Climatic Characteristics of *Vitis vinifera* Production Regions in Canada

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The success and growth of the grape and wine industries in British Columbia and Ontario are largely due to the production of premium quality wines made from noble *Vitis vinifera* cultivars such as Chardonnay, Merlot and Pinot noir. This success has spurred efforts to expand the Canadian grape and wine industry to new regions in these and other provinces, but climate is the main constraint on acreage expansion for production of *V. vinifera* cultivars. Sustainable production of *V. vinifera* requires sufficient growing-season heat, a long frost free period, and winter temperatures that rarely dip to below bud-lethal (< -22 °C) or vine-lethal (< -25 °C) levels.

Historical weather data can be used to assess climatic suitability for grape growing. Using data from Environment Canada (https://weather.gc.ca/) we produced summaries of the historic climate characteristics for a selection of Canadian *V. vinifera* growing locations: Osoyoos, Summerland, Abbotsford and Duncan, BC, Vineland, ON, and Kentville, NS. Indices derived from the data include growing degree days (GDD, base 10 °C), consecutive frost free days (FFD), annual minimum temperature, and daily record low temperature for periods spanning the past quarter to half century (see attached charts).

GDD and consecutive frost free days were derived as:

- Seasonal (Apr to Oct) GDD = $\Sigma_{daily}((T_{max} - T_{min})/2 - 10)$, including only values > 0.
- Consecutive FFD = number of consecutive days having T_{min} > -1˚C.

The record of annual minimum temperatures shows the frequency of lethally cold winters at each location. Daily record low temperatures, from October 1 to April 30, indicate the potential for low-temperature exposure and damage risk during this damage-prone period. Utility of the data for risk assessment is dependent on the length of the data record and whether climate change trends have been detected. In addition, as a result of cold air drainage and pooling, temperatures can vary spatially in a vineyard by as much as +/- 5˚C. This topography-related temperature variation results in sites warmer or colder than average for a region which emphasizes the importance of site selection to the long term success of a vineyard.

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Annual Growing Degree Days, Consecutive Frost Free Days, and Minimum Temperatures in Six Grape Growing Regions in Canada

Annual Growing Degree Days 2005 - 2016

	Osoyoos BC	Summerland BC	Abbotsford BC	Duncan BC	Vineland ON	Kentville NS
Average	1571	1348	1064	986	1565	1093
Max	1768	1519	1271	1200	1773	1183
Min	1386	1200	934	723	1265	1000

Consecutive Frost Free Days 1965 - 2016

	Osoyoos BC	Summerland BC	Abbotsford BC	Duncan BC	Vineland ON	Kentville NS
Average	186	196	225	192	194	164
Max	223	243	324	253	221	204
Min	142	160	150	151	160	118

Minimum Temperature Frequencies 1965 - 2016

Number of days below -	Osoyoos BC	Summerland BC	Abbotsford BC	Duncan BC	Vineland ON	Kentville NS
-21˚C	24	28	0	2	24	114
-23˚C	9	8	0	0	10	27
-25˚C	3	5	0	0	1	7

Record Minimum Temperature (˚C) 1965 - 2016

Month	Osoyoos BC	Summerland BC	Abbotsford BC	Duncan BC	Vineland ON	Kentville NS
Oct	-10.5	-14.0	-7.5	-6.1	-6.7	-7.2
Nov	-22.5	-23.0	-16.7	-17.0	-11.1	-13.0
Dec	-26.5	-29.4	-20.0	-21.7	-26.0	-23.0
Jan	-26.1	-24.4	-20.0	-21.1	-24.5	-28.0
Feb	-24.4	-21.0	-15.3	-13.0	-24.8	-30.0
Mar	-14.0	-16.7	-11.7	-10.0	-24.4	-22.0
Apr	-7.8	-6.3	-4.4	-5.2	-9.0	-13.2

