Water Availability and Drought Conditions Report

September 2017

Executive Summary

- This Water Availability and Drought Conditions Report provides an update on drought conditions throughout Manitoba for September 2017.
- During the short term (one month) Manitoba experienced normal to above normal precipitation conditions across most of the province. Northwest agro-Manitoba and regions of northern Manitoba experienced moderately to severely dry conditions.
- During the medium term (three months) much of Manitoba continued to experience moderately dry precipitation conditions, with some areas of severely dry conditions. Portions of agro-Manitoba, southeastern Manitoba, and the areas surrounding Churchill and Lynn Lake experienced normal precipitation conditions.
- Over the long term (twelve months), most of Manitoba experienced normal to above normal precipitation, except for parts of central and northwestern agro-Manitoba, and regions surrounding Arborg and Norway House which experienced moderately dry conditions.
- Most streamflows and lake levels across southern Manitoba are normal or above normal except for a few tributaries that dropped to below normal conditions. In northern Manitoba, the Hayes and Seal rivers are below normal, and most northerly tributaries to the Nelson River are observing below normal to much below normal flows.
- There are currently no major concerns over reservoir water supplies. There have been continued reports of water levels in dugouts becoming low across agro-Manitoba, suggesting on-farm water supplies would benefit from additional fall precipitation and adequate snowfall over the coming winter.
- Normal to above normal precipitation over the past month drastically reduced fire activity and risk across the province. As of October 2nd, 2017, there have been 532 wildfires burning a total of 169,490 hectares in Manitoba.
- Generally, the drought conditions observed during the 2017 growing season have not had an unfavourable impact to crop yields. Pastures on lighter soils would benefit from additional precipitation at this time. Winter hay supplies are reported as adequate with the exception of the central region.
- Environment and Climate Change Canada's seasonal temperature forecast for October-November-December 2017 is projected to be above normal across Manitoba. The seasonal precipitation forecast is projected to be above normal across most of agro-Manitoba and east of Lake Winnipeg, and normal throughout the remainder of the province.
- For more information on drought in Manitoba, please visit the Manitoba Drought Monitor website.

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Drought Indicators

Precipitation and streamflow drought indicators have been developed to assess drought conditions across Manitoba. These indicators describe the severity of dryness in a watershed.

Precipitation Indicator

Precipitation is assessed to determine the severity of meteorological dryness and is an indirect measurement of agricultural dryness. Three precipitation indicators are calculated to represent long term (twelve months), medium term (three months) and short term (one month) conditions. Long term and medium term indicators provide the most appropriate assessment of dryness as the short term indicator is influenced by significant rainfall events and spatial variability in rainfall, particularly during summer storms. Due to large distances between meteorological stations in northern Manitoba, the interpolated contours in this region are based on limited observations and should be interpreted with caution.

Over the short-term (one month) Manitoba saw normal (85 – 115 %) to above normal (>115 %) precipitation conditions across most of the province; a welcome break from the dryness experienced over the past few months. Exceptions included the area surrounding Swan River which observed moderately (60 – 85 %) to severely (40 – 60 %) dry precipitation conditions. Additionally, a portion of the Seal River Basin and the region spanning from Norway House north to Thompson experienced moderately dry conditions, with severely dry conditions centered over Norway House.

Although the above normal precipitation in September certainty helped alleviate some of the dryness, over the medium term (three months), much of the province continued to experience moderately dry precipitation conditions. Nonetheless, the areal coverage of moderately dry conditions did decrease, particularly throughout large portions of agro-Manitoba (Figure 2) and the area surrounding Lynn Lake. The severely dry conditions in central Manitoba were downgraded to moderate. However, severe conditions persisted in northwest agro-Manitoba, and expanded to include the region surrounding Island Lake and the area between Thompson and Norway House.

Over the long term (twelve months), most of Manitoba experienced normal to above normal precipitation conditions (Figure 3). However, parts of central and northwestern agro-Manitoba, and regions surrounding Arborg and Norway House experienced moderately dry conditions during this period.

Streamflow Indicator

The streamflow indicator is based on average daily flows compared to historical values for that particular day. This indicator is used to determine the severity of hydrological dryness in a watershed and is summarized on Figure 4, representing hydrological conditions for October 2nd, 2017.

As of the beginning of October, most southern Manitoba rivers, tributaries and lakes were within the normal range (25 – 75th percentile), with several locations reporting above normal (75 – 90th percentile) or much above normal (>90th percentile) flows or levels. However, several tributaries and lakes in southern Manitoba have begun to experience below normal conditions (10 – 25th percentile), including the Qu'Appelle River near Welby, the Bloodvein River above Bloodvein Bay, and Round Lake at the Outlet.

Streamflows along major northern Manitoba rivers (Churchill, Burntwood, and Nelson Rivers) are reporting normal to much above normal flows. However, the Hayes River below Gods River and the Seal River below Great Island are both experiencing below normal flows, in addition to many of the northerly tributaries to the Burntwood and Nelson Rivers which are observing below normal to much below normal flows for this time of year (Odei River near Thompson, Taylor River near Thompson, Limestone River near Bird, Weir River above the mouth, and Kettle River near Gillam).

Streamflow percentile plots for select Manitoba rivers are available on the Manitoba Drought Monitor website under the *Current Drought Conditions* tab.

Canada and United States Drought Monitors

Several governments, agencies and universities monitor the spatial extent and intensity of drought conditions across Canada and the United States, producing maps and data products available through the Canadian Drought Monitor and United States Drought Monitor websites. The Canadian Drought Monitor is managed through Agriculture and Agri-Food Canada, while the United States Drought Monitor is a joint effort between the National Drought Mitigation Centre (at the University of Nebraska-Lincoln), the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Drought monitor assessments are based on a suite of drought indicators, impacts data and local reports as interpreted by federal, provincial/state and academic scientists.

The Canadian and United States Drought Monitor maps have been amalgamated for this report (Figure 5), and use the following drought classification system:

- D0 (Abnormally Dry) – represents an event that occurs every 3 to 5 years;
- D1 (Moderate Drought) – 5 to 10 year event;
- D2 (Severe Drought) – 10 to 20 year event;
- D3 (Extreme Drought) – 20 to 50 year event; and
- D4 (Exceptional Drought) – 50+ year event.

Additionally, the map indicates the duration of drought as either short-term (S; less than 6 months) or long-term (L; more than 6 months).

The September 30th Canadian Drought Monitor assessment indicated that in southern Manitoba, drought conditions have improved due to recent rains with the regions of moderate drought (D1) decreasing in extent. However, these D1 conditions remained in areas of central Manitoba and

northwestern agro-Manitoba. The remainder of southern Manitoba experienced abnormally dry (D0) conditions. Since the August 30th assessment, the areal coverage of D0 conditions increased to cover the northeast portion of the province, including the entirety of the Lake Winnipeg and Hayes River Basins, and two-thirds of the Nelson River Basin. Drought conditions in the Saskatchewan portion of the Assiniboine-Souris River Basin have worsened, with larger areas of severe (D2) and extreme (D3) drought conditions and a small region of exceptional drought (D4) conditions developed. Conditions across the Saskatchewan River Basin also continue to degrade and now extend across much of the watershed ranging in severity from D0 to D3.

As of September 26th, 2017, the Unites States Drought Monitor indicated that drought conditions in North Dakota and northern Minnesota are still present, but continue to improve. In North Dakota, the pockets of D3 have almost all been downgraded to D2, and the southeast corner of the state is now free of any drought conditions.

