, Graham Strachan, Istvan (Steve) Losso, Norm Vernon and John Vielvoye

APPENDICES

Table 1 Communications 2008

- 1) Vielvoye, J. 2008. Association of British Columbia Grapegrowers' AGM. Project report to members present.
- 2) Vielvoye, J. 2008. Grape project outline and Report to Okanagan Kootenay Branch of British Columbia Institute of Agrologists
- 3) Gayton, D. Raising a Glass to Economic diversification in Lillooet. Link. Fall 2008. Vol.10 Issue 3. Available online at www.forrex.org.
- 4) Roshard, C. 2008. The Bridge River Lillooet News. Sunday Sept. 28, 2008. Field day and open house 768 Roshard Road, Lillooet.
- 5) Roshard, C. 2008. The Bridge River Lillooet News. Oct. 7, 2008. Lillooet grape project open house and field day success. Page 7.
- 6) Strachan, G. Presentations on the project to various stock associations and agriculture meetings.
- 7) Project progress reports posted on the District of Lillooet website <http://www.lillooetbc.com> and the Village of Lytton website <http://www.lytton.ca>
- 8) B.C. House 2008 at Beijing Olympics featured the video Gold Country which included the Roshard Acres grape test planting.
- 9) District of Lillooet website - 2008. Marketing and Investment video includes promotion of grape production and winery development in Lillooet.

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

Lytton station	Latitude 50° 13.200'N	Longitude 121° 34.800'W	Elevation 225m
Lillooet Station	Latitude 50°40.800'N	Longitude 121°55.800'W	Elevation 235m

Table 3 Lytton Frost Free Season and Extreme Minimum Temperature- Corrected Data

Year	Frost Free Period			Frost	
	Last Spring Frost Temp. (°C)	First fall Frost Temp. (°C)	Free Period (days)	Extreme Minimum Temperature (°C)	
1941-70	April 24	Oct. 24	187	Jan (-31.7)	26 year record
1951-80	April 20	Oct. 24	188	Jan (-31.7)	26 year record
1961-90	n/an/a	Dec 31 1984 (-27.1)		Nov 27 1985 (-27.7)	> 20 year record
1971-2000	n/an/a	Nov 27, 1985 (-27.7)		Dec 31, 1984 (-27.1)	> 20 year record
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)	
Average	Apr. 17	Oct. 28	195	1995-2007	

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Table 4 Lillooet Frost Free Season and Extreme Minimum Temperature- Corrected Data

Frost Free Period				
Year	Last Spring Frost Temp. (°C)	First Fall Frost Temp. (°C)	Frost Free Period in Days	Extreme Minimum Temperature(°C)
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 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 (-0.1)	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)
Average	April 19	Oct. 20	192	



Chancellor – September 2008

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

Estimated Growing Degree Days (base 10° 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
Average 2000-03		1345.7
2000-07	1,449.7	
2008	1301	1333



Petit Verdot – September 2008

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Table 6 Lytton Precipitation (May – October) & Annual Hours of Bright Sunshine

Year	Total Precipitation (mm)							Total Annual Precipitation (mm)	Bright Sunshine (Hrs.)
	May	June	July	Aug	Sept	Oct	Total		
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	M	>673.0	
2001	16.5	M	M	2.0	22.5	24.5	M	> 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	M	500.0	
2004	32.0	18.5	36.0	24.0	46.0	35.5	192.0	357.4	
2005	30.5	46.0	16.5	30.0	M	M	M	> 434.5	
2006	25.5	33.0	4.5	8.0	17.5	20.0	108.5	596.5	
2007	18.5	28.0	15.5	19.5	32.0	29.5	143.0	501.5	
	M= missing data								
Average 1997-07	26.1	28.4	55.5	16.6	20.2	43.7	139.4	445.7	
2008	24.5	35.0	28.5	39.5	30.5	15.0	146	346.5	

**2008 PROGRESS REPORT
(Updated)**

Table 7 Precipitation (April – October) - Lillooet

Year	Rainfall (mm)						Monthly Total	Total Annual Precipitation (mm)	
	May	June	July	Aug	Sept	Oct			
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	M	>178.4	
2003	16.0	24.0	0.6	8.6	22.4	57.8	129.4	> 319.2	
2004	23.6	22.2	32.4	M	M	M	78.2		
2005			Missing data				M		
2006			Missing data				M		
2007	M	M	M	17.6	44.0	M	M		
Average 1998 -2007	21.7	20.9	35.7	13.1	21.7	29.0	134.6		
2008	31.8	39.2	7.6	21.6	32.2	M	132.4+	M	

