Water Availability and Drought Conditions Report

October 2015

Executive Summary

- The Water Availability and Drought Conditions Report provides an update on drought conditions throughout Manitoba for October 2015.
- Precipitation over the short term has been normal or above normal for most of Manitoba. The exceptions are an area centered over the Lake Manitoba Basin that experienced moderately dry conditions, and much of the north-east portion of the province experienced moderately to severely dry conditions. Over the last three to 12 months, most of Manitoba experienced normal conditions with isolated areas experiencing moderately dry conditions. The moderately dry area centered over Dauphin has persisted throughout the last 12 months and an area surroundings Gods Lake has been moderately dry over the long term as well.
- September streamflow was normal or above normal for most major rivers across the province with the exception of the Churchill River Basin, in which portions of the basin experienced moderately to extremely dry conditions.
- There are currently no concerns over water supply as supplies are adequate across the province. Most water supply reservoirs in southern and western Manitoba are close to full supply levels, with the exception of the Elgin Reservoir which has been intentionally de-watered. Manitoba Agriculture, Food and Rural Development reported that dugout conditions are generally adequate across Agri-Manitoba.
- Environment Canada's seasonal temperature forecast for November, December and January is projected to be above normal across Manitoba. The seasonal precipitation forecast for November, December and January is projected to be normal for most of Manitoba, but above normal for the southwestern tip of Manitoba and along the western provincial border. El Niño conditions are present in the Pacific Ocean and will influence North America's weather the next few months. Currently it is forecasted that Manitoba may see mild and dry conditions throughout the winter season.
- For more information on drought in Manitoba please visit Conservation and Water Stewardship's website: http://www.gov.mb.ca/drought.

November 6, 2015

Manitoba
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Drought Indicators

Two types of drought indicators are assessed across Manitoba; precipitation and streamflow. The indicators describe the severity of dryness in a watershed.

Precipitation Indicators

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 the long term (twelve months), medium term (three months) and short term (one month). Precipitation indicators are summarized by basin in Table 1 and on Figures 1, 2 and 3. 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.

Over the short term (one month), most of Manitoba experienced normal or above normal conditions. The exceptions were an area within the centre of the Lake Manitoba Basin that experienced moderately dry conditions, the south-western corner of the province that experienced moderately to severely dry conditions, and portions of the Nelson, Churchill and Hayes River basins that experienced moderately to extremely dry conditions.

Over the medium term (three months), most of Manitoba experienced normal conditions except for three isolated areas surrounding Pilot Mound, Emerson and Dauphin, and the eastern portions of the Churchill and Seal River basins, which experienced moderately dry conditions.

Over the long term (twelve months), most of Manitoba experienced normal conditions. Areas close to Dauphin and Gods Lake experienced moderately dry conditions.

Streamflow Indicators

The streamflow indicator is based on average monthly flows and is used to determine the severity of hydrological dryness in a watershed. The streamflow indicator is summarized by basin in Table 1 and on Figure 4.

The monthly streamflow indicator shows that flows are normal or above normal for most major rivers across the province. Within the Churchill River Basin, the Churchill River at Leaf Rapids is moderately dry and the Cochrane River is extremely dry.

Table 1: Drought Indicators by Major River Basin

Basin (in Manitoba)	Drought Indicators			
	Precipitation Indicators			Monthly Flow Indicators October 2015
	Percent of 1 Month Median October 2015	Percent of 3 Month Median August - October 2015	Percent of 12 Month Median September 2014 – October 2015	
Red River	Normal	Normal except for isolated areas south of Pilot Mound and at Emerson with moderately dry conditions	Normal	Normal
Winnipeg River	Normal	Normal	Normal	Normal
Assiniboine River-Souris River	Normal except for the south-western corner of the province where moderately to severely dry conditions exist	Normal	Normal	Normal
Lake Manitoba	Normal except for moderately dry conditions within the centre of the basin	Normal except for an isolated area of moderately dry conditions centered over Dauphin	Normal to moderately dry	Normal
Lake Winnipeg	Normal	Normal	Normal except for moderately dry conditions west of Fisher Branch	Normal
Saskatchewan River	Normal	Normal	Normal	Normal
Nelson River	Normal in the western portion of the basin, moderately to extremely dry conditions in the northeast portion of the basin	Normal	Normal	Normal
Hayes River	Normal in the south portion of the basin, and moderately to extremely dry conditions north of Island Lake	Normal	Normal except for moderately dry conditions surrounding Gods Lake	Normal
Churchill River	Normal except for moderately dry conditions within the eastern portion of the basin	Normal except for moderately dry conditions within the eastern portion of the basin	Normal	Moderately low flows for Churchill River at Leaf Rapids and extremely low flows for Cochrane River
Seal River	Normal	Normal except for moderately dry conditions within the eastern portion of the basin	Normal	Normal

Water Availability

Reservoir Conditions

Water supply reservoirs are close to or at full supply level, with the exception of the Minnewasta and Elgin Reservoirs. Minnewasta Reservoir is 84 % of full supply volume. Elgin Reservoir has been deliberately dewatered for the 2015-2016 winter season in an attempt to control an aquatic invasive species (bullhead fish).

On Farm Water Supply

Manitoba Agriculture, Food and Rural Development reports on dugout conditions across Agri-Manitoba in their weekly Crop Reports. General dugout conditions from their last report for the year, Crop Report: Issue 24 (October 13th, 2015) are summarized in Table 2.