Water Availability

Reservoir Conditions

Of the fifteen water supply reservoirs updated on in this report (Table 2), nine are automated and have real-time water level information available. The remaining six locations require site visits to collect water level information and therefore do not always have recent water level readings. Note that Table 2 specifies which reservoirs have real-time monitoring capabilities and the *Observed Date* column summarizes the date corresponding to the most recent water level measurement.

As of October 2nd, 2017, real-time reservoir levels continued to slowly decline, with the exception of the Vermilion Reservoir which increased from 60 to 90 % of full supply level over the month of September. Of the real-time reservoirs, seven of the nine were close to (> 85 %) or at full supply level. Jackson Lake (81 % of full supply level) and Stephenfield (75 %) were slightly lower, as denoted within the brackets.

The non-automated water supply reservoirs were visited during the month of September. Five of the six reservoirs were close to (> 85 %) full supply level, except for Lake Irwin, which was at 68 % of full supply level.

Reservoirs are being managed to conserve water as necessary. Overall, there are currently no concerns over reservoir water supplies.

On Farm Water Supply

Farm water supply updates from Manitoba Agriculture's most recent Crop Report: Issue 23 (October 2nd, 2017) are summarized in Table 1. If conditions were not commented on within Issue 23, the date corresponding to the most recently reported conditions is provided in brackets.

Table 1: On Farm Water Supply (Dugout) Conditions

Region	General Dugout Condition
Eastern	Dugouts are approximately 50 % full from the recent rains and water availability is rated as adequate.
Interlake	Dugouts are 10 to 50 % full and water quality varies from poor to good.
Southwest	60 % full (as of September 25th).
Central	85 % adequate – dugouts are low as the water table has dropped significantly. More rainfall needed to replenish dugouts.
Northwest	Producers continue to monitor their livestock water sources (as of September 18th).

This information suggests that on-farm water supplies will require precipitation and snowfall to be replenished for next summer, in contrast to the previous few years where above normal precipitation has generally kept on-farm supplies nearly full all year round.

Soil Moisture

Manitoba Agriculture's mapping of topsoil (0 – 30 cm) conditions as of September 25th, 2017 show most of agro-Manitoba was experiencing adequate to wet topsoil conditions (Figure 6). Small, isolated areas of dry topsoil conditions occurred around Drifting River (northwest agricultural region), Findlay (southwest), Virden (southwest), Inwood (Interlake), and Zhoda (eastern). Topsoil moisture condition maps available at: http://www.gov.mb.ca/agriculture/weather/pubs/topsoil-moisture-conditions.pdf.

Aquifers

Groundwater levels in major aquifers are generally good. Groundwater hydrographs from 2014 to the end of September 2017 for the Assiniboine Delta aquifer, the Oak Lake aquifer, and the Carbonate aquifer near Anola are provided on Figure 7.

Water level responses to seasonal or yearly precipitation fluctuations in most aquifers lag considerably behind surface water responses, so even prolonged periods of below normal precipitation may not have a significant negative effect on groundwater levels. Most aquifers also store very large quantities of groundwater and can continue to provide water during extended periods of dry weather. Consequently, the major concern regarding groundwater and dry periods relates to water levels in shallow wells constructed in near surface sand aquifers. As the water table drops, there is less available drawdown in shallow wells and some wells may 'go dry', even in short-term drought conditions.

Wildland Fires

Normal to above normal precipitation over the past month (Figure 1) has significantly reduced fire activity and risk across Manitoba (Figure 8). The Provincial Wildfire Program reported a total of 31 wildfires during September (compared to 292 throughout August), bringing the total number of

fires this year to 532 as of October 2nd. A total of 169,490 hectares have been burned by this date overall, 20,965 of which occurred in September (12 % of the overall total). This, in comparison to August when 95,872 hectares burned, accounting for 57 % of the overall total burned area. Similar to August, most of the area burned in September occurred in the northeast portion of the province (97 %).

More up to date wildfire conditions and restrictions, including burning bans, are available at the Wildfire Program's website (www.gov.mb.ca/wildfire).

Drought Impacts

Overall, drought impacts reported within Manitoba for the month of September have mostly been minimal to moderate. However, one instance of severe impacts was reported.

The Agroclimate Impact Reporter is a Canadian database of agroclimate impacts that is managed by the National Agroclimate Information Service of Agriculture and Agri-Food Canada. During the month of September, nine municipalities registered minimal drought impacts on agricultural operations, six reported moderate drought impacts and one reported severe drought impacts with the Impact Reporter. Most of these reports continued to come from the southwest (50 %; one report of severe drought impacts in the RM of Wallace-Woodworth) and central (31 %) agricultural regions, with the remainder from the northwest (6 %) and Interlake (13 %) regions. There were no drought impacts reported from the eastern region.

Manitoba Agriculture reports that harvest is underway across the province. However, wet conditions over the past several weeks have stalled progress. Reported progress and yields can be found in Manitoba Agriculture's Crop Reports. Overall, it appears that in most regions the drought conditions observed over much of the growing season did not have an unfavourable impact to crop yields. However, Issue 22 states that in the central region the second cut of hay was below average due to dry conditions. Additionally, post-harvest field work and fertilization in this region has been limited by dry topsoil conditions.

Recent rains have helped to replenish soil moisture on pasture lands, and they have been showing signs of recovery in some areas. In northwest agro-Manitoba, pasture situated on lighter soils still requires additional moisture. Similarly, in the central region, pastures on lighter soils were reported as browning off with little regrowth. The eastern region reported that 20 % of hay and pasture land required additional moisture, with the driest soil conditions in the south. Pasture conditions in this region were rated as 20% good, 30% fair, 40% poor and 10% very poor.

Winter feed supplies for livestock appear to generally be adequate for most of agro-Manitoba. Exceptions include reports of producers in the central region having to travel to secure straw supplies. Interestingly, a positive impact of the dry conditions observed this growing season is in

parts of the southwest region sloughs and marshlands that have not been accessible in recent wet years can now be cut, increasing the amount of available feed.

Drought continues to persist in North Dakota. However, conditions are improving. For up to date drought information in North Dakota, visit http://www.ndresponse.gov/.

Future Weather

The short-range (October 11th to October 13th) weather forecast for Manitoba from Environment and Climate Change Canada's Regional Climate Model predicts that some portions of northern Manitoba may experience 5 to 10 mm over the next few days. The long range forecast (October 14th to 21st) predicts additional precipitation across most of northern Manitoba, with amounts ranging from 5 to 30 mm with most regions averaging between 10 - 20 mm. Agro-Manitoba is not forecasted to receive any significant precipitation during this period, with the exception of a portion of the southwest region that may receive 2 – 10 mm. Please note that long range precipitation forecasts have considerable uncertainty and are likely to change in the upcoming days.

Environment and Climate Change Canada's seasonal forecast for the next three months (October-November-December) projects temperatures to be above normal across Manitoba (Figure 9). Precipitation over the next three months is forecasted to be normal across most of agro-Manitoba (excluding the northwest region) and east of Lake Winnipeg, but above normal throughout the remainder of the province (Figure 10). The National Oceanic and Atmospheric Administration indicate that ENSO neutral conditions are currently present. There is an increasing chance (55 – 60 %) of La Niña conditions during the fall and winter of 2017 – 2018 in the Northern Hemisphere.

Table 2: Reservoir Status (Southern and Western Manitoba).