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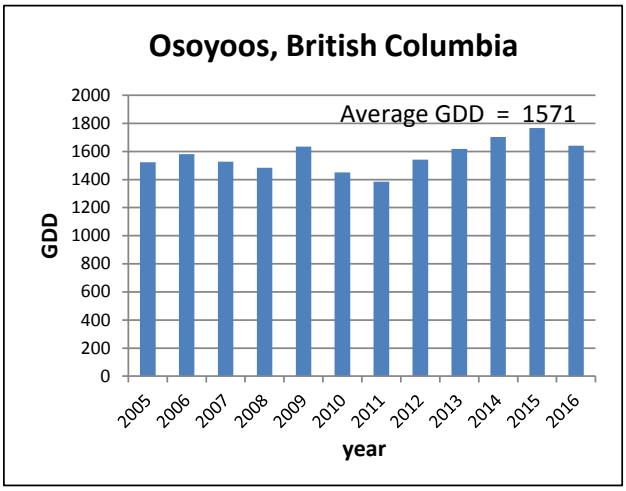
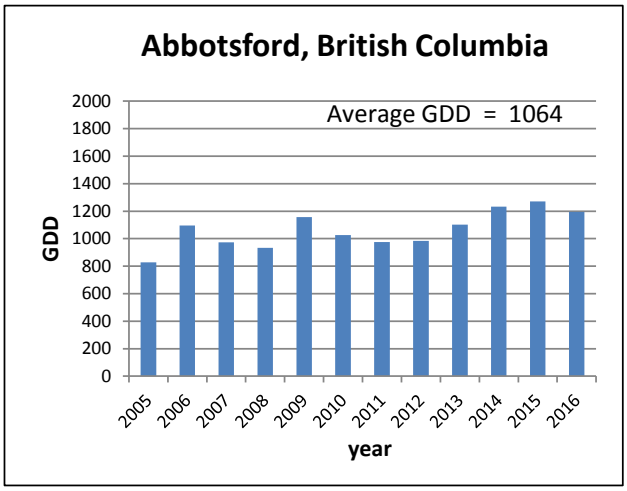
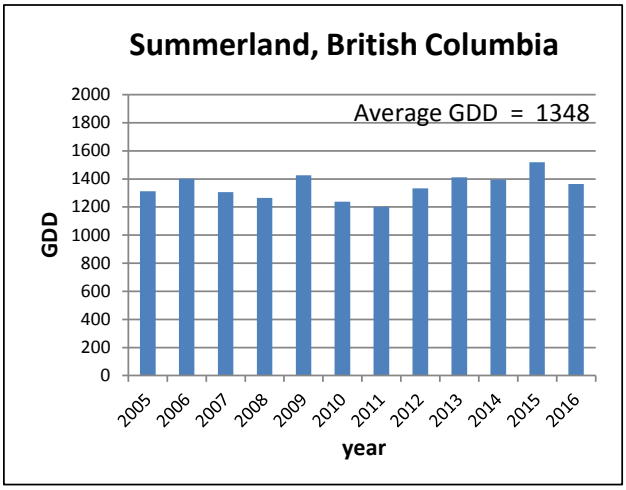
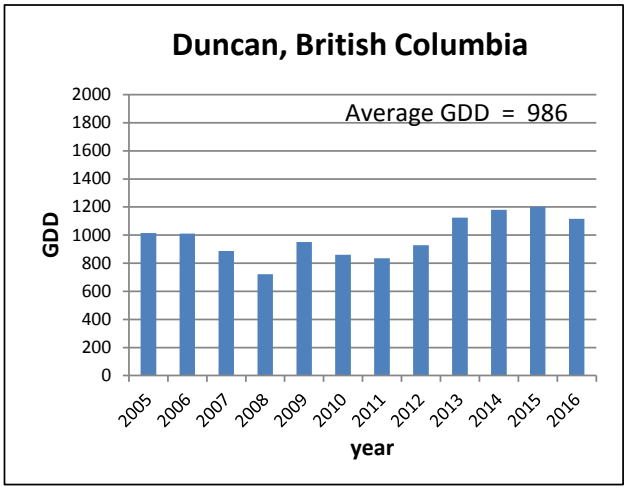
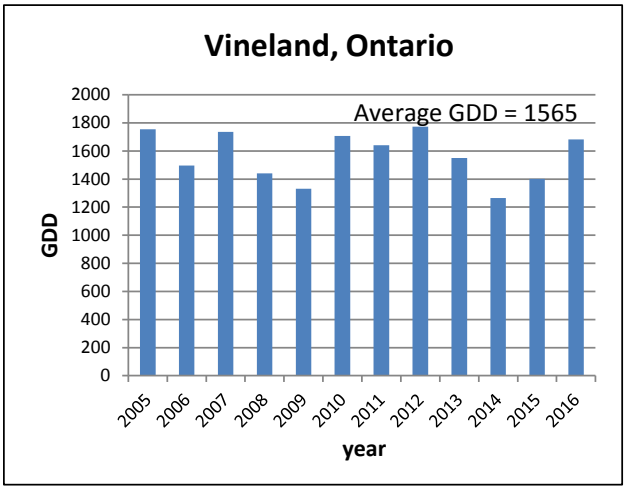
Annual Growing Degree Days 2005-2016