Table 2: On Farm Water Supply (Dugout) Conditions

Region	General Dugout Conditions
Eastern	Adequate
Interlake	Adequate
Southwest	Adequate
Central	60-100% capacity
Northwest	Adequate

Aquifers

Groundwater levels in major aquifers are generally good. 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'.

Forest and Grassland Fires

The Provincial Wildfire Program reported that there are currently no active fires burning within the province. 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

Observed Impacts

Overall, there have been minimal drought impacts during the month of October.

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. Four municipalities (Rossburn, Killarney-Turtle Mountain, Thompson, and Portage la Prairie) have registered minimal drought impacts within their regions with the Agroclimate Impact Reporter during the month of October. Drought impacts in these municipalities were generally related to short-term dryness slowing crop/pasture growth and anticipated water shortages if conditions persisted.

Manitoba Agriculture Food and Rural Development's most recent Crop Report indicates that as of October 13th, harvest in Manitoba was over 95 % complete. Generally, crop yields are at or above 10 year average yields. Lower than average yields for certain crop types have been attributed to early growing season frost events, high winds, and extremes in moisture. Drought was generally considered to have minimal impact on lower than average yields during the 2015 growing season, with the exception of areas within and surrounding Dauphin, Swan River and Roblin. The lack of sufficient moisture during the spring resulted in some moderate drought impacts such as slow crop and pasture growth and development of localized water shortages within the aforementioned regions.

The Provincial Wildfire Program has indicated increased dryness in the south-western portion of the province. This observed dryness is shown in the Drought Code map generated by the Provincial Wildfire Program (Figure 5), which is a component of the Canadian Forest Fire Weather Index (FWI) System. The Drought Code indicator is a rating of the average moisture content of deep, compact organic layers and provides context on seasonal drought effects on forest fuels, with the more extreme values denoting increased potential for wildfire.

Five municipalities continue to have burning bans in place.

Future Potential Impacts

North America's climate can be influenced by fluctuations in ocean temperatures, particularly in the Pacific Ocean. Warmer than normal sea-surface temperatures have been observed across much of the Pacific Ocean resulting in strong El Niño conditions within the Northern Hemisphere, including Canada. According to the United States National Weather Service, there is a high chance that strong El Niño conditions will continue throughout the winter of 2015-2016 in the Northern Hemisphere, and begin to weaken during late winter or early spring of 2016. El Niño conditions are generally correlated to warmer winters for Manitoba.

Environment Canada's seasonal forecast for the next three months (November-December-January) projects temperatures to be above normal across Manitoba (Figure 6), as is expected during El Niño

conditions. Precipitation is projected to be normal for most of Manitoba and above normal for the southwestern tip of Manitoba and along a large portion of the western provincial border (Figure 7). If El Niño conditions persist throughout the winter and into the spring, several sources are predicting a mild and drier than average winter, until conditions dissipate and return to normal. Lower than average snowfall may pose a risk to 2016 summer water supply, as many reservoirs and lakes achieve summer target levels from snowmelt.

Currently, water supply reservoirs are close to or at full supply level, with the exception of the Minnewasta and Elgin Reservoirs. Minnewasta Reservoir is above the recommended level for this time of year, and therefore there are currently no concerns about future water supply for this reservoir. Elgin Reservoir has been completely de-watered and therefore is well below the target level approaching the winter season. However, this is a small reservoir with a full supply level of 520 acre-feet, and it is likely that there will not be any issues recharging the reservoir back to full supply level in the spring, provided there are adequate spring melt conditions. Monitoring will continue over the winter season.

Table 3: Reservoir Status (Southern and Western)

Reservoir Levels and Storages								
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) (%)**
Elgin	Elgin	1,532.00	Low**	October 20, 2015	N/A	520	N/A	0 %
Lake of the Prairies (Shellmouth)*	Brandon, Portage	1,402.50	1,400.65	October 31, 2015	-1.85	300,000	277,255	92 %
Lake Wahtopanah (Rivers)	Rivers	1,536.00	1,535.64	November 2, 2015	-0.36	24,500	24,106	98 %
Manitou (Mary Jane)	Manitou	1,537.00	1,535.97	October 26, 2015	-1.03	1,150	1,058	92 %
Minnewasta (Morden)	Morden	1,082.00	1,078.72	November 2, 2015	-3.28	3,150	2,635	84 %
Stephenfield	Carman	972.00	971.17	November 2, 2015	-0.83	3,810	3,426	90 %
Turtlehead (Deloraine)	Deloraine	1,772.00	1,770.34	October 20, 2015	-1.66	1,400	1,311	94 %
Vermilion	Dauphin	1,274.00	1,274.32	November 2, 2015	0.32	2,600	2,675	103 %
Goudney (Pilot Mound)		1,482.00	1,481.79	November 2, 2015	-0.21	450	436	97 %
Jackson Lake		1,174.00	1,173.68	November 2, 2015	-0.32	2,870	2,908	101 %
Kenworth Dam		1,448.00	1,447.79	October 27, 2015	-0.21	600	585	97 %
Killarney Lake		1,615.00	1,614.91	October 15, 2015	-0.09	7,360	7,320	99 %
Lake Irwin		1,178.00	1,177.95	October 19, 2015	-0.05	3,800	3,771	99 %
Rapid City		1,573.50	1,574.21	**July 29, 2015**	0.71	200	250	125 %
St. Malo		840.00	840.29	October 13, 2015	0.29	1,770	1,817	103 %

* Summer target level and storage.