Water Supply Reservoir Levels and Storages – October 2nd, 2017.								
Lake or Reservoir	**Community Supplied**	**Target Level (feet)**	**Latest Observed Level (feet)**	**Observed date**	**Supply Status (Recent - Target) (feet)**	**Storage at Target Level (acre-feet)**	**Storage at Observed Level (acre-feet)**	**Supply Status (observed storage/target storage) (%)**
Lake of the Prairies (Shellmouth)[1]	Brandon, Portage	1,402.5	1,401.09*	October 2, 2017	-1.41	300,000	282,706	94%
Lake Wahtopanah (Rivers)	Rivers	1,536	1,535.38*	October 2, 2017	-0.62	24,500	23,817	97%
Minnewasta (Morden)	Morden	1,082	1,079.89*	October 2, 2017	-2.11	3,150	2,804	89%
Stephenfield	Carman	972	969.87*	September 28, 2017	-2.13	3,810	2,848	75%
Vermilion	Dauphin	1,274	1,273.01*	October 10, 2017	-0.99	2,600	2,340	90%
Goudney (Pilot Mound)		1,482	1,482.02*	October 2, 2017	0.02	450	451	100%
Jackson Lake		1,174	1,171.74*	October 2, 2017	-2.26	2,990	2,428	81%
Manitou (Mary Jane)		1,537	1,536.10*	October 2, 2017	-0.90	1,150	1,069	93%
Turtlehead (Deloraine)	Deloraine	1,772	1,770.67*	October 2, 2017	-1.33	1,400	1,330	95%
Kenton Reservoir		1,448	1,447.03	September 22, 2017	-0.97	600	527	88%
Killarney Lake		1,615	1,614.06	September 11, 2017	-0.94	7,360	6,929	94%
Lake Irwin		1,178	1,175.43	September 12, 2017	-2.57	3,800	2,599	68%
Elgin	Elgin	1,532	1,531.20	September 21, 2017	-0.80	520	464	89%
Rapid City		1,573.5	1,573.39	September 22, 2017	-0.11	200	192	96%
St. Malo		840	839.70	**August 31, 2017**	-0.30	1,770	1,722	97%

[1] Summer target level and storage.
* Real-time water level gauge.

Drought Definitions

Meteorological Drought is generally defined by comparing the rainfall in a particular place and at a particular time with the average rainfall for that place. Meteorological drought leads to a depletion of soil moisture and this almost always has an impact on agricultural production. Meteorological droughts only consider the reduction in rainfall amounts and do not take into account the effects of the lack of water on water reservoirs, human needs or on agriculture. A meteorological drought can occur without immediately impacting streamflow, groundwater, or human needs. If a meteorological drought continues, it will eventually begin to affect other water resources.

Agricultural Drought occurs when there is not enough water available for a particular crop to grow at a particular time. Agricultural drought depends not only on the amount of rainfall but also on the use of that water. Agricultural droughts are typically detected after meteorological drought but before a hydrological drought. If agricultural drought continues, plants will begin to protect themselves by reducing their water use, which can potentially reduce crop yields.

Hydrological Drought is associated with the effect of low rainfall on water levels in rivers, reservoirs, lakes, and aquifers. Hydrological droughts are usually noticed some time after meteorological droughts. First, precipitation decreases and after some time, water levels in rivers and lakes drop. Hydrological drought affects uses that depend on water levels. Changes in water levels affect ecosystems, hydroelectric power generation, and recreational, industrial and urban water use. A minor drought may affect small streams causing low streamflows or drying. A major drought could impact surface storage, lakes, and reservoirs thereby affecting water quality and causing municipal and agricultural water supply problems.

Rainfall also recharges groundwater aquifers through infiltration through the soil and run-off into streams and rivers. Once groundwater and surface waters are significantly impacted by lack of precipitation, a “hydrologic drought” occurs. Aquifer declines can range from a quick response (shallow sand) to impacts extending over multiple years. Impacts can include depletion of shallow depth wells, drying of farm dugouts, and changes to ground water quality.

Socioeconomic Drought occurs when the supply fails to meet the demand for an economic good(s) such as domestic water supplies, hay/forage, food grains, fish, and hydroelectric power, due to weather related water supply shortages from one or both of natural or managed water systems. At any time during meteorological, hydrological, or agricultural droughts, a socioeconomic drought can occur.

Acknowledgements

This report was prepared with information from the following sources which are gratefully acknowledged:

- Manitoba Infrastructure - Reservoir level information: *http://www.gov.mb.ca/mit/floodinfo/floodoutlook/river_conditions.html*
- Environment and Climate Change Canada: Flow and lake level information: *http://www.wateroffice.ec.gc.ca/index_e.html*
- Manitoba Sustainable Development's Fire Program: *http://www.gov.mb.ca/conservation/fire/*
- Environment and Climate Change Canada three month climatic outlook: *http://weatheroffice.gc.ca/saisons/index_e.html*
- Manitoba Agriculture: *http://www.gov.mb.ca/agriculture/crops/seasonal-reports/crop-report-archive/index.html*
- AAFC Drought Watch (including the Canadian Drought Monitor): *http://www.agr.gc.ca/drought*
- United States Drought Monitor: *droughtmonitor.unl.edu/*
- National Oceanic and Atmospheric Administration: ENSO: Recent Evolution, Current Status and Predictions: *http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf*

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Past reports are available on the Manitoba Drought Monitor website.

