



# Manitoba North Boreal Shield

## Low Carbon Emissions (RCP4.5)

Climate Variable	Season	1981–2010 (Baseline)	2021–2050			2051–2080		
			L	M	H	L	M	H
Mean Temperature	Annual	-2.3 °C	-1.1 °C	-0.5 °C	0.1 °C	0.2 °C	0.7 °C	1.1 °C
	Summer	15.0 °C	15.8 °C	16.4 °C	16.9 °C	16.9 °C	17.3 °C	17.8 °C
	Winter	-21.4 °C	-20.1 °C	-18.9 °C	-17.8 °C	-18.4 °C	-17.2 °C	-16.2 °C
Precipitation	Annual	463.5 mm	470.0 mm	491.4 mm	515.8 mm	476.2 mm	496.6 mm	517.5 mm
	Summer	187.5 mm	174.8 mm	191.7 mm	210.3 mm	173.5 mm	187.9 mm	203.1 mm
	Winter	70.1 mm	70.3 mm	75.4 mm	81.5 mm	71.8 mm	79.0 mm	85.7 mm
Days ≥ 30 °C	Annual	1.3 days	1.2 days	3.7 days	6.6 days	3.5 days	7.0 days	10.7 days
Nights ≥ 20 °C	Annual	0.1 days	0.0 days	0.2 days	0.6 days	0.0 days	0.9 days	2.0 days
Days ≤ -30 °C	Annual	34.2 days	14.3 days	21.9 days	27.8 days	8.8 days	14.4 days	19.9 days
Frost-Free Period	Annual	108.0 days	107.0 days	121.8 days	137.2 days	116.5 days	129.7 days	142.9 days
5 °C Degree Days	Annual	1144.7	1281.1	1349.5	1424.4	1435.0	1508.6	1582.9
10 °C Degree Days	Annual	538.2	628.0	682.7	733.5	742.4	797.0	852.0
Freeze-Thaw Cycles	Annual	56.7 cycles	44.9 cycles	53.6 cycles	62.2 cycles	43.1 cycles	51.3 cycles	59.8 cycles
Max 1-day Precip Total	Annual	39.7 mm	31.1 mm	45.2 mm	61.5 mm	29.9 mm	40.8 mm	54.3 mm
Max 3-day Precip Total	Annual	87.2 mm	68.8 mm	97.8 mm	130.2 mm	67.1 mm	90.4 mm	118.5 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	-2.3 °C	-0.8 °C	-0.2 °C	0.6 °C	1.1 °C	2.2 °C	3.6 °C
	Summer	15.0 °C	16.1 °C	16.7 °C	17.3 °C	17.8 °C	18.8 °C	19.8 °C
	Winter	-21.4 °C	-19.6 °C	-18.3 °C	-17.0 °C	-16.7 °C	-15.2 °C	-13.6 °C
Precipitation	Annual	463.0 mm	466.5 mm	492.1 mm	516.6 mm	483.5 mm	511.7 mm	543.9 mm
	Summer	187.0 mm	173.1 mm	188.1 mm	204.6 mm	172.9 mm	188.4 mm	204.7 mm
	Winter	69.4 mm	68.7 mm	76.0 mm	84.6 mm	75.5 mm	84.4 mm	94.2 mm
Days ≥ 30 °C	Annual	1.3 days	1.6 days	4.7 days	8.2 days	8.7 days	13.2 days	18.8 days
Nights ≥ 20 °C	Annual	0.1 days	0.0 days	0.4 days	1.1 days	1.0 days	3.2 days	5.9 days
Days ≤ -30 °C	Annual	34.7 days	11.7 days	19.7 days	27.1 days	3.1 days	8.4 days	13.4 days
Frost-Free Period	Annual	108.3 days	110.1 days	125.9 days	142.9 days	125.9 days	141.4 days	157.7 days
5 °C Degree Days	Annual	1146.1	1327.7	1402.8	1497.9	1594.8	1741.1	1946.4
10 °C Degree Days	Annual	538.4	662.7	722.8	799.1	860.6	975.7	1125.1
Freeze-Thaw Cycles	Annual	56.5 cycles	44.6 cycles	52.7 cycles	61.3 cycles	39.2 cycles	48.7 cycles	57.4 cycles
Max 1-day Precip Total	Annual	39.1 mm	31.0 mm	45.1 mm	61.3 mm	30.9 mm	42.2 mm	54.7 mm
Max 3-day Precip Total	Annual	85.8 mm	68.4 mm	97.4 mm	130.7 mm	69.5 mm	93.1 mm	120.4 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](http://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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