** Reservoir has been deliberately de-watered for environmental reasons.

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 and Transportation: Reservoir level information: http://www.gov.mb.ca/mit/floodinfo/floodoutlook/river_conditions.html
- Environment Canada: Flow and lake level information: http://www.wateroffice.ec.gc.ca/index_e.html
- Manitoba Conservation and Water Stewardship Fire Program: http://www.gov.mb.ca/conservation/fire/
- Environment Canada three month climatic outlook: http://weatheroffice.gc.ca/saisons/index_e.html
- Manitoba Agriculture, Food and Rural Development: http://www.gov.mb.ca/agriculture/crops/seasonal-reports/crop-report-archive/index.html
- Agriculture and Agri-Food Canada: Agroclimate Impact Recorder: http://www5.agr.gc.ca/eng/?id=1363983829708

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Past reports are available at:
www.gov.mb.ca/drought

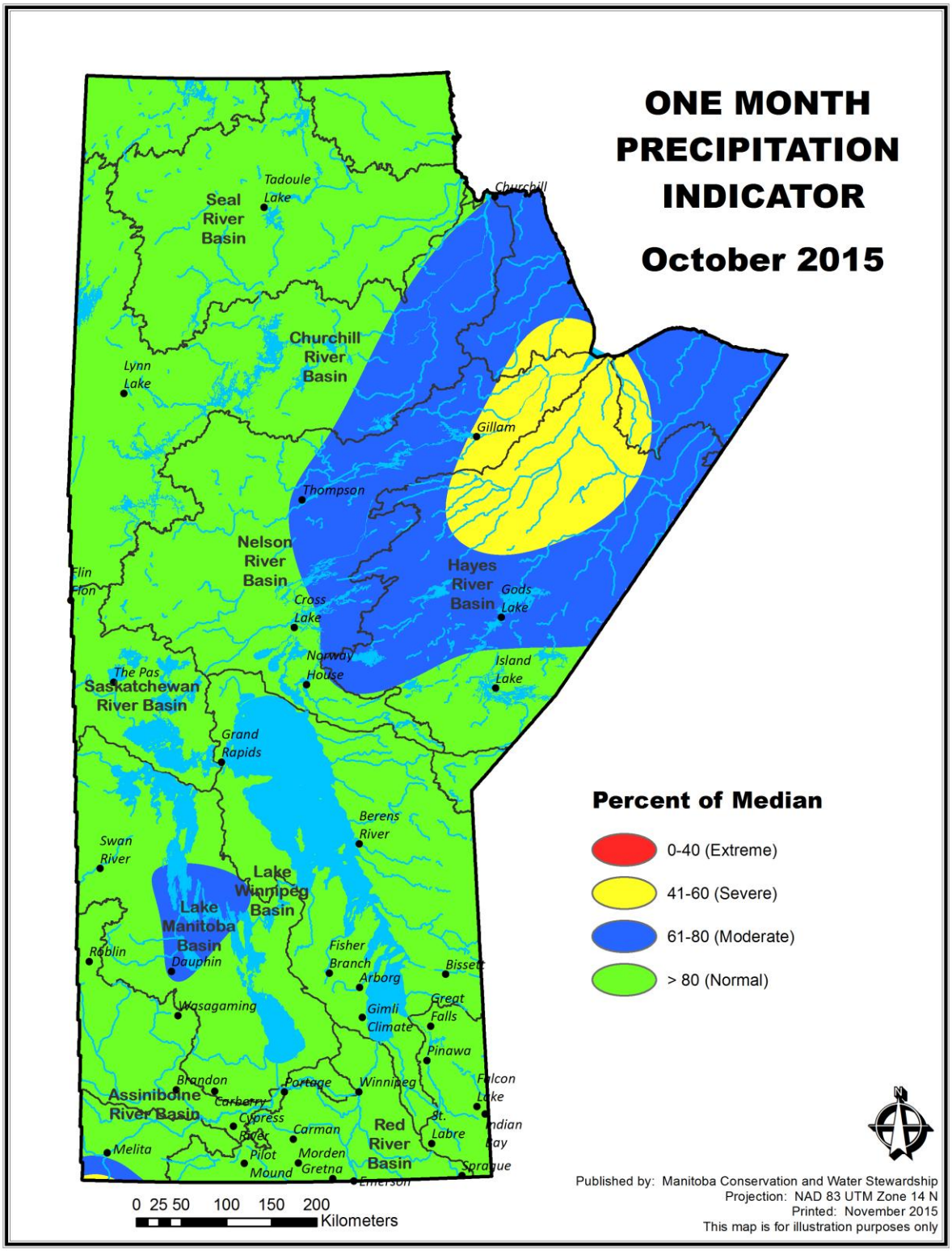

Figure 1: Precipitation Indicator (Percent of One Month Median Precipitation).

