Grapes Suitability Analysis

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# Growing Degree Days

## Data Source

The Growing Degree Days were derived from historical data supplied by Environment Canada from 1987 to 2016. The raw data can be downloaded from [Environment Canada's Historical Data Site](http://climate.weather.gc.ca/historical_data/search_historic_data_e.html). The following stations were used for this analysis:

* Alma;
* Aroostook;
* Bathurst;
* Bouctouche;
* Causapscal;
* Charlo;
* Edmundston;
* Fredericton;
* Gagetown;
* Grand Manan;
* Juniper;
* Kouchibouguac;
* Lyons Brook;
* Mactaquac;
* Miramichi;
* Miscou Island;
* Moncton;
* Nappan;
* Riviere Bleue;
* Saint John;
* St. Leonard;
* St. Stephen;
* Summerside;
* Sussex; and
* Woodstock

In cases where weather stations had been relocated in the same area, the newest position was used as the location and the data combined to arrive at the values.

## Formula

The values for Growing Degree Days at each site were calculated for each year based upon the formula

Where

,

 ,

Note that the summation was calculated over the period between April 1st and October 31st of each year.

The values were than averaged to arrive at the 30-year average for Growing Degree Days for each station. Values were then derived for the entire province using a [regularized spline](http://pro.arcgis.com/en/pro-app/tool-reference/3d-analyst/how-spline-works.htm). These values were than classified into the following groups:

|  |  |
| --- | --- |
| Growing Degree Days | Value |
| < 900 | 1 (Red) |
| ≥ 900, < 1100 | 3 (Yellow) |
| ≥ 1100 | 5 (Green) |

# Frost-Free Days

Using the historical weather data discussed in the section on [Growing Degree Days](#_Data_Source), daily temperatures were then analyzed for each to find the last date in the spring and the first date in the fall when the daily low temperature was less than or equal to zero. The number of days between these two dates was than averaged to arrive at the 30-year average for number of frost-free days for each station. Values were then derived for the entire province using a [regularized spline](http://pro.arcgis.com/en/pro-app/tool-reference/3d-analyst/how-spline-works.htm). These values were than classified into the following groups:

|  |  |
| --- | --- |
| Frost-Free Days | Value |
| < 150 | 1 (Red) |
| > 150, < 165 | 3 (Yellow) |
| > 165 | 5 (Green) |

# Winter Minimum Temperatures

Using the historical weather data discussed in the section on [Growing Degree Days](#_Data_Source), the lowest minimum temperature for each winter season was determined. Since winters straddle the beginning and end of a given calendrical year, the lowest minimum from the second half of the previous year and the lowest temperature for the first half of a given year were found. The lower of these two temperatures was then taken to be the winter minimum temperature for a given year.

A count was then made of the number of occurrences of given temperatures for the most recent 10 years of available data. Based upon these counts, a classification of the severity of the winter at a given station was determined.

|  |  |
| --- | --- |
| Minimum Temperature | Value |
| Either > -23°C 5 or more times in 10 years or > -26°C 2 or more times in 10 years | 1 (Red) |
| Any of the following: -21°C more than 5 times in 10 years; > -26°C only once in 10 years; or -23°C less than 5 times in 10 years | 3 (Yellow) |
| -21°C 5 times or less in a year period as well as never having a minimum temperature of -26°C | 5 (Green) |

# Slope

The percent slope was calculated from the Province of New Brunswick 10 metre digital elevation model and classified based on the following criteria:

|  |  |
| --- | --- |
| Percent Slope | Value |
| ≤ 2% | 5 (Green) |
| > 2%, ≤ 5% | 3 (Yellow) |
| ≤ 9% | 1 (Red) |
| > 9% | Land unusable |

# Depth to Water Table

Depth to water table was used as a measure of the drainage of the soil within an area. The depth is the measured depth to the water table at the end of summer. The data was classified as follows:

|  |  |
| --- | --- |
| Depth to Water Table | Value |
| ≤ 10 cm | Unusable wetland |
| > 10 cm, ≤ 25 cm | 1 (Red) |
| > 25 cm, ≤ 50 cm | 3 (Yellow) |
| > 50 cm | 5 (Green) |

This data was supplied to AAF as part of the research carried out by Dr. Paul Arp and Jae Ogilvie of the University of New Brunswick in 2010. Please contact them for more information about this data.

# Final Analysis

The categorized values from the previous sections were then combined to arrive at a final classification of sites via the formula

Where

The resultant values were than classified based upon the following criteria:

|  |  |
| --- | --- |
| Value | Classification |
| 1 – 2.333333333 | Poor (Red) |
| 2.333333334 – 3.666666666 | Fair (Yellow) |
| 3.666666667 - 5 | Good (Green) |

Finally, the following areas were removed from the results because the land would not be available for agriculture under any circumstance:

* National and Provincial Parks;
* Protected Natural Areas;
* Military Bases;
* Federal Land; and
* First Nations Communities.