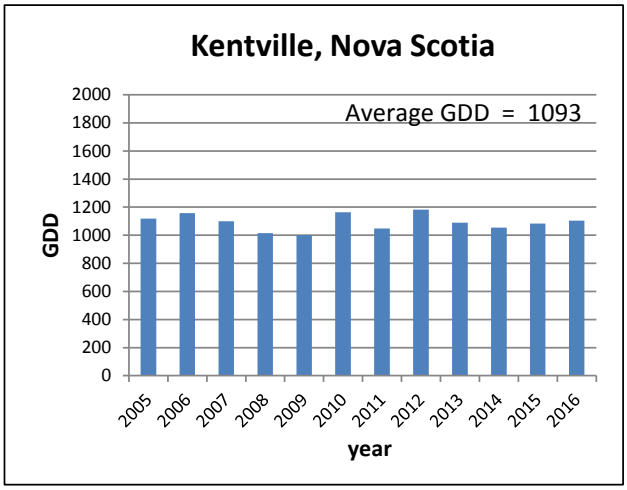












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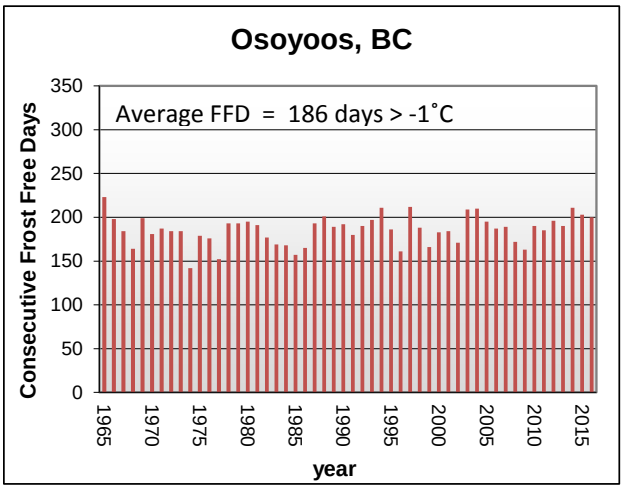
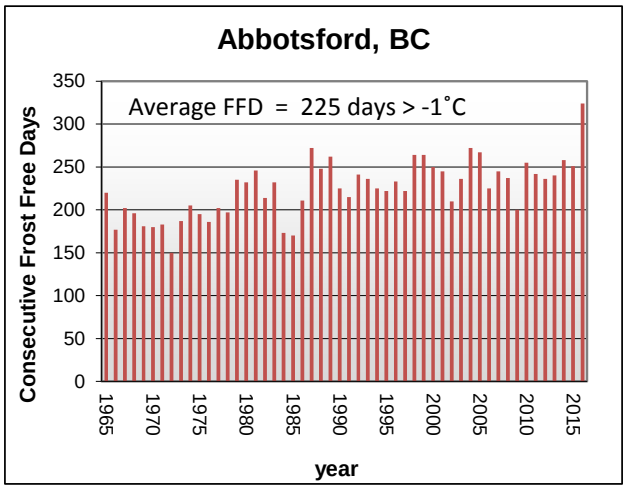