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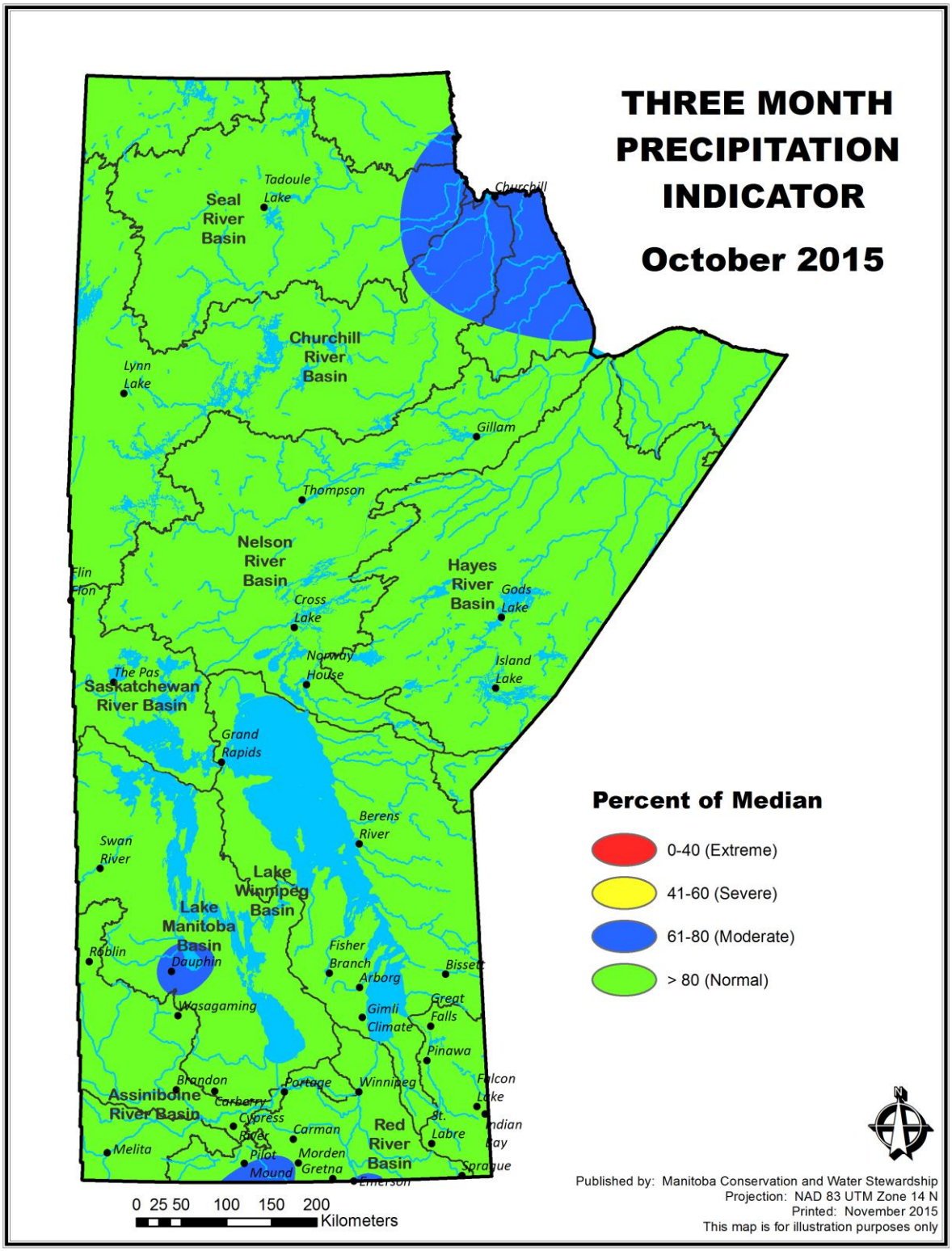

Figure 2: Precipitation Indicator (Percent of Three Month Median Precipitation).