Table 8 Location of Selected AES Climate Stations in Table 9

Name	Latitude	Longitude	Elevation (m)	Elevation (feet)
Kamloops A	50° 42.000' N	120° 26.400' W	345.3	1133
Kelowna AWOS	49° 57.600' N	119° 22.800' W	429.5	1409
Kelowna MWSO	49° 57.000' N	119° 24.000' W	456	1496
Lillooet	50° 40.800' N	121° 55.800' W	235	771
Lytton	50° 13.200' N	121° 34.800' W	225	738
Lytton RCS	50° 13.200' N	121° 34.800' W	225	738
Penticton A	49° 27.600' N	119° 36.000' W	334.1	1129
Summerland CS	49° 33.600' N	119° 38.400' W	454.2	1490
Osoyoos CS	49° 1.8000' N	119° 26.400' W	282.9	928

**2008 PROGRESS REPORT
(Updated)**

**Table 9 Minimum Temperatures (°C) December 2008 at Climate Stations
Identified in Table 8**

Stations	Dates				
	Dec. 19	Dec. 20	Dec. 21	Dec. 22	Dec. 23
Kamloops A	-23.6	-26.5	-23.4	-21.0	-25.3
Kelowna AWOS	-27.3	-30.6	-20.2	-23.2	-27.6
Kelowna MWSO	M	M	-20.8	-15.1	-21.8
Lillooet	-20.7	-24.6	-23.8	-15.5	-20.8
Lytton	-18.7	-23.5	-19.0	-13.5	-19.4
Lytton RCS	-18.7	-23.5	19.0	13.4	-18.8
Penticton	-16.3	-21.6	-18.2	-13.4	-18.8
Summerland CS	-20.0	-21.6	-18.9	-15.1	-18.2
Osoyoos CS	-14.0	-21.7	-17.2	-10.1	-20.0

**Table 10 Minimum Temperatures (°C) January 2009 at Climate Stations
Identified in Table 8**

Stations	Dates			
	Jan. 2	Jan. 3	Jan. 4	Jan. 26
Kamloops A	-18.2	-21.6	-15.7	-23.7
Kelowna AWOS	-21.0	-23.4	-11.7	-24.3
Kelowna MWSO	-8.7	-18.3	-11.7	-21.5
Lillooet	-15.8	-16.1	-10.7	-19.0
Lytton	-12.5	-15.1	-11.3	-17.3
Lytton RCS	-12.6	-15.2	-11.3	-17.4
Penticton	-17.0	-20.2	-8.3	-13.6
Summerland CS	-13.8	-16.7	-10.5	-16.8
Osoyoos CS	-16.2	-21.5	-11.7	-16.4

**2008 PROGRESS REPORT
(Updated)**

Table 11 Percent Budbreak of Grape Varieties in Test Vineyards - 2008				
Grape Variety	Vineyard			
	Roshard May-10	Ruddock May-09	Wonderland May-10	Pietila May-10
Cabernet Franc	85	50	75	
Cabernet Sauvignon	55	60	60	90
Chancellor	90	70	60	
Chardonnay	60	60	60	100
Göcseji Zamos	50	50	50	100
Foch	80			
Gewurztraminer	80	75	70	100
Johannisberg Riesling	55	90	80	90
Limberger	95	60	65	
Tinta Madeira	60	80	90	100
Merlot	75	40	50	100
Muscat Ottonel	85	80	80	
Petite Verdot	85			
Pinot Blanc	80	20	70	100
Pinot Gris	60	30	70	
Pinot Noir	60	50	80	90
Riesling Muscat	40	40	50	
Sauvignon Blanc	60	100	90	
Syrah	70	50	50	100
Viognier	60			
Zweigeltrebe	85	80		



Grapes begin to grow at about the time pears bloom.
Airport Gardens pears in bloom April 2008

