

2011 Fall Soil Moisture Survey

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Background

During the last two weeks of October 2011, a soil moisture survey was completed across Agro-Manitoba. Knowing the fall soil moisture status can be helpful for agronomic decisions such as crop selection, determining potential yield, and estimating fertilizer requirements. The amount of moisture within the root zone just prior to freeze-up provides a good indication of what can be expected in the spring. With snow cover and freezing temperatures, soil moisture content remains relatively stable throughout the winter. This is especially true in frozen moist soils whose pores become “sealed off” from further water infiltration.

Method

Each sampling site was chosen based on the soil properties that best represent each area and the most common cropping system in the region. Soil samples were collected from 101 locations at five depths throughout the root zone: 0-15 cm, 15-30 cm, 30-60 cm, 60-90 cm, and 90-120 cm. Samples were placed in sealed containers and subsequently weighed, oven dried, and re-weighed to determine their gravimetric moisture content.

Soil samples were classified based on their similarities to other well characterized soils in Manitoba according to Haluschak *et al* (2004). This enabled us to assign a bulk density, wilting point, field capacity, and available water holding capacity value to each depth from each sample location. From there, soil moisture by weight was converted to percent moisture by volume. Then available water and soil moisture as a percent of available water holding capacity were calculated and mapped. An inverse distance weighted (IDW) interpolation technique with minimal smoothing was used to retain the spatial variability of the results. The interpolation was performed between the actual values of the sample sites without accounting for soil variability between those locations.

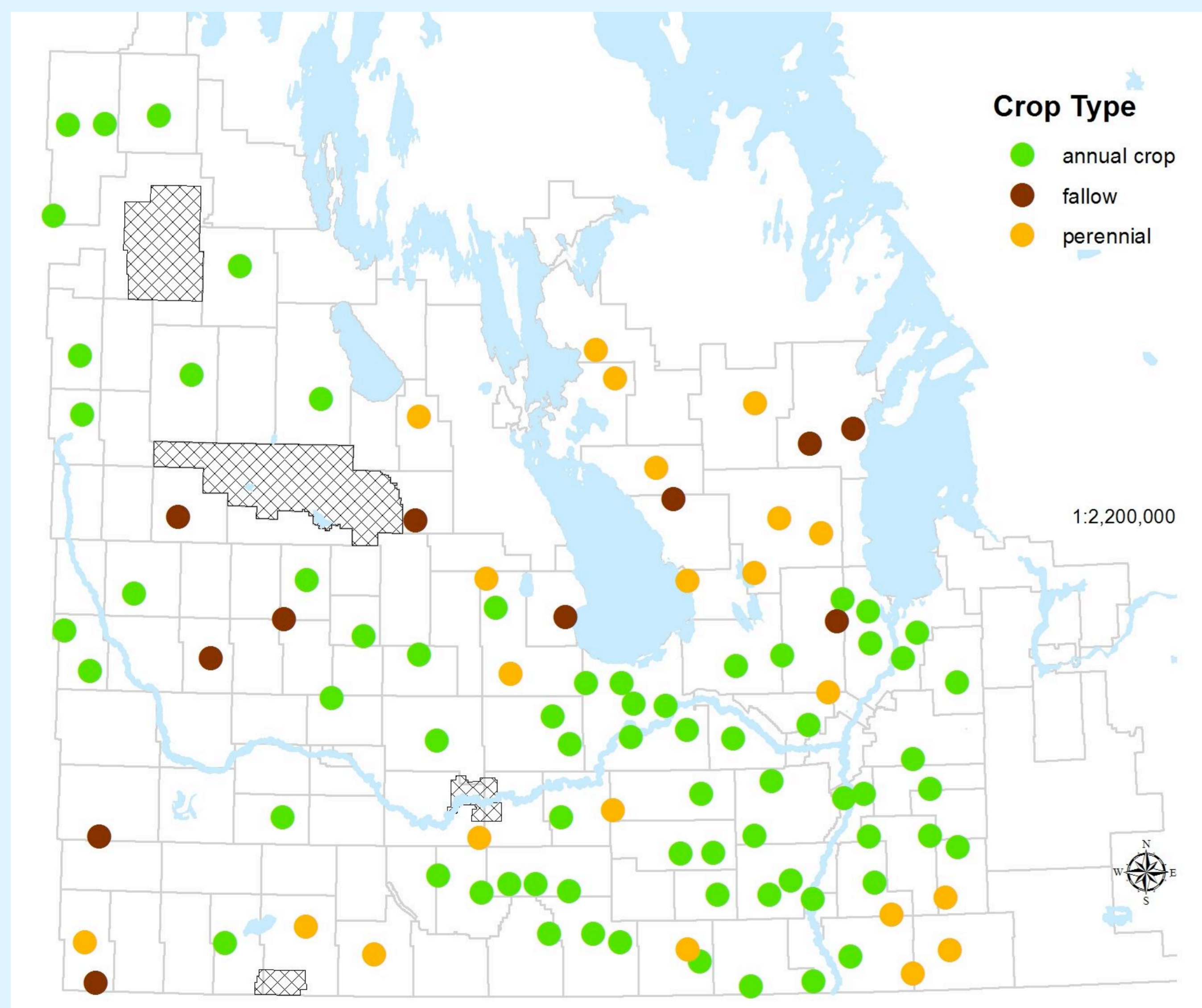


Figure 1: Locations of 101 sample points for the 2011 fall soil moisture survey.