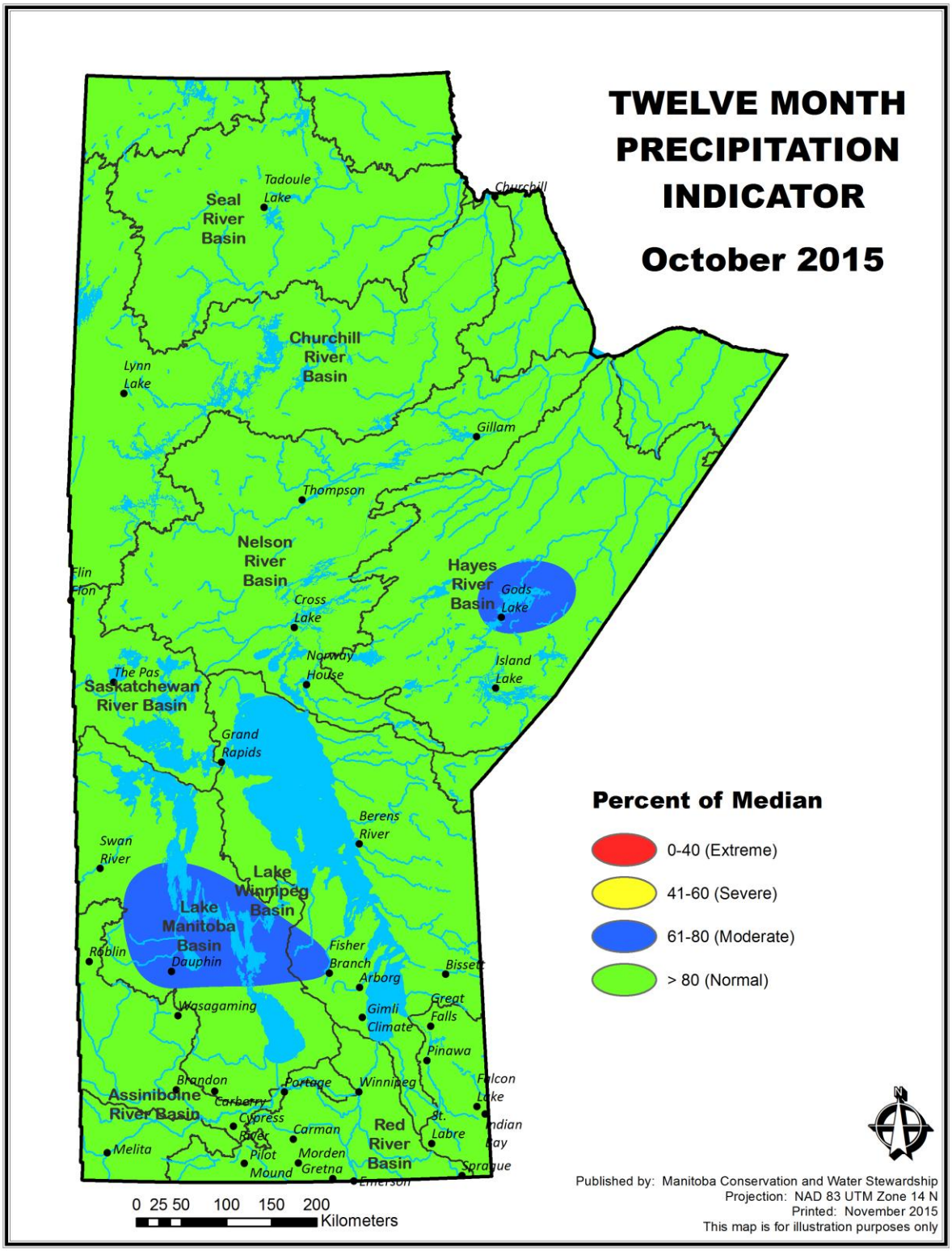

Figure 3: Precipitation Indicator (Percent of Twelve Month Median Precipitation).

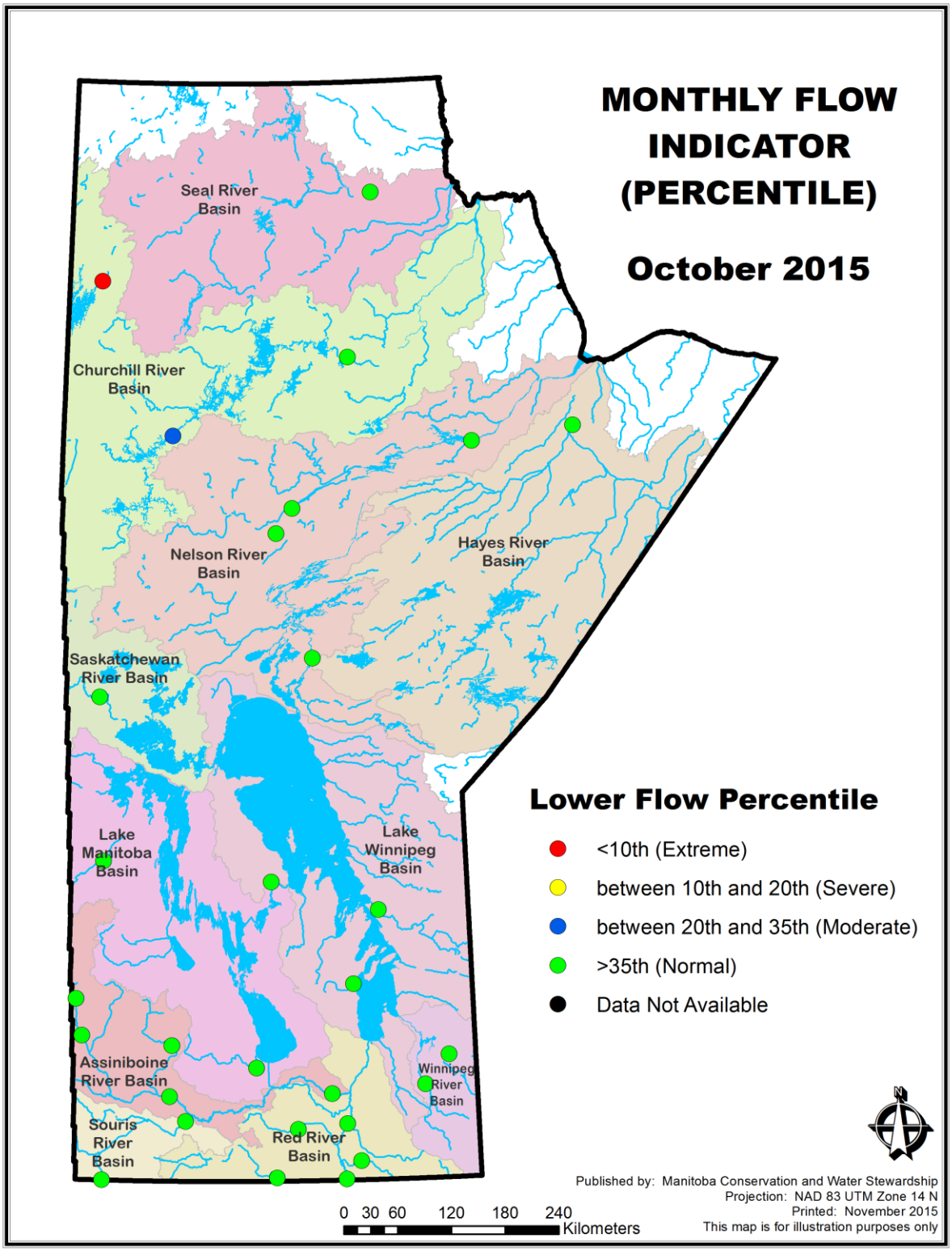

Figure 4: Monthly Flow Indicator (lower 10th, 20th and 35th monthly flow percentile).