**2008 PROGRESS REPORT
(Updated)**

Table 12 Percent Bloom of Grape Varieties in Test Vineyards - 2008

Grape Variety	Vineyard and Observed Date			
	Roshard July 3	Ruddock July 4	Wonderland July 3	Pietila July 3
Cabernet Franc	Complete	90	Bloom removed	
Cabernet Sauvignon	complete	100	Bloom removed	complete
Chancellor	complete	80	100	
Chardonnay	95	dead	Bloom removed	90
Foch	Complete June 24			
Göcseji Zamos	60	dead	Bloom removed	complete
Gewurztraminer	90	dead	Bloom removed	complete
Johannisberg Riesling	complete	dead	Bloom removed	90
Limberger	complete	100	Bloom removed	
Tinta Madeira	complete	No bloom	Bloom removed	No bloom
Merlot	complete	90	Bloom removed	complete
Muscat Ottonel	80	dead	Bloom removed	
Petite Verdot	complete			
Pinot Blanc	complete	dead	Bloom removed	complete
Pinot Gris	90	dead	Bloom removed	
Pinot Noir	90	50	Bloom removed	complete
Riesling Muscat	complete	dead	Bloom removed	
Sauvignon Blanc	90	dead	Bloom removed	
Syrah	complete	50	100	complete
Viognier	complete			
Zweigeltrebe	90	dead		



Foch in Bloom

**2008 PROGRESS REPORT
(Updated)**

Table 13 Percent Set of Grape Varieties in Test Vineyards by July 15, 2008

Grape variety	Vineyard			
	Roshard	Ruddock	Pietila	Wonderland
Cab. Franc	100	90	100	Bloom
Cab. Sauvignon	100	80	100	removed
Chancellor	100	50		from
Chardonnay	100		100	all
Göcseji Zamatós	100		100	varieties
Foch	80			
Gewurztraminer	100		100	
Johannisberg Riesling	100		100	
Limberger	10	90		
Tinta Madeira	90		no fruit	
Merlot	10	100	no fruit	
Muscat Ottonel	100			
Petite Verdot	100			
Pinot Blanc	100		100	
Pinot Gris	100			
Pinot Noir	10	50	100	
Riesling Muscat	100			
Sauvignon Blanc	100		no fruit	
Syrah	10	70	100	
Viognier	100			
Zweigeltrebe	100			

**2008 PROGRESS REPORT
(Updated)**

Table 14 Brix (sugar content) of Grapes at Roshard Acres - Sept. 4, 2009

Grape variety	Brix	Observations
Cabernet Franc	8	15% of berries coloured, green seeds.
Cabernet sauvignon	12	86% of berries coloured, green seeds.
Chancellor	13	80% of berries coloured, green seeds.
Chardonnay	13.5	Some tan coloured seeds.
Cosceji Zamos	15	Some tan coloured seeds.
Foch	17	80% of berries coloured. Some tan coloured seeds.
Gewurztraminer	16.5	Some tan coloured seeds.
Johannisberg Riesling	9.8	Some tan coloured seeds.
Limberger	13	Some tan coloured seeds.
Merlot	14	80% of berries coloured. Some tan coloured seeds.
Muscat Ottonel	12.5	Some tan coloured seeds.
Petite Verdot	12.5	Some tan coloured seeds.
Pinot Blanc	14	Some tan coloured seeds.
Pinot Gris	14	Some tan coloured seeds.
Pinot Noir	16	90% of berries coloured. Some tan coloured seeds.
Okanagan Riesling	12	Some tan coloured seeds.
Riesling Muscat	15.5	Some tan coloured seeds.
Sauvignon Blanc	13.5	Some tan coloured seeds.
Syrah	12	50% of berries coloured. Some tan coloured seeds.
Tinta Madeira	13	75% of berries coloured. Some tan coloured seeds.
Viognier	9	Some tan coloured seeds.
Zweigeltrebe	15.5	90% of berries coloured. Some tan coloured seeds.

Table 15 Brix (sugar content) of Grapes at Ruddock Ranch - Sept 4, 2008

Grape variety	Brix	Observations
Chancellor	11.5	50% of berries coloured. Seeds tan colour.
Cabernet Franc	5.2	Berries green and hard. Green seeds.
Cabernet Sauvignon	7	Berries green and hard. Green seeds.
Limberger	10	20% of berries coloured. Green seeds.
Merlot	6	Green berries and seeds.
Pinot Noir	10.5	20% of berries coloured. Green seeds.
Syrah	4.5	Green berries and seeds.