Results

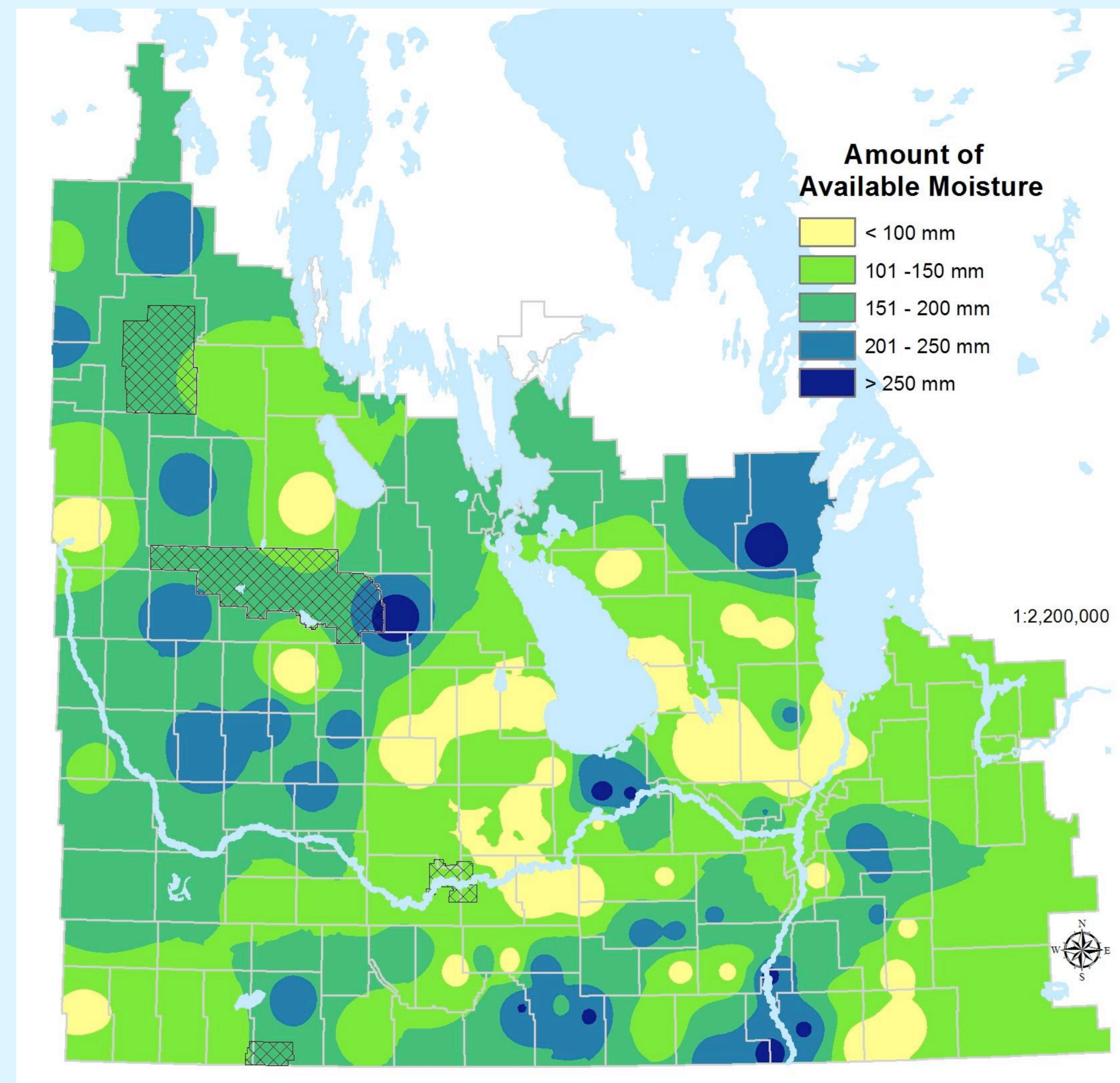


Figure 2: Available Soil Moisture in the Root Zone. Available moisture is the amount of water that a crop could potentially extract from the soil. As the water becomes depleted and is less readily available, the plant will have more difficulty accessing moisture. If the water becomes depleted, the crop will sustain permanent damage and the soil has reached the permanent wilting point. In a normal growing season, a wheat crop is expected to use between 250 and 325 mm of water while a corn crop would require between 400 and 500 mm of water. Therefore, it is important that precipitation arrives somewhat regularly throughout the growing season to avoid moisture deficits.