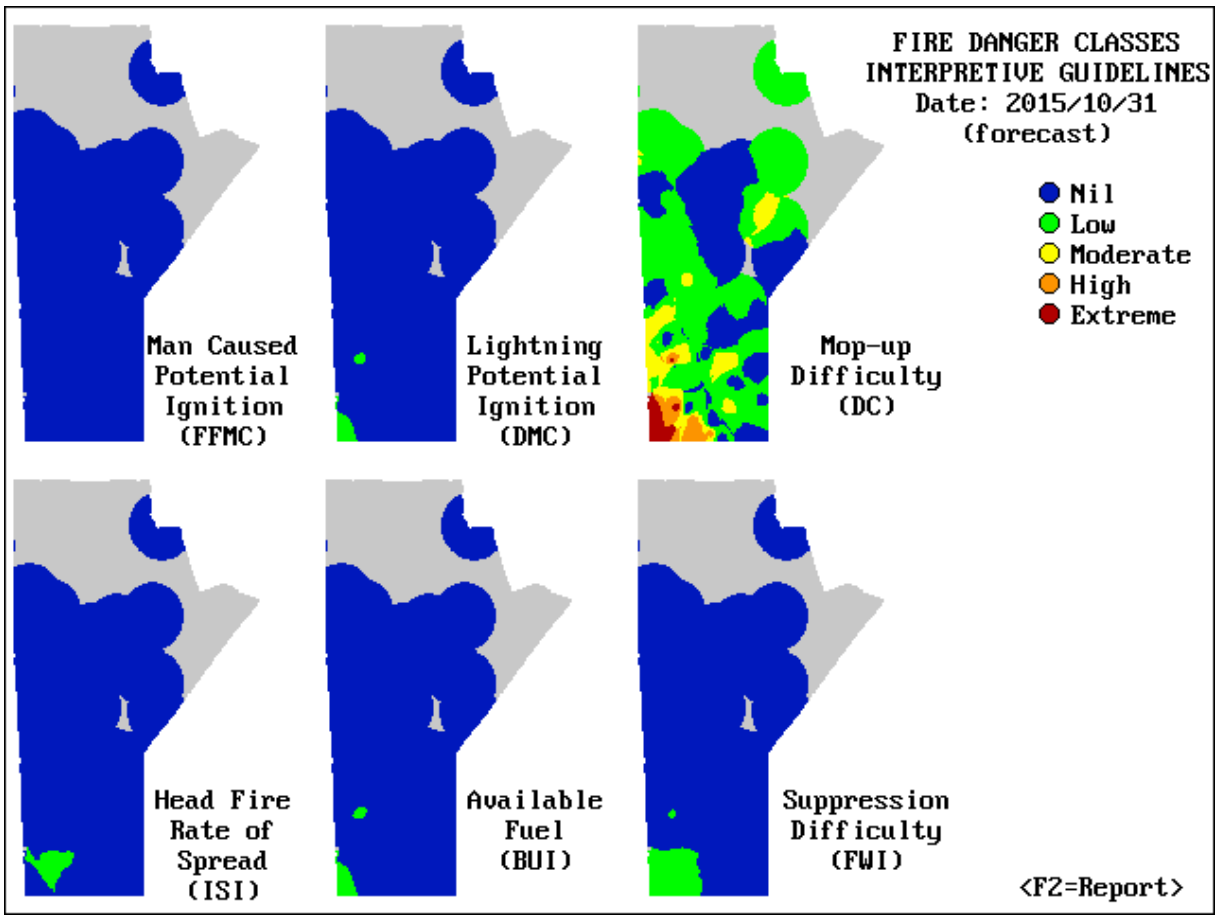

Figure 5: Relative Wildfire Potential Forecast maps, including Drought Class (DC), for Manitoba as generated by the Provincial Wildfire Program.