**2008 PROGRESS REPORT
(Updated)**

Table 16 Final Sampling & Analysis & Harvest Date Roshard Acres Vineyard - 2008

Variety	Sample & Analysis Date	Brix	pH	Total Acid	Harvest Date
Cabernet Sauvignon	Oct. 10	20	3.04	12	Oct. 11
Cabernet Franc	Oct. 10	19.4	2.82	15.75	Oct. 11
Chancellor	Oct.17	19	2.91	15	Oct.17
Chardonnay	Oct.10	22.9	3.18	9.3	Oct. 11
Göcseji Zamos	Oct.10	20.9	3.1	9	Oct. 11
Foch	Sept. 27	22	3.05	13.5	Sept. 27
Gewurztraminer	Oct. 1	21.5	3.35	8.25	Oct. 4
Johannisberg Riesling	Oct. 10	18.1	2.76	12.45	Oct.18
Limberger	Oct. 10	19.1	2.95	11.1	Oct. 11
Okanagan Riesling	Oct. 10	22.3	3.02	11.1	Oct. 18
Merlot	Oct. 10	23.2	3.28	9	Oct. 11
Muscat Ottonel	Oct. 10	17.2	3.21	6.6	Oct. 11
Pinot Blanc	Oct. 10	20.8	3.14	9.1	Oct. 10
Pinot Gris	Oct. 1	21	3.18	8	Oct. 4
Pinot Noir	Oct. 10	21.5	3.03	10.8	Oct. 11
Petite Verdot	no sample				
Riesling Muscat	Sep-28	20.1	3.41	6.5	Sept. 28
Sauvignon Blanc	Oct. 10	21	2.95	11.7	Oct. 11
Syrah	Oct. 10	18	3.05	11.85	Oct. 11
Tinta Madeira	Oct. 10	20.8	3.05	9.6	Oct. 11
Viognier	Oct. 10	20	2.95	14.4	Oct. 12
Zweigeltrebe	Oct. 10	20.8	3.06	7.65	Oct. 11

Table 17 Final Sampling & Analysis Pietila Vineyard - Sept. 28, 2008

Analysis (small samples)			
Variety	Brix	pH	Total Acid
Cabernet Sauvignon	18	2.93	11.7
Chardonnay	20.5	n/a	n/a
Göcseji Zamos	23.6	3.13	11.2
Gewurztraminer	23.2	3.42	7.13
Johannisberg Riesling	18	2.95	16.65
Pinot Blanc	19.8	3.09	9.6
Pinot Noir	22	n/a	n/a
Syrah	20	3.32	9.44

2008 PROGRESS REPORT (Updated)

Table 18 Analysis of Grape Samples Taken at Harvest from Roshard Acres Conducted at the Pacific Agri-Food Research Centre (PARC) Summerland - Dec. 9th, 2008

#	Variety	Sample Size	wt. 30 berries (gm)	pH	Brix	Total Acid	Harvest Date
1	Okanagan Riesling	1 cluster	43.77	3.04	22.2	11.54	18-Oct-08
2	Pinot Gris	1 cluster	38.48	3.19	18.2	7.5	04-Oct-08
3	Viognier	1 cluster	38.2	3.13	19.5	7.91	12-Oct-08
4	Johannisberg Riesling	2 small clusters	36.94	2.95	16.2	9.18	18-Oct-08
5	Gewurztraminer	1 cluster	38.55	3.36	20.1	5.34	04-Oct-08
6	Sauvignon Blanc	1 cluster	35.99	3.1	24.6	9.51	11-Oct-08
7	Pinot Blanc	single berry mush	-	3.25	20.6	7.33	10-Oct-08
8	Chardonnay	single berry mush	-	3.25	25	9.05	11-Oct-08
9	Muscat Ottonel	single berry mush	-	3.3	21	6.35	11-Oct-08
10	Göcseji Zamos	single berry mush	-	3.14	21.3	7.65	11-Oct-08
11	Riesling Muscat	single berry mush	-	3.43	28.1	5.33	28-Sep-08
12	Foch (Roshard)	single berry mush	-	3.38	24.6	12.41	27-Sep-08



