The 2021 Manitoba Fall Soil Moisture

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Introduction

❖The availability and mobility of many crop nutrients as well as the distribution and rate of activity of soil microbial populations are influenced by the moisture status of the soil. Soil moisture considerations are important for many farm management decisions from seeding to post-harvest operations.

❖ The spatial heterogeneity of soil and spatio-temporal variability of soil moisture make monitoring soil moisture challenging. Manitoba has a network of 114 weather stations with soil moisture sensors at 113 of these stations (Figure 1).

❖ Soil moisture sensors use a property of the soil, such as dielectric permittivity, to determine the soil water content. The permittivity of water is ~80, dry soil ~5, ice ~3 and air is 1. Therefore, an increase in soil moisture content increases the dielectric permittivity of the soil.

❖ As the soil temperature reaches the freezing mark, the permittivity difference between water and ice results in the sharp drop in the soil moisture (Figure 2).

Figure 1: North-view of the weather station at Brunkild, MB.

Fall Soil Moisture Survey

❖ Soil moisture sensors installed at 5, 20, 50 and 100 cm depths were used to represent soil moisture at 0-10, 11-30, 31-70 and 71-120 cm, respectively. The amount of available moisture (mm) is the water content observed prior to freeze-up which can be made available to plants. The percent of available water holding capacity (PAWHC) relates the available moisture at freeze-up to the water holding capacity (WHC) of the soil which is the amount of moisture that the soil can hold for crop use.

❖The WHC of a soil is mainly determined by the soil texture and the amount of organic matter. Clay soils have higher WHC than sandy soils due to larger surface area and higher total porosity. However, the PAWHC standardizes the observations regardless of the soil type.

❖ The 2021 fall soil moisture maps were based on data from 103 weather stations. Much of agri-Manitoba had < 150 mm of available water. Areas around the Red River into the Interlake region are mostly at < 60% of WHC.

❖ Additional soil moisture maps prior to soil freeze-up can be found on the Manitoba Agriculture and Resource Development website: https://www.gov.mb.ca/agriculture/environment/soil-management/manitoba-fall-soil-moisture-survey.html

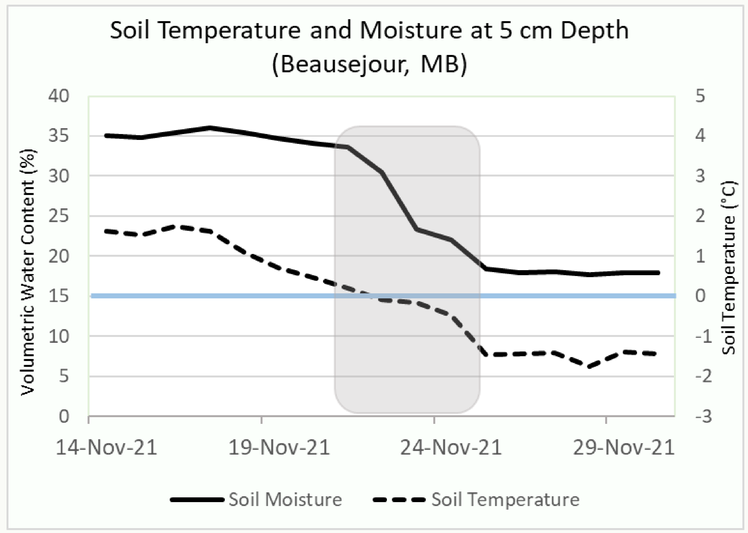
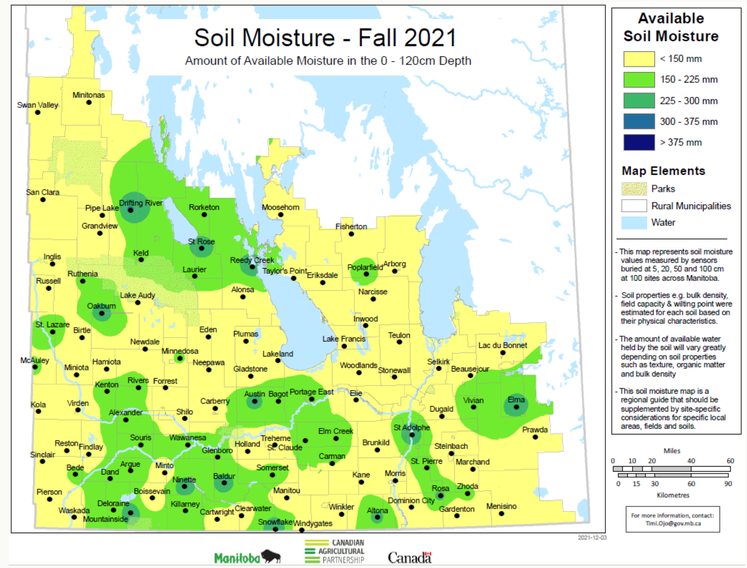


Figure 2: A sharp drop in soil volumetric water content as soil temperature approaches and drops below 0°C (blue horizontal line). The grey box highlights the transition zone.

Soil Moisture Maps



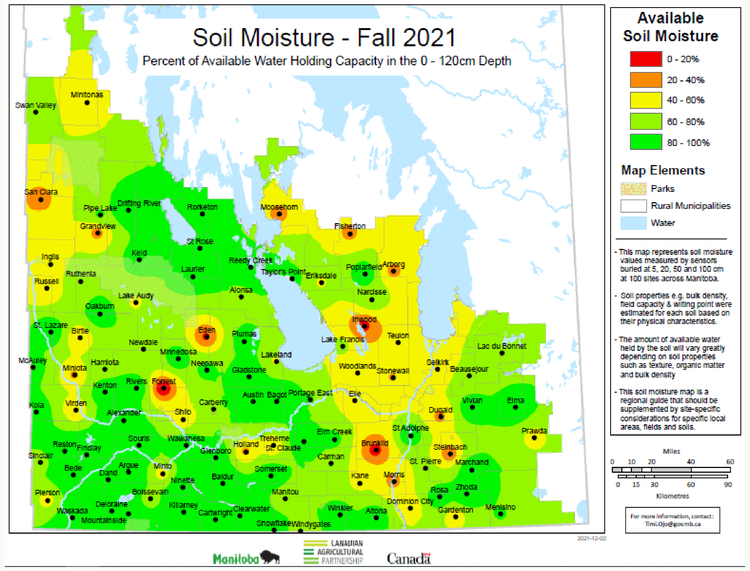


Figure 3: Soil moisture maps showing the available water content (above) and the percent of available water holding capacity (below). The maps should be used as a regional guide only and not for site-specific inferences.

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