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LOWER WINNIPEG RIVER BASIN DISCUSSION SHEET SERIES
Sheet #1

Climate and Climate Change

May 2021

Introduction

The lower Winnipeg River basin (LWRB) is located in the northwest section of the entire Winnipeg River basin (WRB), which spans parts of western Ontario and small parts of Manitoba and northern Minnesota, United States. The Discussion Sheet Series highlights research on ecological and socio-economic aspects of the basin to encourage discussion with experts, government departments, Indigenous groups, and stakeholders. The Discussion Sheet Series is based on available data collected in 2018 and 2019. Sheet 1 of 11 summarizes climate conditions and climate change in the LWRB.

Climate

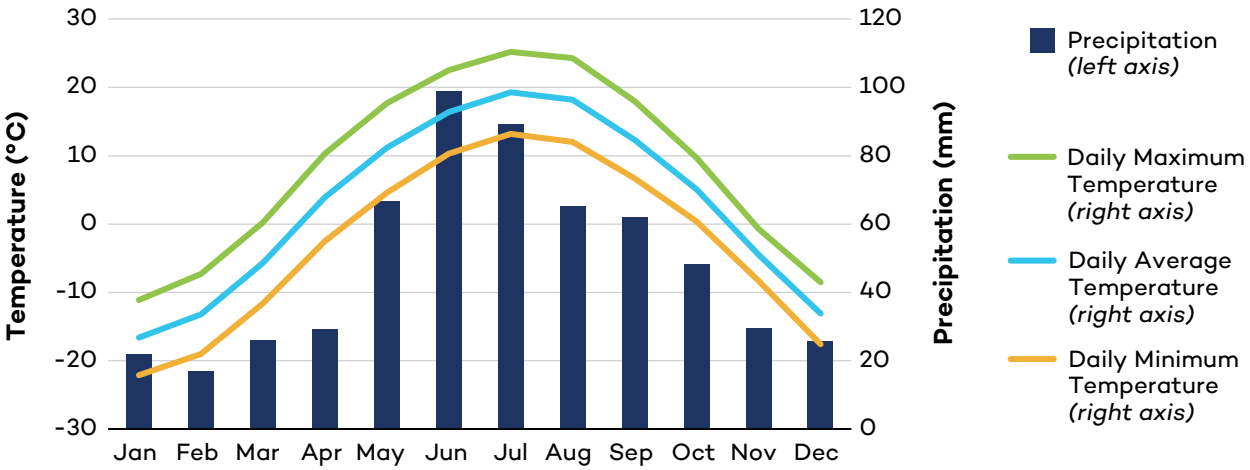
The LWRB is located near the centre of the North American continent, near the margin between the Boreal Shield and Boreal Plains ecozones. The region experiences a humid, warm-summer continental climate (Köppen Dfb) with four distinct seasons and most precipitation in the warm summer months.

Observations from 1981 to 2010 reflect this in the climate normal presented for the Pinawa WNRE station in Manitoba (ID: 5032162, 50°10'50" N, 96°03'30" W) (Figure 1). In the LWRB, the mean daily temperature is 2.8°C, and the mean annual precipitation is 578.3 mm (Environment and Climate Change Canada, 2019).

Climate Change and the Winnipeg River

While most Canadian rivers observed a decrease in water flows in the 20th century, the discharge in the Winnipeg River has increased since 1924, caused by an increase in summer and fall precipitation, an increase in winter discharge (Zhang et al., 2001; St. George, 2006), and direct human activity, such as diversion of water from Lake St. Joseph. Years with lower flows in the Winnipeg River are a result of less precipitation from the previous year and atmospheric circulation patterns in western Canada (St. George, 2006). Overland et al. (2016) propose that a

Figure 1. Climograph of the lower Winnipeg River basin, collected from Pinawa WNRE (ID 5032162) climate normals from 1981 to 2010.



Source: Environment and Climate Change Canada, 2019.

warming Arctic will continue to have large effects on these circulation patterns and, therefore, the distribution of precipitation at mid-latitudes.

Manitoba Hydro uses an ensemble of climate model simulations to project temperature, precipitation, evaporation, runoff, and wind speed for the 2050s period (2040 to 2069) relative to the 1981–2010 baseline.[1] The ensemble median projected the mean annual temperature to increase by 2.8˚C, mean annual precipitation to increase by 6.9%, and mean runoff to increase by 3.3% (Manitoba Hydro, 2020). The Prairie Climate Centre's Climate Atlas of Canada uses statistically downscaled data from the Pacific Climate Impacts Consortium ensemble, which also projected an increase in temperature and precipitation under various future climate/carbon scenarios (Climate Atlas of Canada, n.d.a, n.d.b).

Current ensemble-median climate projections suggest increased mean annual precipitation, runoff, and temperature in the LWRB. While there is good agreement among climate simulations that temperature will increase, there is greater uncertainty regarding changes in other variables, such as runoff (Manitoba, Hydro, 2020). Future variability may have implications for hydroelectric development, river hydrology, water level and temperature, water quality, river morphology, and nutrient/contaminant loading, which may also influence aquatic life and people that live and rely on the river.

[1] The ensemble includes 18 Global Climate Models (GCMs) using Representative Concentration Pathway (RCP) 4.5 and RCP 8.5, running 40 GCM simulations.

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