The beginning of grape growth – April 2008

**2008 PROGRESS REPORT
(Updated)**

Table 19 Percent Wood Maturity in Participating Vineyards - October 5, 2008

Grape Variety	Vineyard			
	Roshard Acres	Ruddock Ranch	Pietila Vineyard	Wonderland Farms
Cabernet Franc	80	90		80
Cabernet Sauvignon	65	90	75	80
Chancellor	85	90		80
Chardonnay	80		80	90
Göcseji Zamatos	80		85	85
Foch	85			
Gewurztraminer	75		85	80
Johannisberg Riesling	80		95	85
Limberger	85	75		75
Merlot	90	80	85	80
Muscat Ottonel	75			60
Petit Verdot	60			
Pinot Blanc	85		90	80
pinot Gris	85			80
Pinot Noir	85	75	90	85
Riesling Muscat	75			75
Sauvignon Blanc	50		50	75
Syrah	85	80	80	85
Tinta Madeira	85		75	85
Viognier	40			
Zweigeltrebe	90			

**2008 PROGRESS REPORT
(Updated)**

Table 20 Percent Survival of Vine Buds and Trunks in Test Vineyards to February 24, 2009

Variety	Test Vineyard and Date Observed		
	Roshard	Wonderland	Pietila
Cab. Franc	80	5 *	
Cab. Sauvignon	90	0 *	20
Chancellor	95	100	
Chardonnay	90		90
Göcseji Zamatós	10	0 *	25
Foch	100		
Gewurztraminer	90	0 *	25
Johannisberg Riesling	60	10 *	20
Limberger	50		
Tinta Madeira	25	10 *	5 *
Merlot	5	5 *	20 *
Muscat Ottonel	10	10 *	
Petite Verdot	10		
Pinot Blanc	60	50 *	20
Pinot Gris	95		
Pinot Noir	80	10 *	70
Riesling Muscat	90	50 *	
Sauvignon Blanc	10 *	10 *	0 *
Syrah	5		5
Viognier	60 *		
Zweigeltrebe	40		

* = Severe trunk damage to these varieties

**2008 PROGRESS REPORT
(Updated)**

Table 21 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
Grossler Farm	304	Weather Hawk & iButton
Halfway Ranch	308	Davis Vantage Pro 2 & iButton
Wonderland Farm	348	iButton
Pietila Farm	349	iButton
Roshard Acres	210	Weather Hawk & iButton
Ruddock Ranch	400	Weather Hawk & iButton

**2008 PROGRESS REPORT
(Updated)**

Table 22 2008 Selected Climatic Events at iButton and Weather Station Locations

Site & iButton Number	Corrected Data Minimum Winter Temperatures (°C)		Corrected Data Growing Degree Days (base10°C) April-Oct.		Frost Free Season Length (days)	
	2007-Dec	2008-Dec.	2007 *	2008	2007	2008
1	-17.25	-24.09	475	1310	188	169
2	-18.11	-22.79	364	1055	188	166
3	-17.64	-23.65	411	1206	188	169
4	-17.98	-23.55	414	1148	188	169
5	-18.30	-23.87	403	1108	188	169
6	-19.48	-24.10	362	1065	188	166
7	-17.78	-26.34	463	1403	188	171
8	-21.38	-28.95	425	1244	187	158
9	-17.69	-26.52	457	1320	187	169
10	-18.47	-25.48	472	1282	187	160
11	-16.43	-24.17	471	1306	188	166
12	-17.78	-25.71	463	1306	188	166
13	-20.36	-25.30	357	1175	188	166
14	-18.17	-22.21	388	1286	188	166
15	-17.98	-22.41	404	1289	188	166
16	-19.20	-23.75		1131	M	166
17	-19.27	-23.52	383	1197	188	166
18	-17.71	-23.21	392	1247	188	166
19	-17.72	-23.49	381	1229	188	166
20	-17.67	-22.62	416	1295	188	166
21	-17.03	-23.64	376	1278	188	169
22	-20.09	-26.28	358	1220	188	160
23	-18.15	-24.16	376	1252	188	166
24	-17.15	-23.67	385	1296	188	169
25	-17.29	-24.44		1291	M	166
26	-17.76	-23.46		1266	M	169
27	-17.55	-23.41	392		188	169
28	-22.54	-29.06	206	1141	175	160
29	-21.91	-28.61	201	1131	175	159
30	-18.62	-27.63	227	1202	188	166
31	-18.81	-28.17	250	1291	188	169
32	-17.16	-24.75	277	1324	175	166
33	-16.58	-22.18	291	1247	175	168