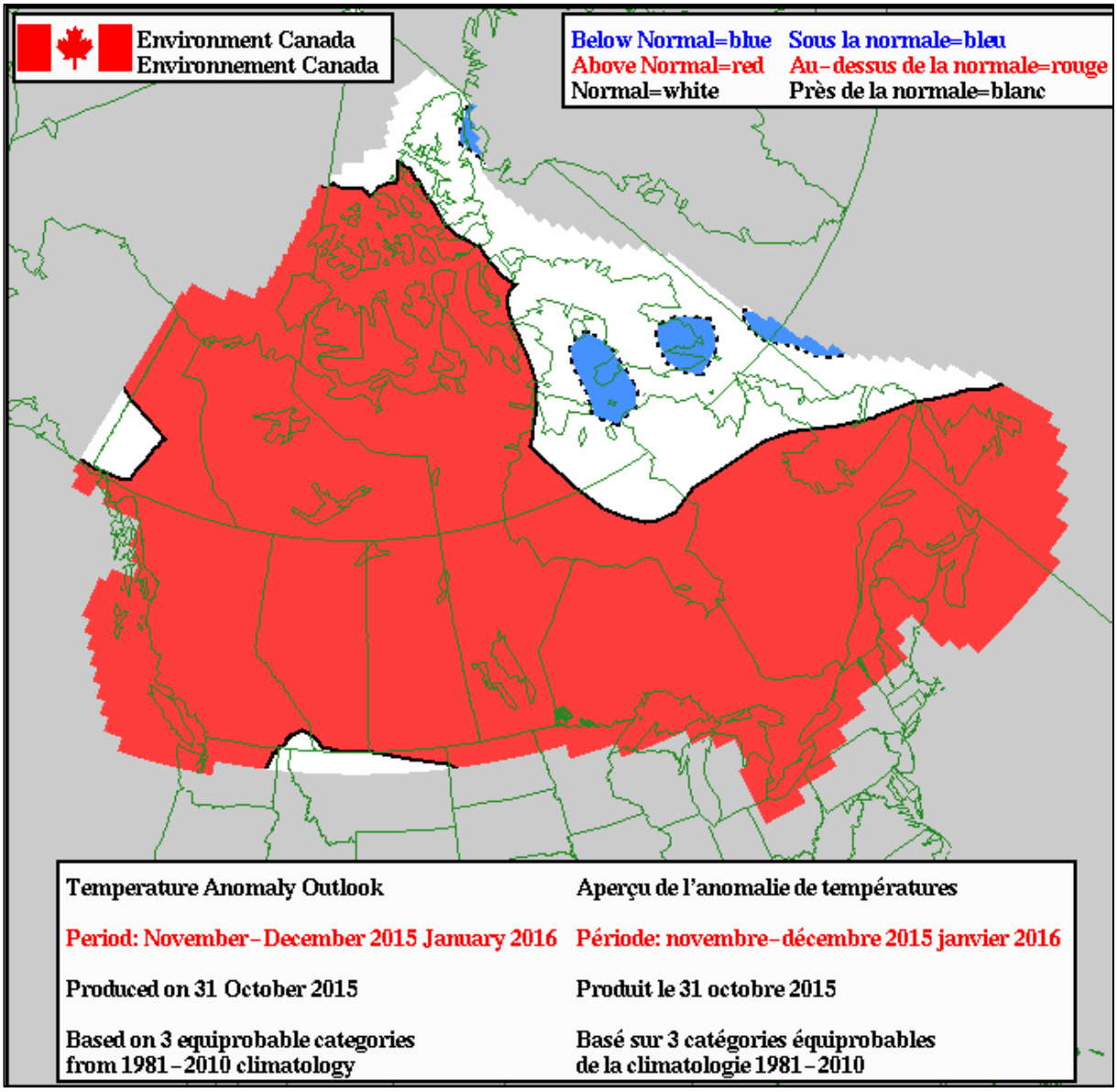

Figure 6: Environment Canada Seasonal (3 month) Temperature Outlook.

