



Medicine Hat

Low Carbon Emissions (RCP4.5)

Climate Variable	Season	1981–2010 (Baseline)	2021–2050			2051–2080		
			L	M	H	L	M	H
Mean Temperature	Annual	5.7 °C	6.6 °C	7.2 °C	7.9 °C	7.8 °C	8.3 °C	8.7 °C
	Summer	18.8 °C	19.6 °C	20.3 °C	20.9 °C	20.9 °C	21.5 °C	22.0 °C
	Winter	-8.4 °C	-7.8 °C	-6.7 °C	-5.6 °C	-6.4 °C	-5.4 °C	-4.4 °C
Precipitation	Annual	326.8 mm	308.6 mm	337.8 mm	371.0 mm	310.4 mm	345.7 mm	368.7 mm
	Summer	133.8 mm	106.7 mm	128.0 mm	146.5 mm	108.5 mm	125.5 mm	142.3 mm
	Winter	49.9 mm	46.7 mm	53.6 mm	59.8 mm	47.9 mm	57.8 mm	65.9 mm
Days ≥ 30 °C	Annual	25.8 days	32.0 days	38.3 days	46.0 days	40.0 days	49.2 days	59.0 days
Nights ≥ 20 °C	Annual	0.1 days	0.0 days	0.8 days	2.0 days	0.0 days	1.3 days	3.0 days
Days ≤ -30 °C	Annual	3.2 days	0.0 days	1.2 days	4.0 days	0.0 days	0.7 days	2.0 days
Frost-Free Period	Annual	129.6 days	126.0 days	147.9 days	167.0 days	136.0 days	153.5 days	172.0 days
5 °C Degree Days	Annual	1973.2	2142.8	2287.0	2422.2	2412.9	2497.1	2576.9
10 °C Degree Days	Annual	1075.6	1185.1	1316.0	1414.4	1389.8	1492.9	1581.2
Freeze-Thaw Cycles	Annual	91.2 cycles	71.0 cycles	82.1 cycles	93.0 cycles	70.0 cycles	81.3 cycles	90.0 cycles
Max 1-day Precip Total	Annual	57.1 mm	37.7 mm	60.5 mm	79.6 mm	42.1 mm	62.8 mm	88.5 mm
Max 3-day Precip Total	Annual	125.8 mm	92.7 mm	132.5 mm	173.9 mm	84.9 mm	135.3 mm	195.5 mm

High Carbon Emissions (RCP8.5)

Climate Variable	Season	1981–2010 (Baseline)	2021–2050			2051–2080		
			L	M	H	L	M	H
Mean Temperature	Annual	5.6 °C	7.0 °C	7.5 °C	8.2 °C	8.5 °C	9.4 °C	10.6 °C
	Summer	18.8 °C	20.1 °C	20.7 °C	21.3 °C	22.0 °C	22.9 °C	24.1 °C
	Winter	-8.6 °C	-7.1 °C	-6.1 °C	-4.9 °C	-5.9 °C	-4.3 °C	-2.6 °C
Precipitation	Annual	325.1 mm	318.6 mm	340.4 mm	358.8 mm	318.2 mm	354.0 mm	390.4 mm
	Summer	131.4 mm	112.8 mm	125.7 mm	141.4 mm	101.9 mm	123.2 mm	143.9 mm
	Winter	49.6 mm	43.7 mm	52.2 mm	61.5 mm	51.9 mm	60.6 mm	68.3 mm
Days ≥ 30 °C	Annual	25.9 days	34.0 days	41.7 days	49.0 days	52.0 days	63.3 days	76.0 days
Nights ≥ 20 °C	Annual	0.1 days	0.0 days	1.0 days	2.0 days	1.0 days	5.3 days	13.0 days
Days ≤ -30 °C	Annual	3.4 days	0.0 days	0.9 days	3.0 days	0.0 days	0.4 days	2.0 days
Frost-Free Period	Annual	129.9 days	135.0 days	150.6 days	167.0 days	146.0 days	164.7 days	181.0 days
5 °C Degree Days	Annual	1973.2	2223.2	2350.0	2482.2	2604.4	2784.9	2992.3
10 °C Degree Days	Annual	1077.6	1267.6	1372.3	1487.4	1570.2	1729.1	1915.2
Freeze-Thaw Cycles	Annual	91.7 cycles	73.0 cycles	82.1 cycles	91.0 cycles	62.0 cycles	74.3 cycles	84.0 cycles
Max 1-day Precip Total	Annual	54.0 mm	44.5 mm	64.5 mm	79.6 mm	35.6 mm	60.3 mm	87.1 mm
Max 3-day Precip Total	Annual	120.1 mm	93.7 mm	134.5 mm	159.5 mm	88.3 mm	129.3 mm	176.2 mm

Where did this data come from?

Global Climate Models (GCMs) are used to depict how the climate is likely to change in the future. Since no one climate model can be considered 'correct', it is important to use many GCMs to capture a range of possible conditions. The GCM data we used were obtained from the Pacific Climate Impacts Consortium (PCIC). PCIC collected temperature and precipitation data produced by 12 different models and used advanced statistical techniques to create high-resolution (daily, 10km) versions of the data for all of Canada (for more information visit pacificclimate.org).

What is the difference between the 'Low' and 'High' Carbon emission scenarios?

One of the most important inputs into GCM simulations of the future climate is the expected concentration of greenhouse gases (GHGs; especially carbon dioxide) in the atmosphere as a result of human activity. In the scientific literature these future GHG concentrations are used to calculate Representative Concentration Pathways (RCPs). The High Carbon scenario (RCP8.5) assumes that we continue to emit very large amounts of carbon dioxide from the burning of fossil fuels; the Low Carbon scenario (RCP4.5) assumes that drastic reductions of emissions in the coming decades will stabilize the concentration of GHGs in the atmosphere by the end of this century. We did not use RCP2.6, an even lower emissions scenario.

How were the Low, Mean, and High values calculated?

For a variety of climate variables, we used the projected values from the 12 models to calculate an *ensemble* (average) value for each year. The ensemble values for the 2021-2050 and 2051-2080 periods were used to calculate the 'M', or mean, values. To portray the range of values within the 30-year periods, we calculated the 10th and 90th percentiles; 10% of the annual values are lower than the 'L' values and 10% of the annual values are higher than the 'H' values. For comparative purposes, we also calculated ensembles for the baseline period of 1981-2010 (as simulated by the models).

Some definitions

Frost-Free Period: number of consecutive days without freezing temperatures

5 °C Degree Days: cumulative number of degrees greater than 5 °C (using daily mean temperatures)

Freeze-Thaw Cycles: number of days with maximum temperature > 0 °C and minimum temperature < -1 °C



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