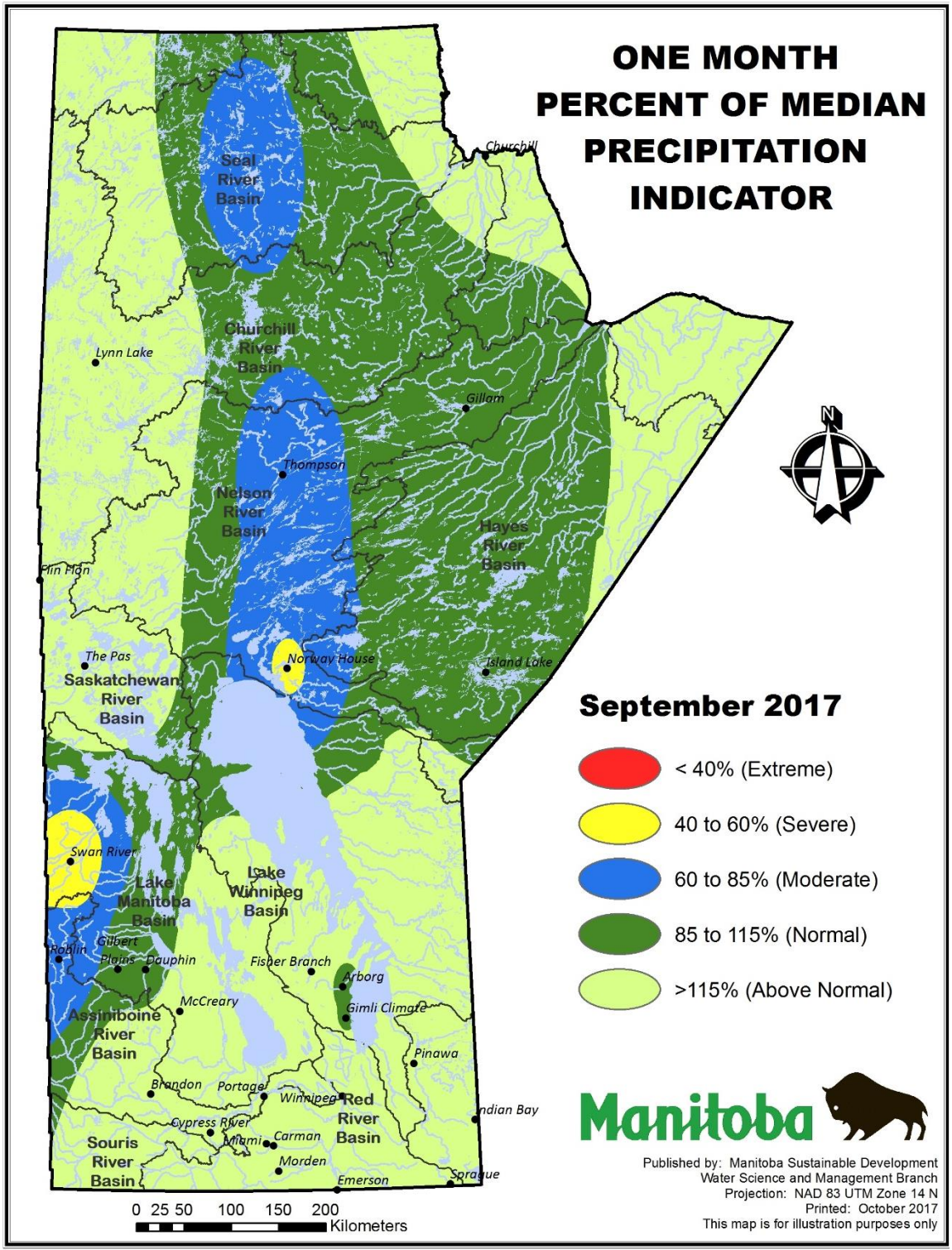

Figure 1: Short term precipitation indicator (percent of one month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

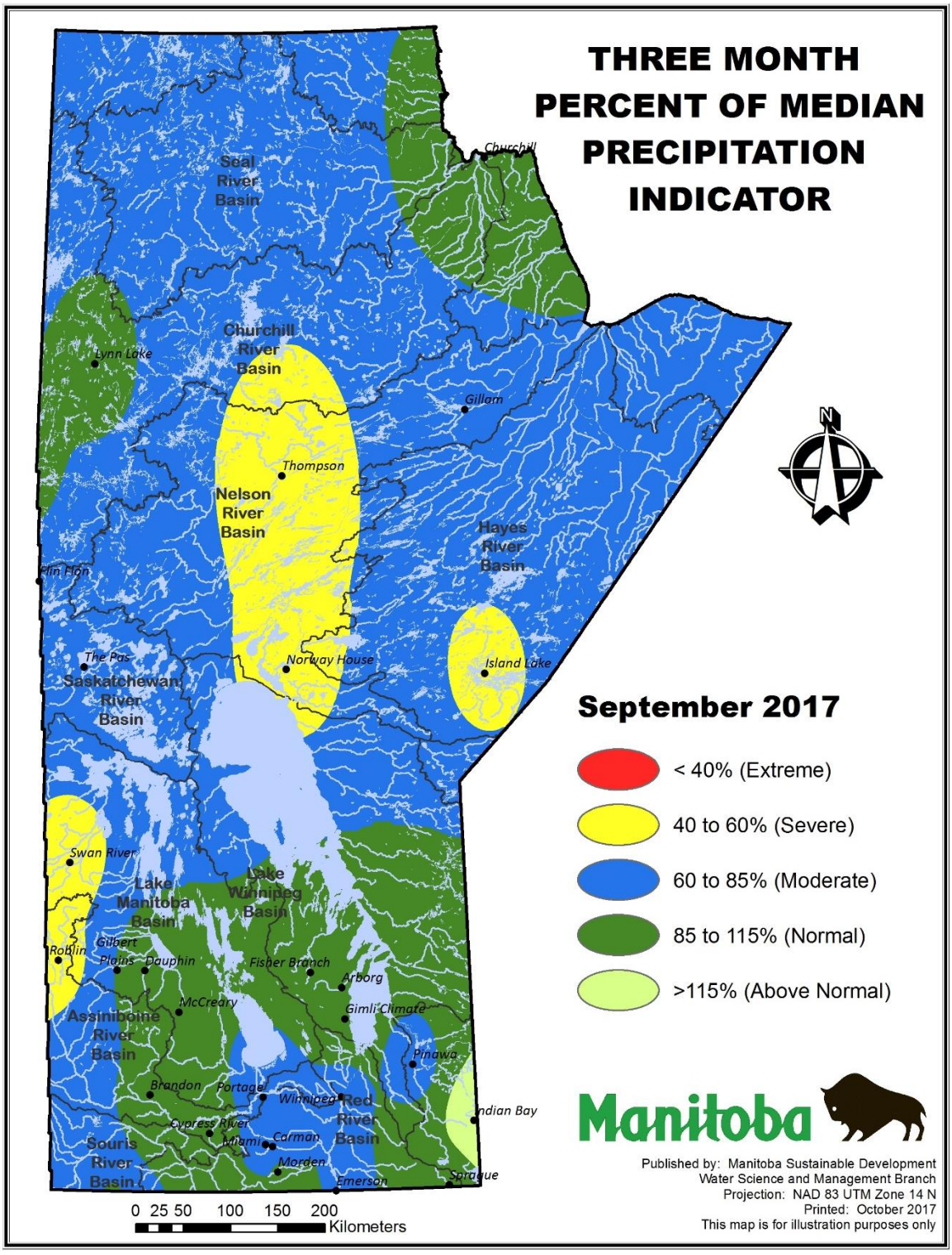

Figure 2: Medium term precipitation indicator (percent of three month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