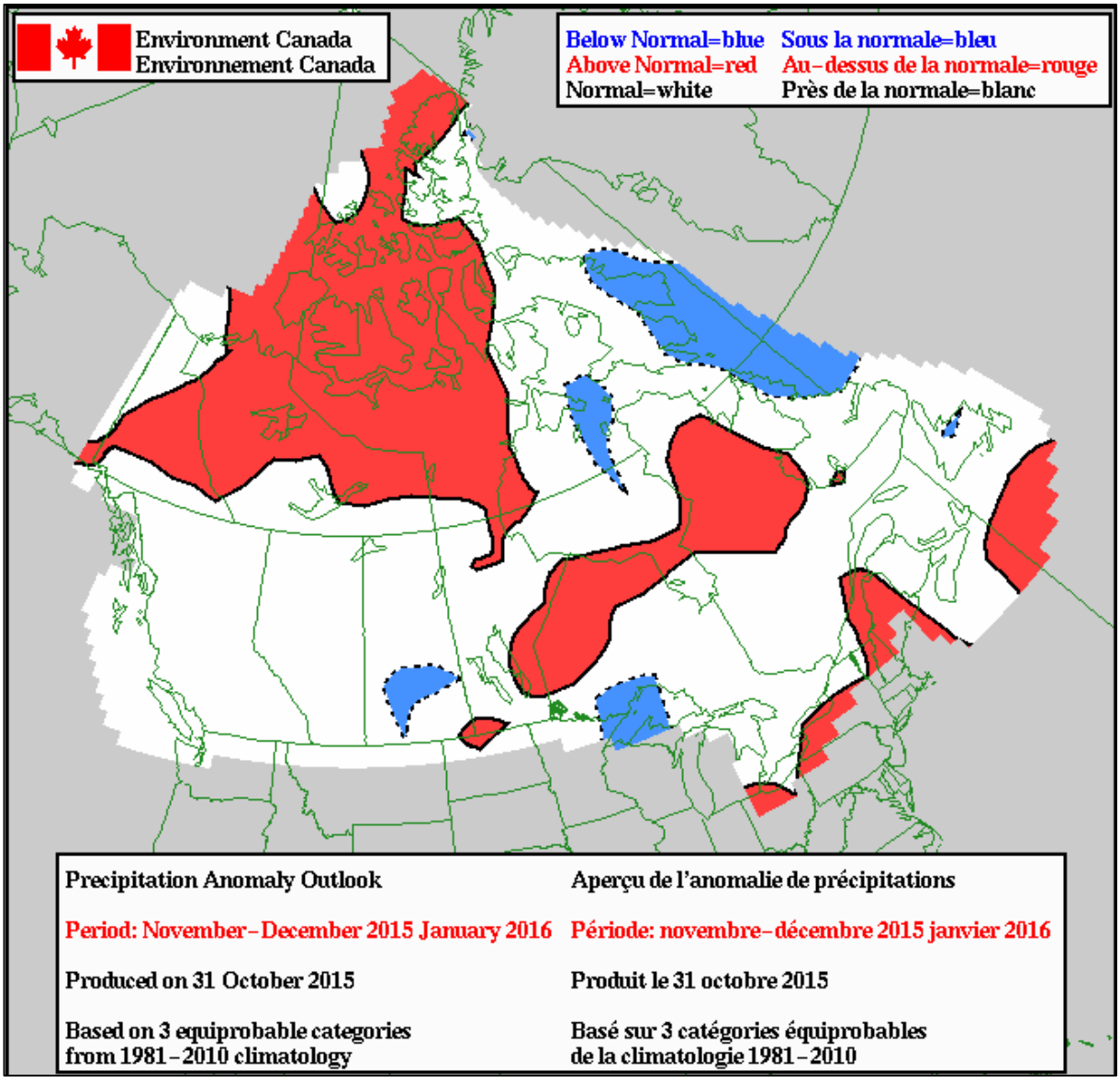

Figure 7: Environment Canada Seasonal (3 month) Precipitation Outlook.

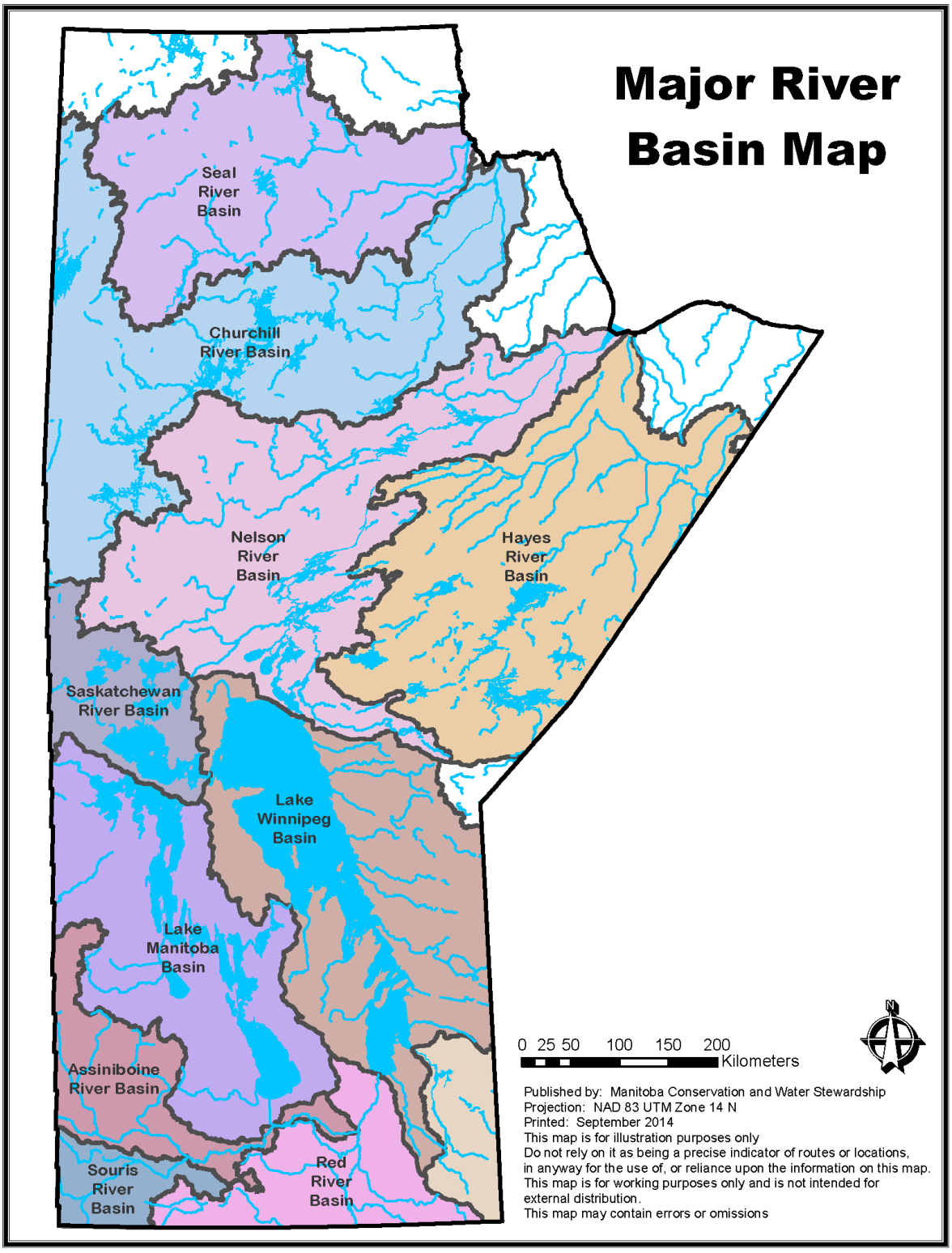

Figure 8: Major Manitoba River Basins.