Summary

In general, east-central Manitoba is consistently drier than other areas of the province. A major impact on soil moisture is the 2011 crop (Figure 4). Note that a number of the high moisture readings (dark green and blue areas of Figure 2) coincide with sample locations where the fields were left fallow in 2011.

Acknowledgements

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References

Haluschak, P., Griffiths, J. and Shaykewich, C. F. 2004. Available water holding capacities of Manitoba soil. Manitoba Soil Science Society Proceedings 2004: 224-232.

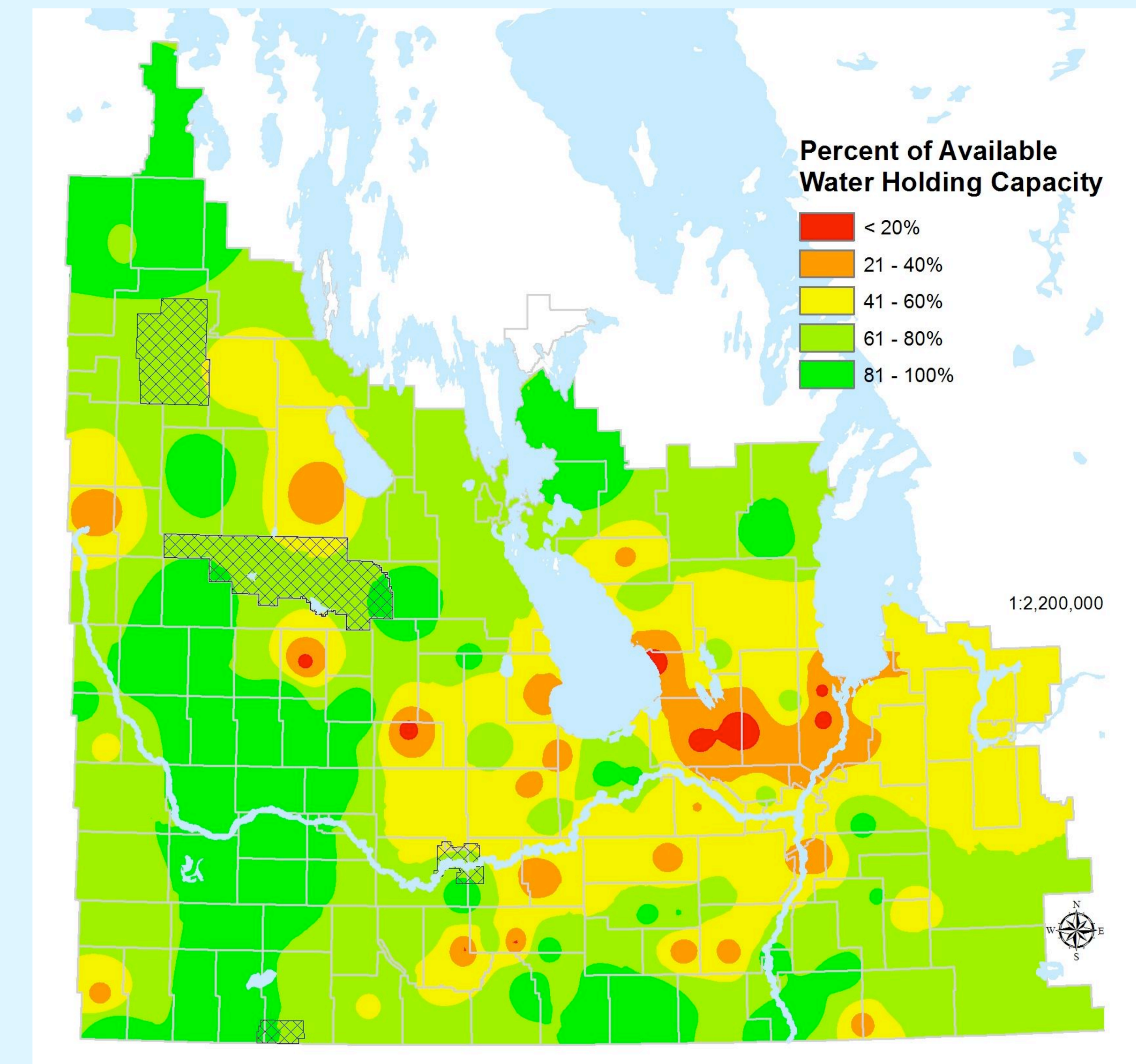


Figure 3: Percent of Available Water Holding Capacity in the Root Zone. Soil moisture expressed as percent of capacity shows the amount of available moisture in the soil as a percentage of the total available water holding