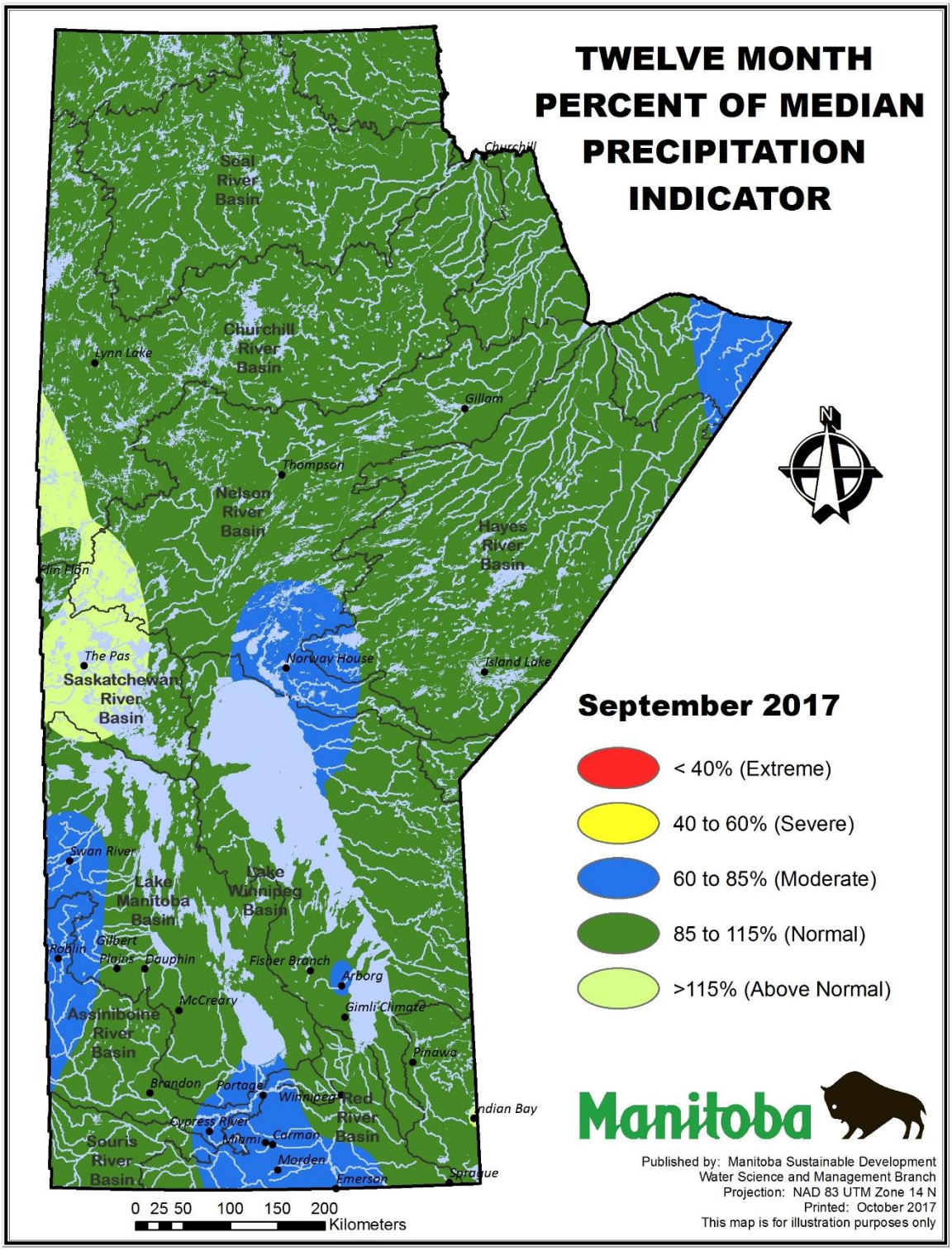

Figure 3: Long term precipitation indicator (percent of twelve month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

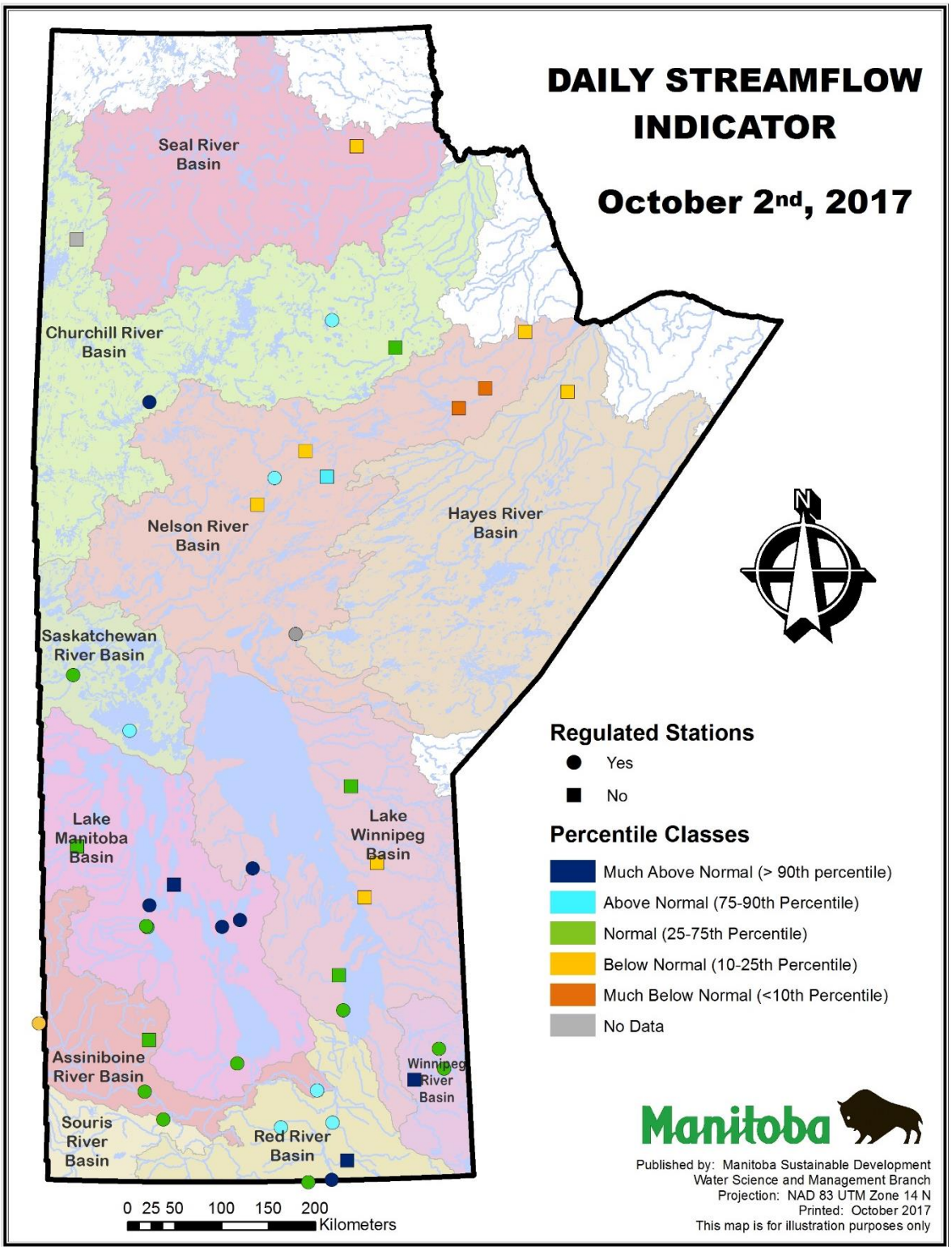

Figure 4: Daily streamflow indicator for October 2nd, 2017. Real-time daily streamflow and water levels are compared to historical values for the specified day.