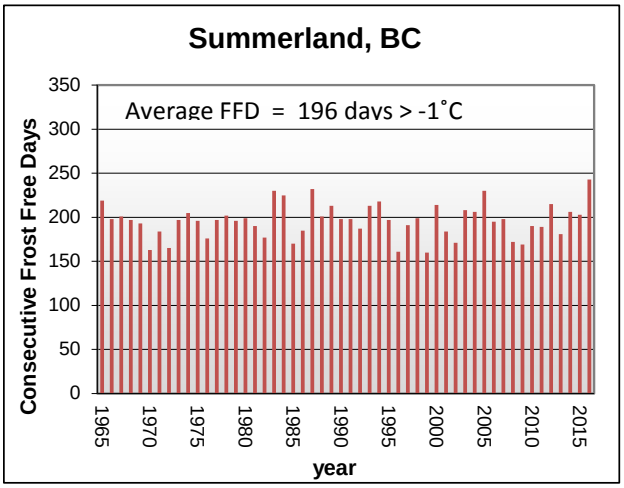
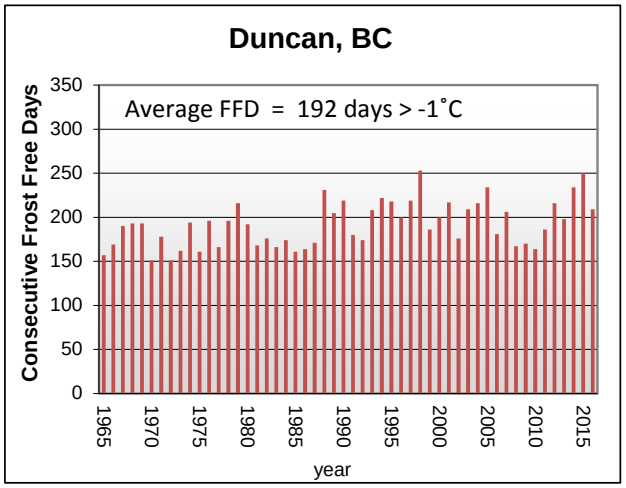
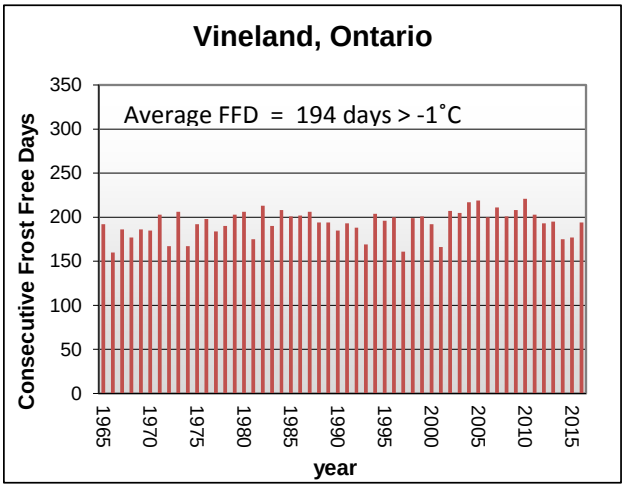
Consecutive Frost Free Days 1965-2016