**2008 PROGRESS REPORT
(Updated)**

Table 22 2008 Selected Climatic Events at iButton and Weather Station Locations						
Site & iButton Number	Corrected Data Minimum Winter Temperatures (°C)		Corrected Data Growing Degree Days (base10°C) April-Oct.		Frost Free Season Length (days)	
	2007- Dec	2008-Dec.	2007 *	2008	2007	2008
34	-16.26	-22.47	305	1321	188	168
35	-16.33	-23.22	301	1318	175	169
36	-16.94	-24.10	269	1222	188	169
37	-16.48	-23.47	280	1249	188	169
38	-14.63	-24.09	263	1352	188	166
39	-14.79	-24.31	256	1315	175	166
40	-15.27	-24.25	271	1280	189	172
41	-15.23	-23.69	286	1364	188	172
42	-15.33	-23.36	275	1308	188	166
43	-15.30	-23.93		1236	M	169
44	-17.64	-23.28	205	921	188	159
45	-17.98	-24.29	240	1184	188	169
46	-18.14	-24.59	229	1166	188	166
47	-16.96	-23.36	275	1285	188	171
48	-16.85	-23.15	190	1220	188	171
49	-17.68	-23.61	202	1311	188	166
50	-15.94	-22.66	235	1308	188	160
51	-16.14	-23.41	225	1233	187	160
52	-16.25	-23.33	247	1298	187	160
53	-18.89	-25.39	203	1089	188	166
54	-18.16	-24.68	201	1130	188	166
55	-17.61	-24.76	215	1164	188	166
56	-17.30	-25.31	210	338	188	166
57	-17.39	-25.12	218	1166	188	169
58	-17.26	-24.57	161	1225	188	169
59	-19.95	-24.80	151	1154	188	166
60	-22.54	-28.91	132	1128	187	158
61	-15.09	-24.13	139	1321	188	160
62	-16.15	-22.48	133	1272	188	166
63	-16.21	-22.80	128	1250	188	169
64	-16.26	-23.36	136	1278	188	166
65	-17.25	-24.09	475	1310	188	169
66	-16.57	-22.88	136	1315	188	122