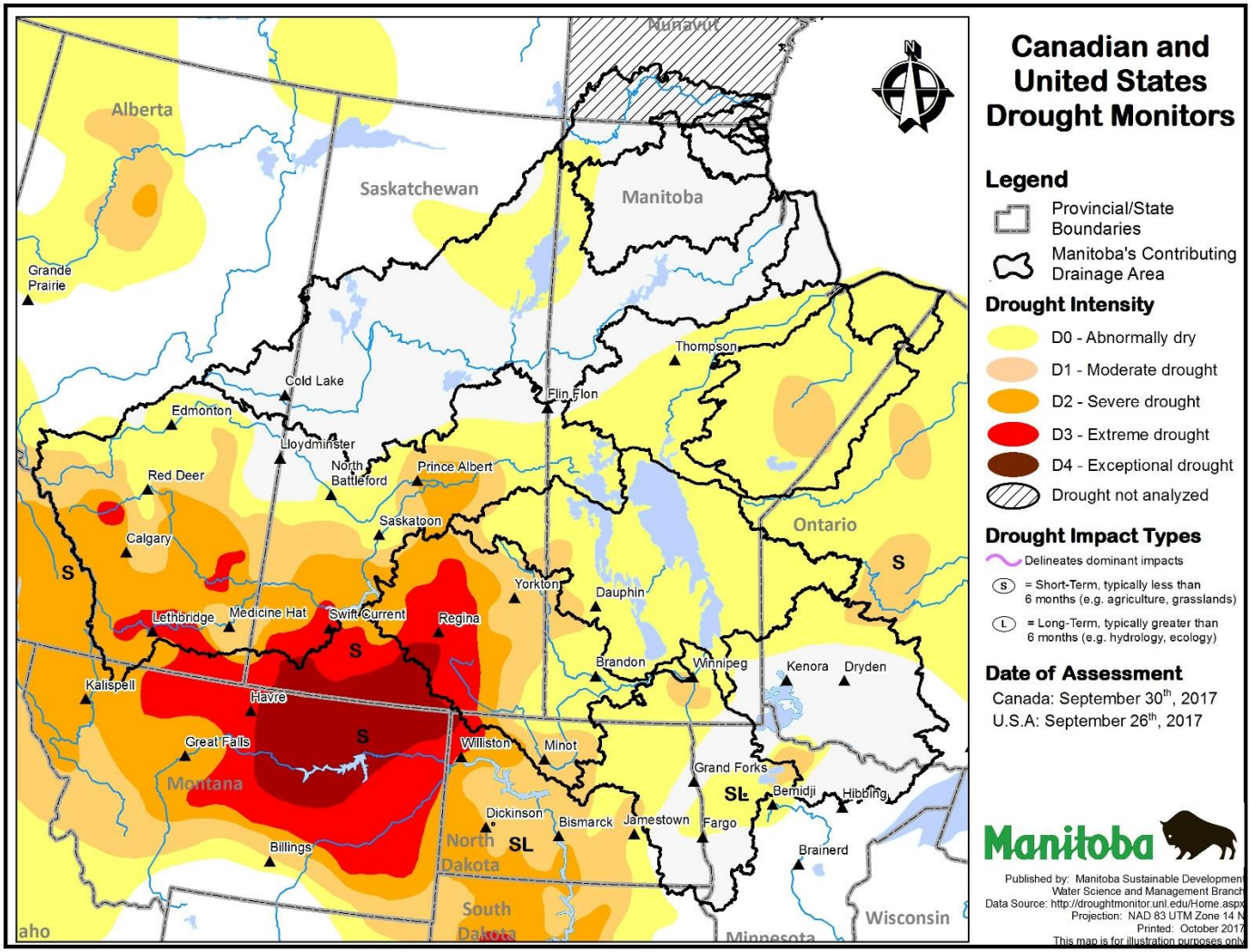

Figure 5: Canadian and United States Drought Monitors' classification of short-term (S) and long-term (L) drought conditions. Canadian Drought Monitor assessment date is September 30th, 2017. United Satates Drought Monitor assessment date is September 26th, 2017.

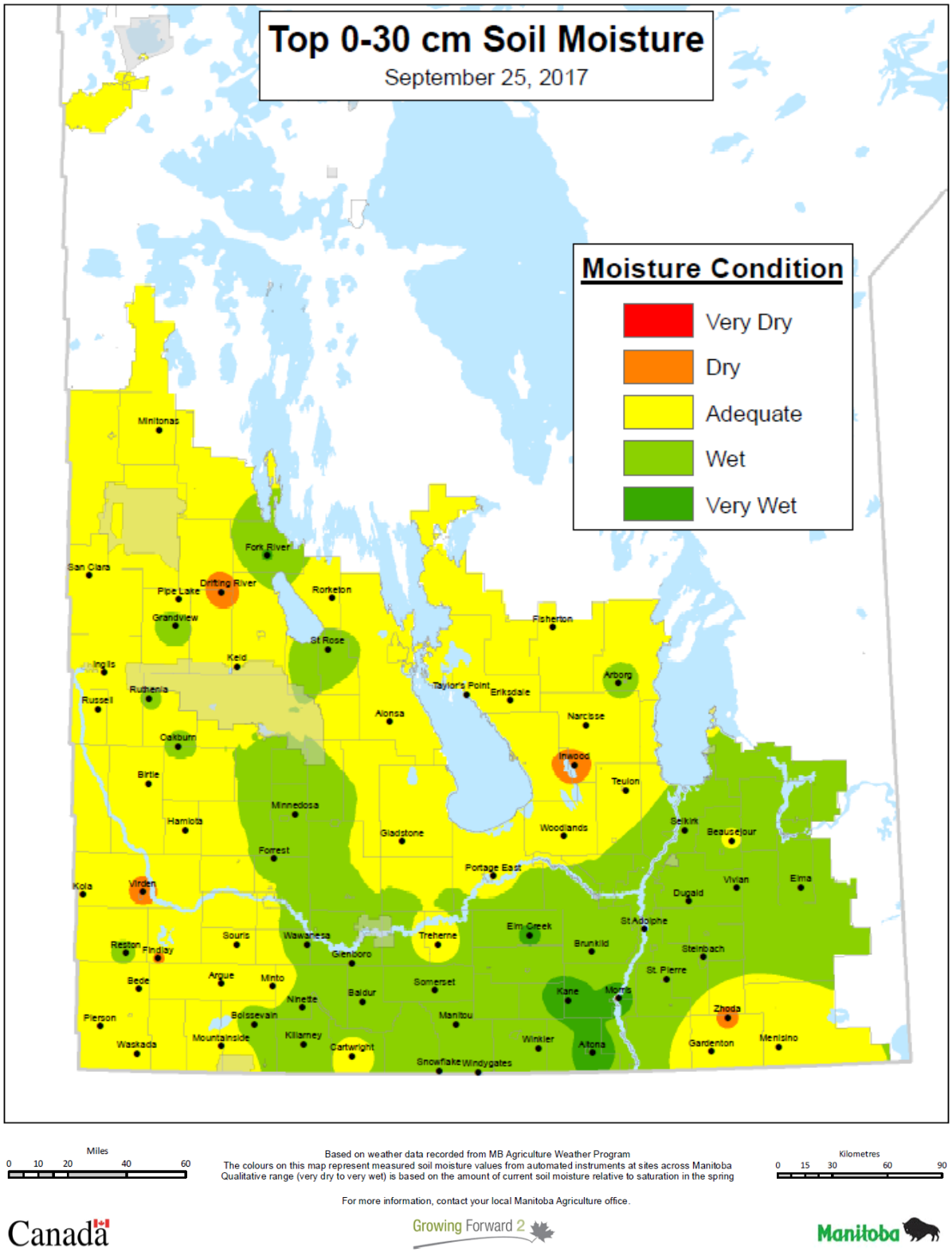

Figure 6: Manitoba Agriculture's September 25th, 2017 mapping of soil moisture conditions in the top 0 – 30 cm.