capacity for the soil. Percent of available water holding capacity can be used to determine soil moisture on a relative scale to assess whether the soils are dry or wet. Soil with its moisture content at field capacity would have an available water holding capacity of 100% while soil at the wilting point would have a value of zero. For most crops, moisture stress can begin as the moisture content drops below 50-60%. The amount of water held at field capacity will vary greatly depending on the soil texture. Coarse sand at field capacity would have about 75 mm of available soil moisture, sandy loam would have about 175 mm, loam would have about 250 mm, clay loam would have about 275 mm, and clay could have over 300 mm.

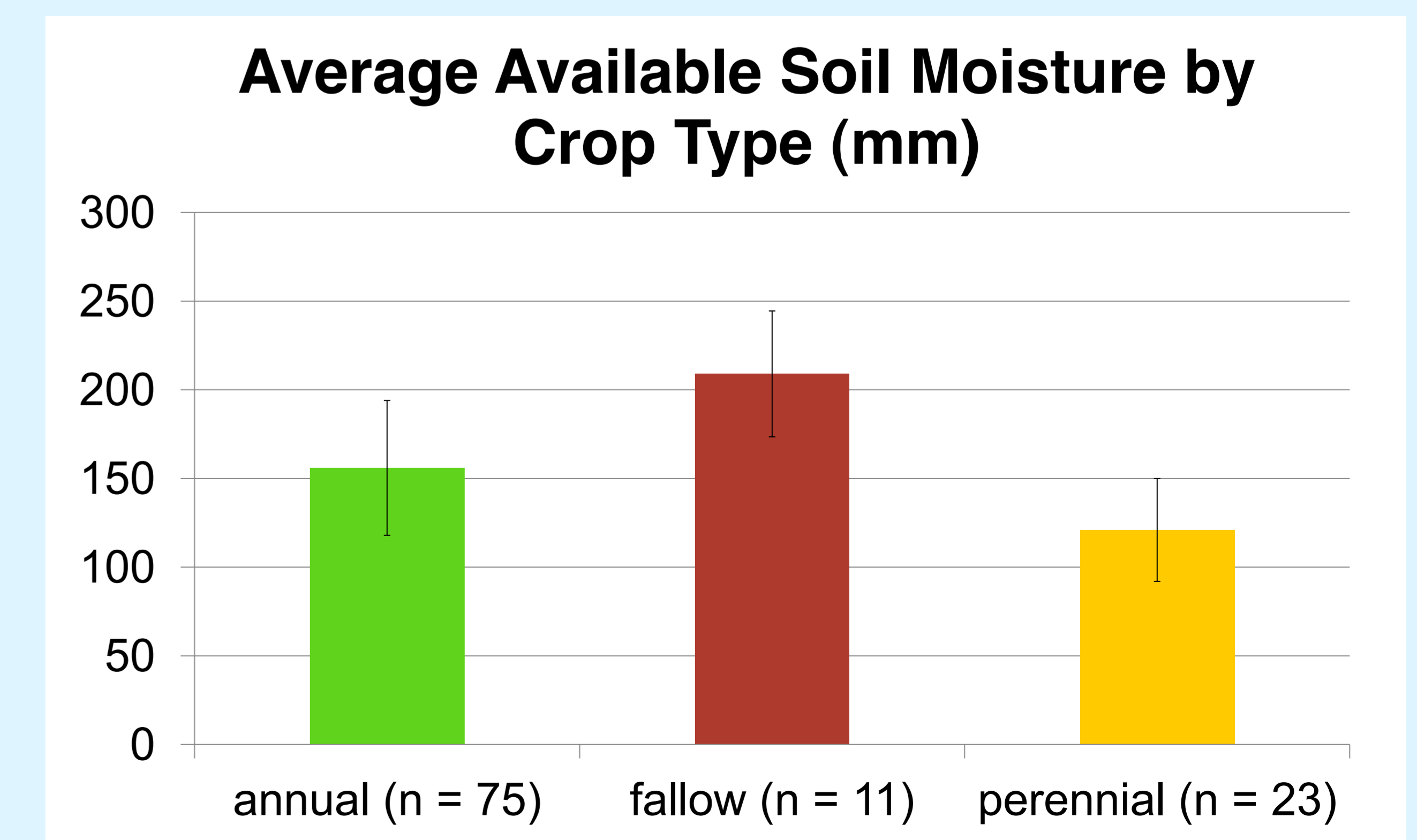


Figure 4: Average Available Soil Moisture (mm) for Each Crop Type.