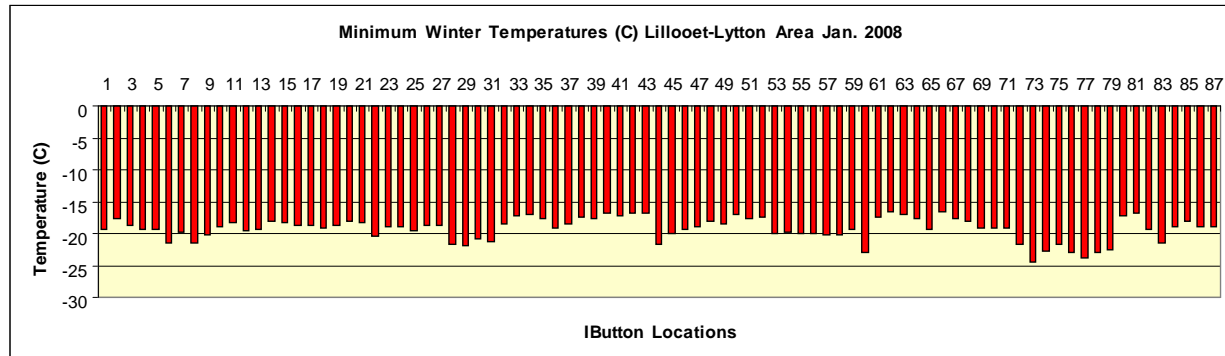
**2008 PROGRESS REPORT
(Updated)**

Table 22 2008 Selected Climatic Events at iButton and Weather Station Locations						
Site & iButton Number	Corrected Data Minimum Winter Temperatures (°C)		Corrected Data Growing Degree Days (base10°C) April-Oct.		Frost Free Season Length (days)	
	2007- Dec	2008-Dec.	2007 *	2008	2007	2008
67	-16.91	-22.92	127	1258	188	169
68	-16.66	-23.61	62		188	169
69		-25.44	50	1224	188	166
70	-18.42	-24.37	51	1160	142	160
71	-17.07	-23.57	52		188	169
72	-19.75	-28.04	39	1318	175	169
73	-20.17	-29.07	24	1085	187	162
74	-21.08	-30.08	58	1397	188	171
75	-19.94	-29.12	76	1468	188	171
76	-20.33	-31.36	62	1361	188	171
77	-22.60	-30.26	55	1312	188	171
78	-20.81	-31.12	63	1383	188	171
79	-21.69	-30.42	67	1393	188	171
80	-17.44	-22.05	35	1345	188	166
81	-17.33	-21.38	34	1302	188	171
82	-17.05	-24.65	66	1240	175	161
83	-19.39	-20.02	0	1304	M	171
84	-17.97	-24.88	0	1304	M	160
85	-16.41	-24.03	0	1268	M	160
86	-19.17	-24.79	0	1292	M	166
87	-16.72	-23.90	0	1269	M	166
Weather Station Locations						
Grossler	-19.67	-26.02	1236	1215 *	M	160
Roshard	-18.28	-24.83	1261	1201*	166	160
Ruddock	-18.00	-24.51	980	1218*	M	160
Diamond S	-19.33	-27.39	129	1264*	M	171
Halfway	-17.94	n/a	136	1206*	M	166
Lillooet EC	-18.2	-24.6	1346	1333*	189	166
Lytton EC	-15.3	-23.5	1450	1301*	199	168
M means data is missing.						
* means that data from iButtons has been used due to missing station data						

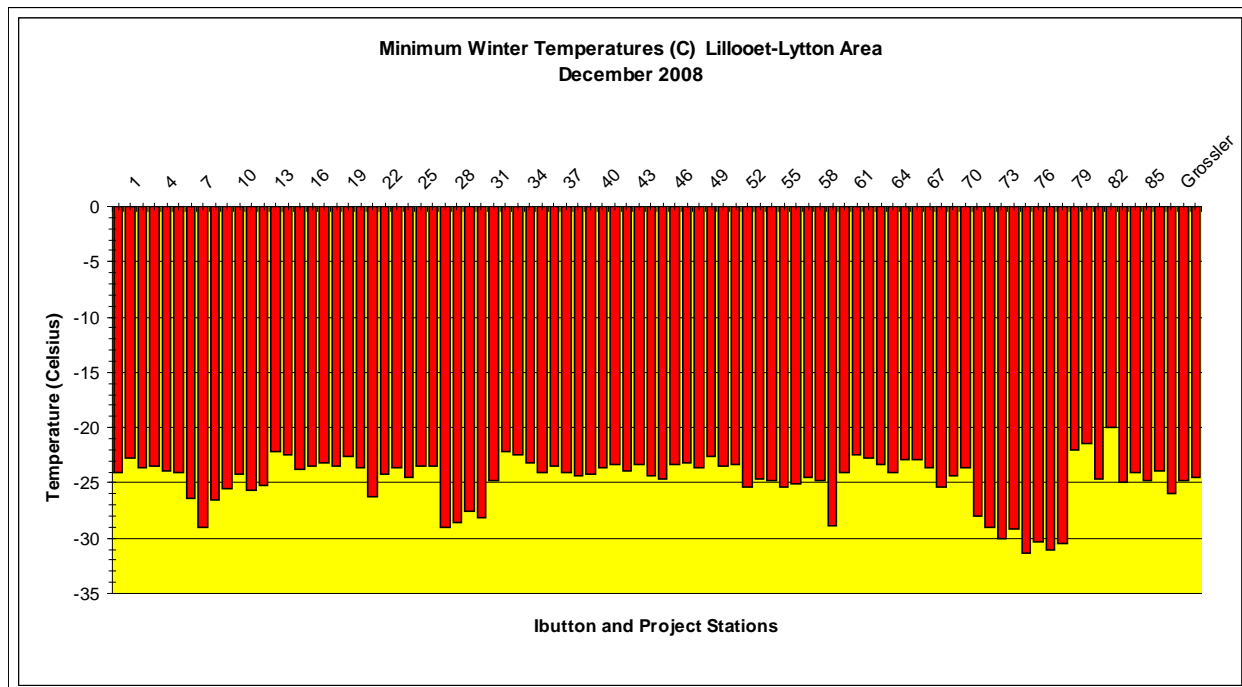
2008 PROGRESS REPORT (Updated)

GRAPHS Minimum Temperatures January and December 2008

Minimum temperatures at sites 1-87 – January 2008



Minimum temperatures at Sites 1 - 87 - December 2008 (Amended December 2010)