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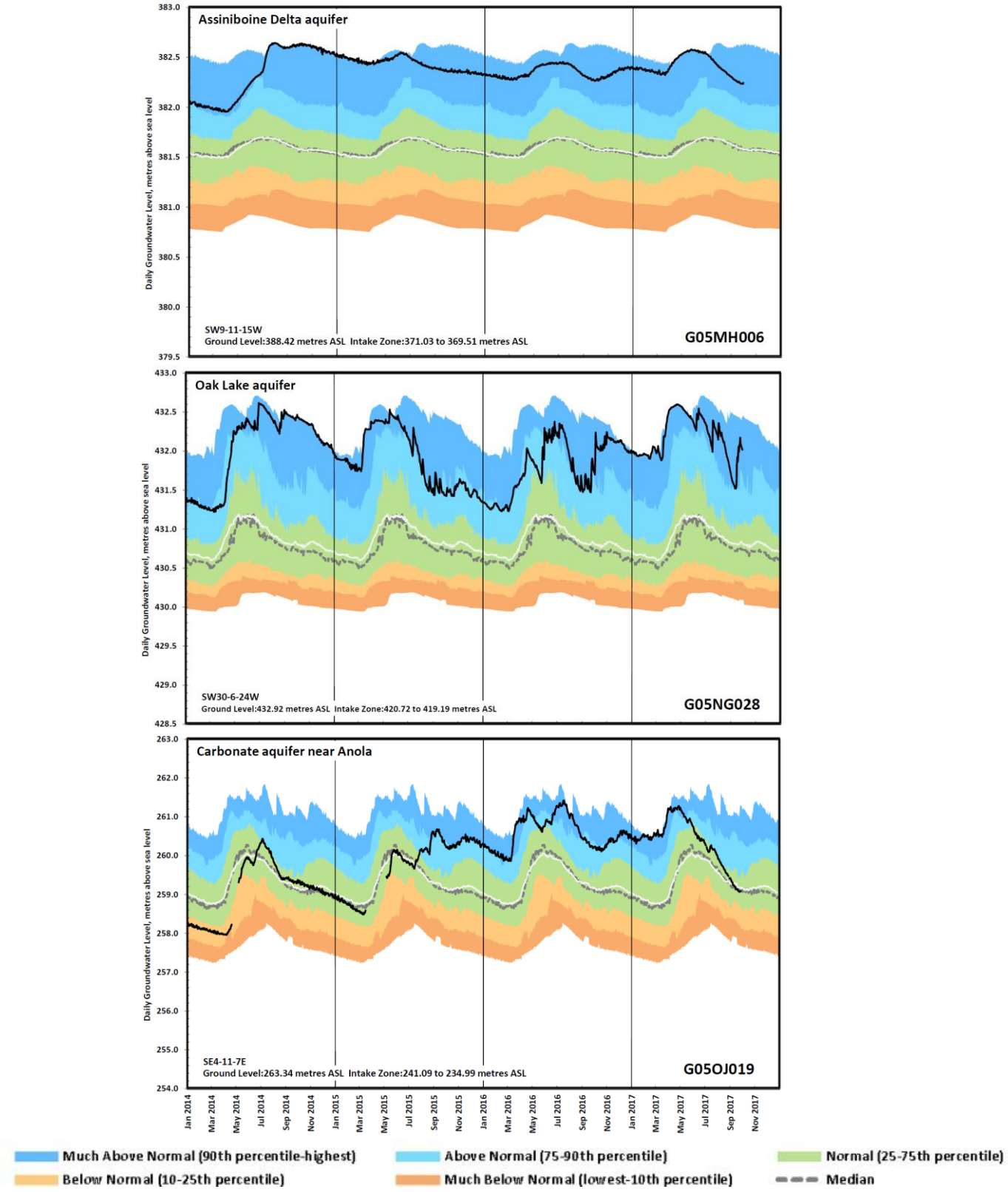

Figure 7: Groundwater hydrographs from 2014 – current for the Assiniboine Delta aquifer, the Oak Lake aquifer, and the Carbonate aquifer near Anola.

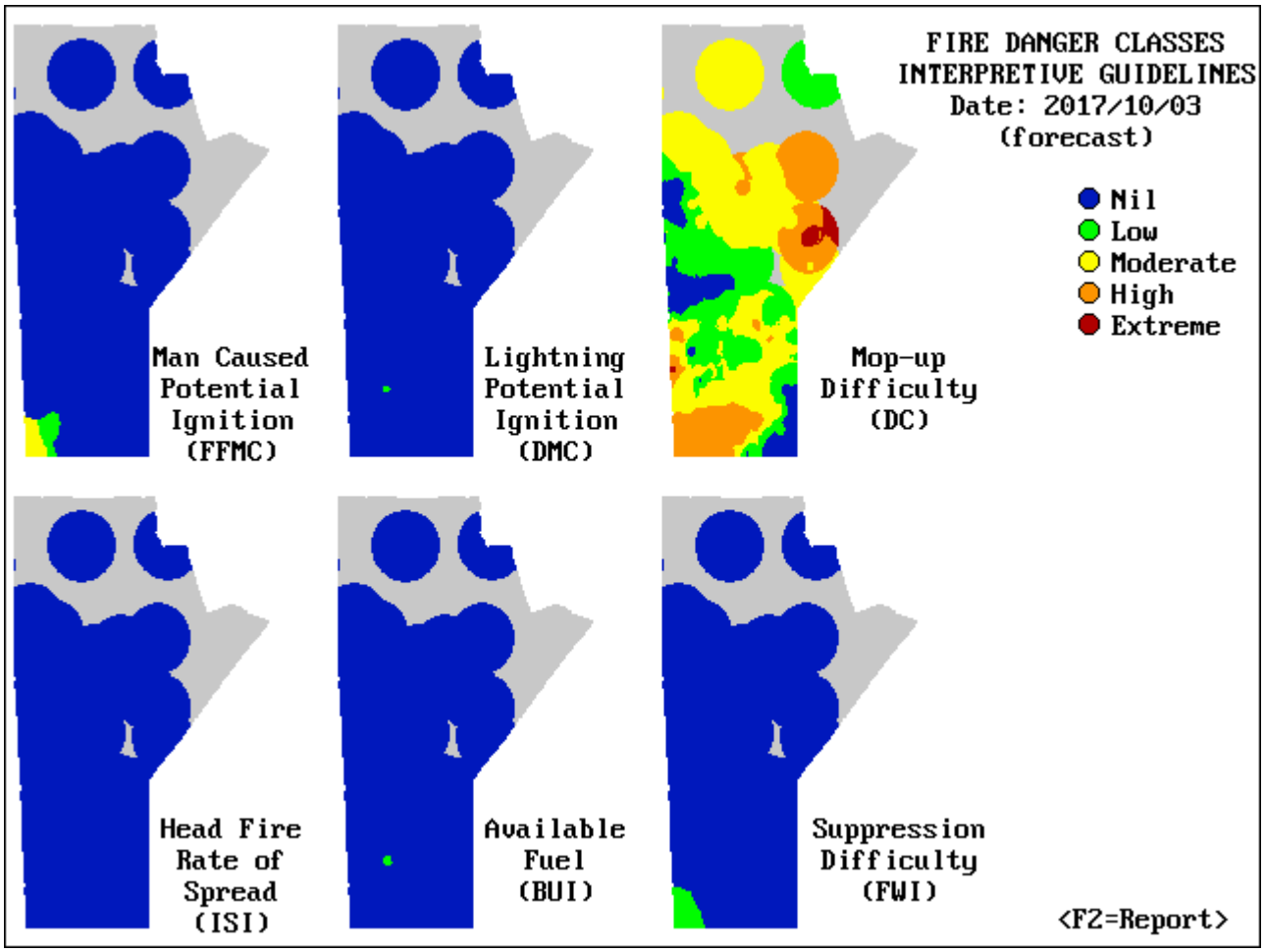

Figure 8: Predicted wildfire hazard mapping for October 3rd, 2017, including the six components of the Canadian Forest Fire Weather Index System generated by the Manitoba Fire Program.