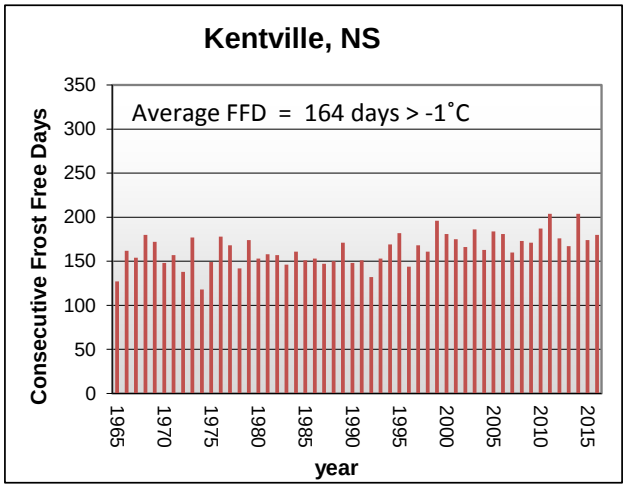












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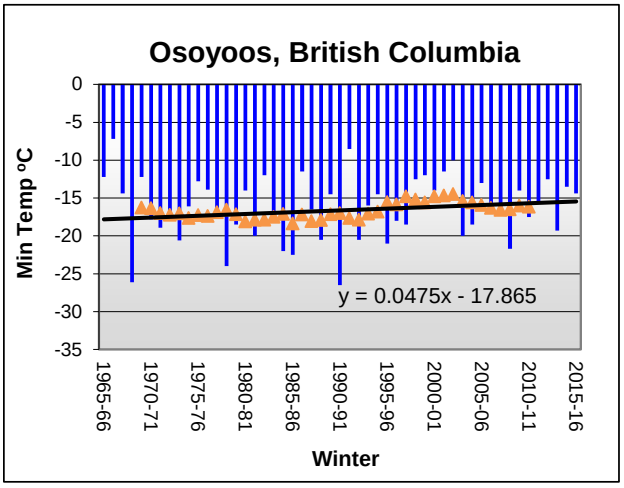
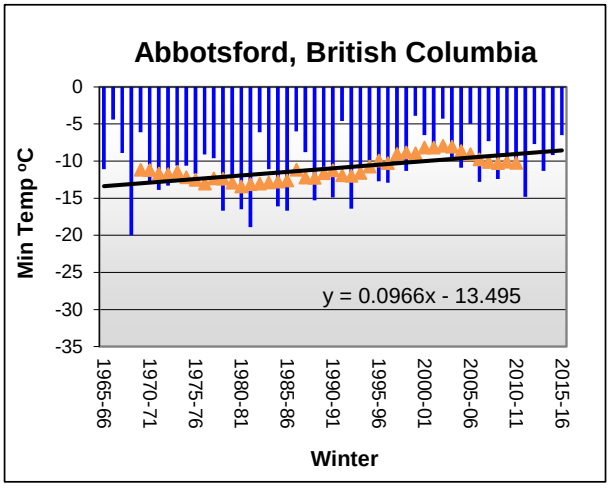
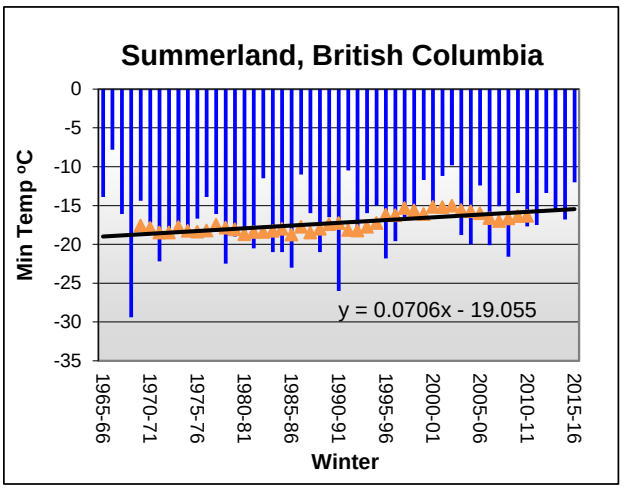
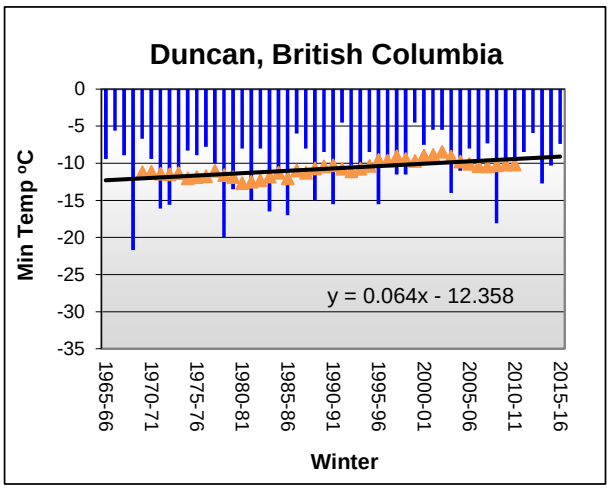
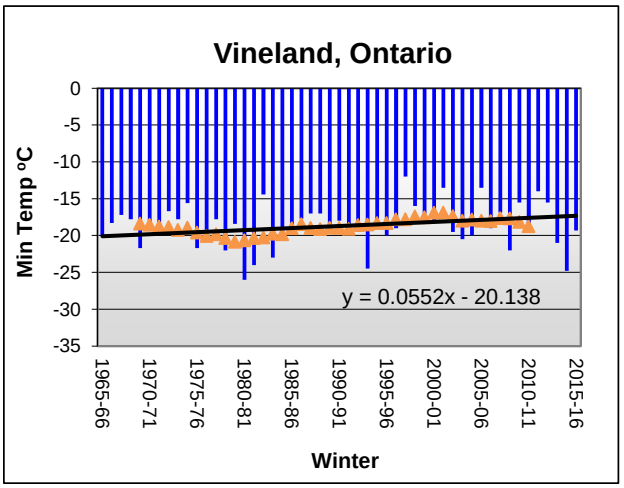
Annual Minimum Temperatures 1965 - 2016