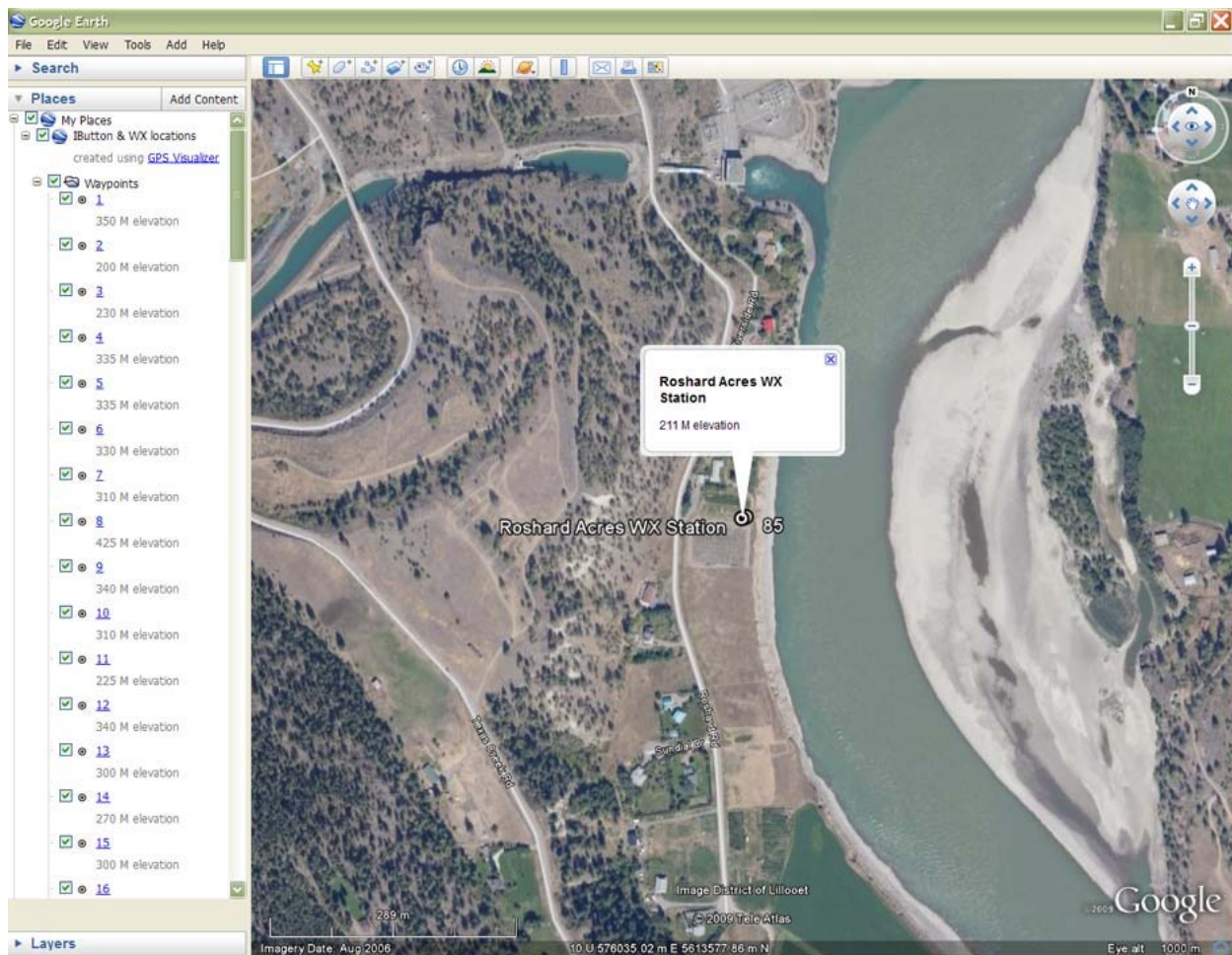


MAP OF PROJECT AREA

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 station, iButton and test vineyard locations. Using Google Earth you are able to see the locations, find the latitude, longitude and elevation of a weather station or iButton, 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 'iButton & WX locations', expand the 'Waypoints' folder and then click on the iButton number or weather station location of interest.



2008 PROGRESS REPORT
(Updated)

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