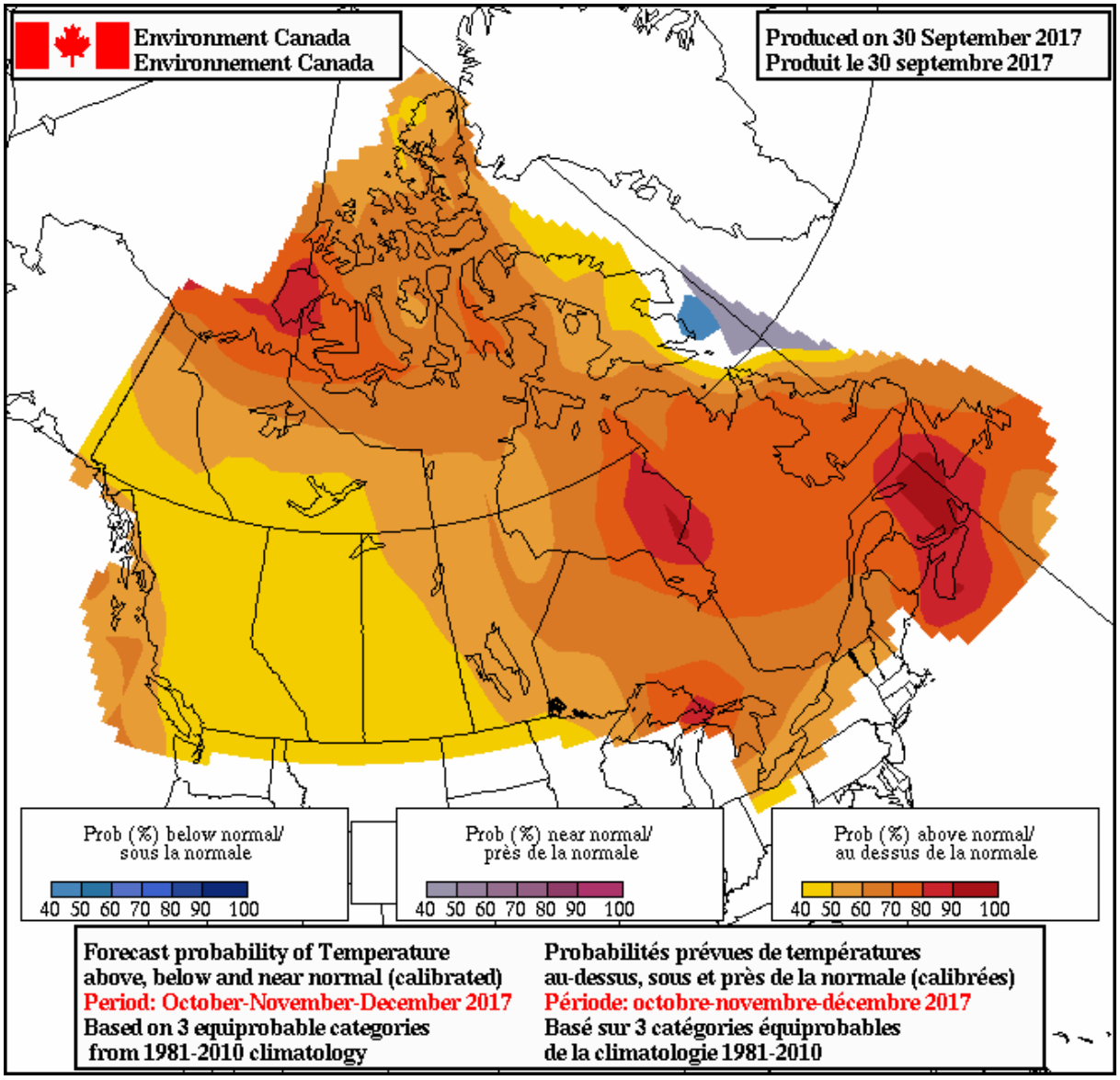

Figure 9: Environment and Climate Change Canada's seasonal (three month) temperature outlook for October-November-December.

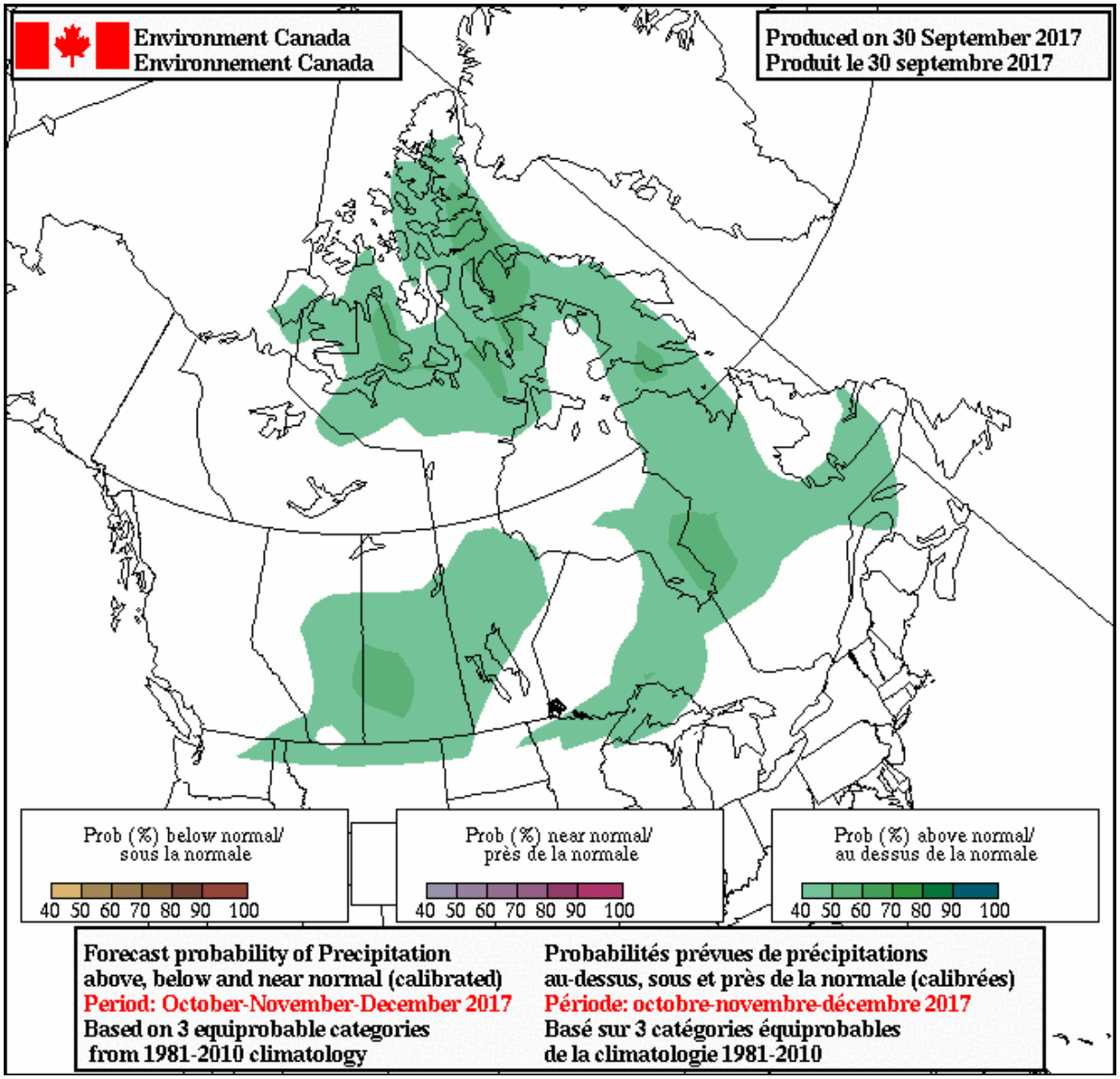

Figure 10: Environment and Climate Change Canada's seasonal (three month) precipitation outlook for October-November-December.

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