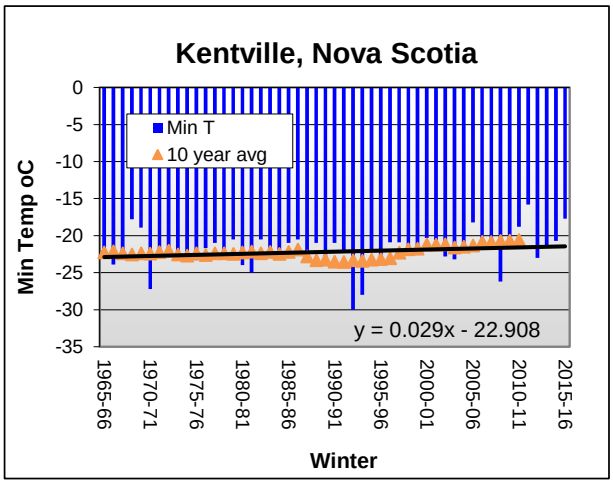












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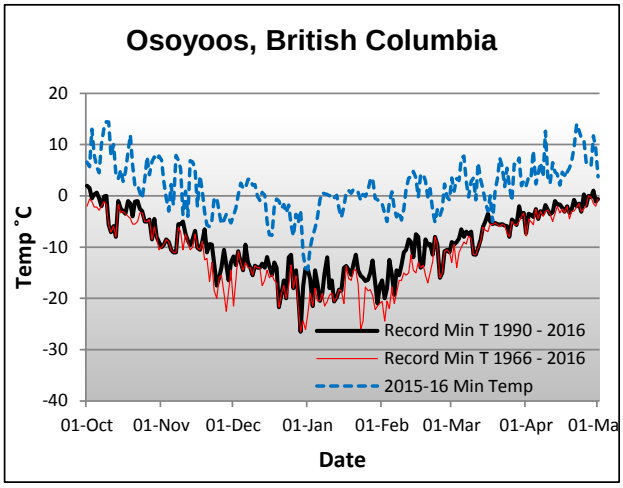
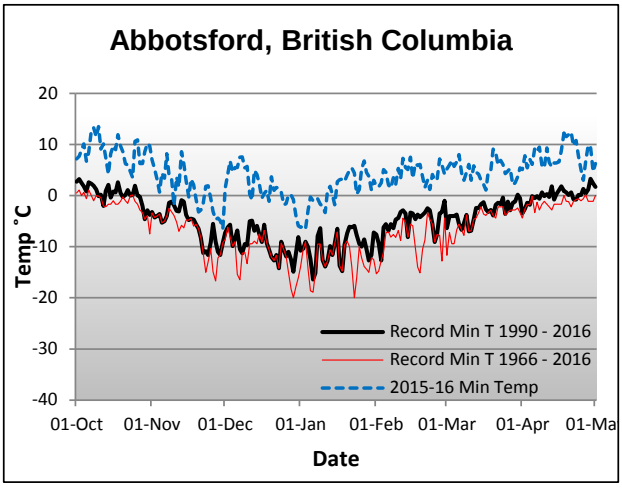
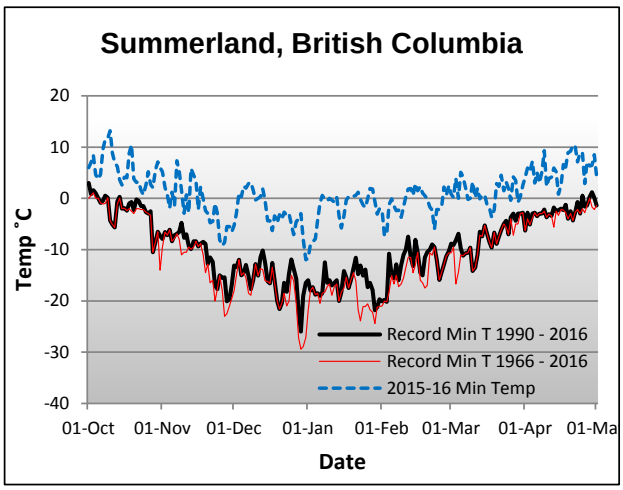
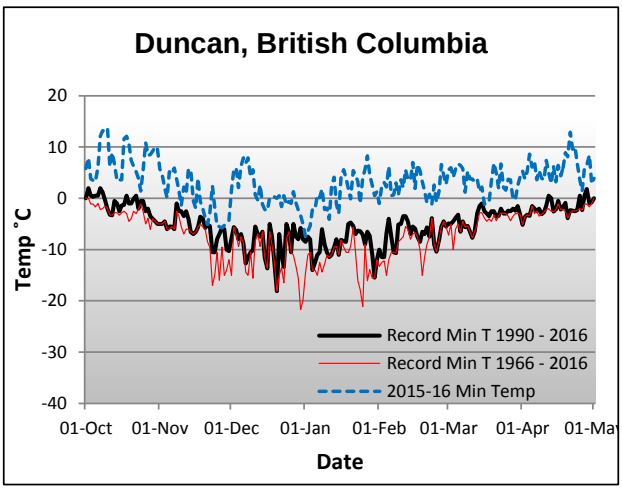
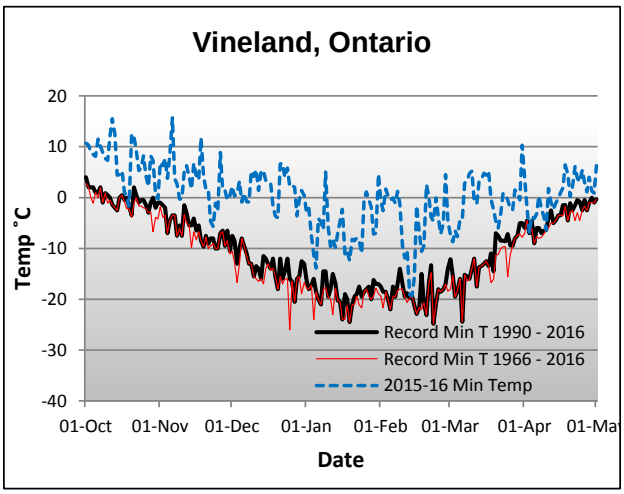
Daily Record Minimum Temperatures

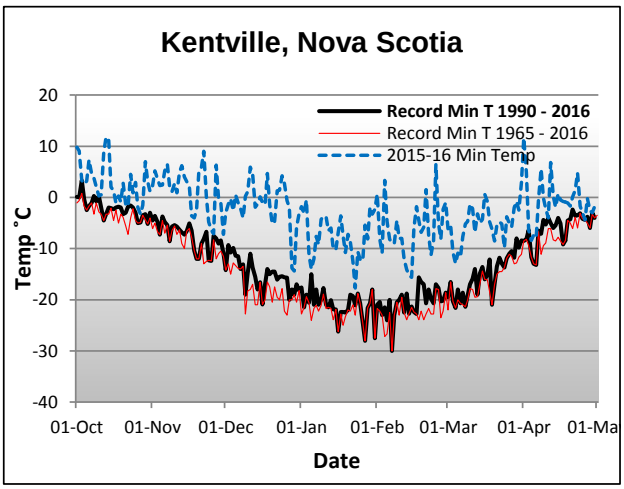












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