Water Availability and Drought Conditions Report

August 2016

Executive Summary

- This Water Availability and Drought Conditions Report provides an update on drought conditions throughout Manitoba for August 2016.
- During the month of August, precipitation conditions were normal or above normal throughout southern Manitoba, with portions of northern Manitoba experiencing moderately to severely dry conditions.
- Over the medium term (June – August), precipitation was generally normal to above normal except for a moderately to severely dry area surrounding Gillam extending to Churchill and a small region of moderately dry conditions centered over Gimli.
- Over the long term (twelve months), most of Manitoba experienced normal to above normal precipitation conditions with the exception of an area surrounding Churchill.
- Southern Manitoba watersheds generally experienced normal to above normal flow conditions in August, except for the upper reaches of the Souris River in Manitoba which saw moderately low flows. In northern Manitoba, the Cochrane and Kettle Rivers and Churchill River near Fidler Lake experienced moderately to severely low flows. The remaining northern rivers and tributaries experienced normal to above normal flows.
- There are currently no major concerns over water supply as reservoir and on-farm supplies are adequate across the province.
- The number of wildfires and total area burned are well below average for this time the year for Manitoba, with only two wildfires currently active in northeastern Manitoba.
- Environment and Climate Change Canada's seasonal temperature forecast for September, October and November is projected to be above normal across Manitoba. The seasonal precipitation forecast is projected to be above normal for the western portion of Manitoba and normal for the remainder of the province.
- For more information on drought in Manitoba, please visit the Manitoba Drought Monitor website at http://www.gov.mb.ca/drought.

September 2nd, 2016

Manitoba
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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 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. 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), precipitation conditions were normal to above normal across southern Manitoba. Normal to moderately dry conditions were experienced throughout much of the central and eastern portions of northern Manitoba, and severely dry conditions developed around Thompson and Flin Flon.

Over the medium term (three months), southern Manitoba experienced normal or above normal precipitation conditions, with the exception of a small area centered over Gimli that experienced moderately dry conditions. In northern Manitoba, mostly normal to above conditions were experienced except for an area surrounding Gillam extending to Churchill which experienced moderately to severely dry conditions.

Over the long term (twelve months), most of Manitoba experienced normal to above normal precipitation conditions. An isolated area centered over Churchill 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 and is summarized by basin in Table 1 and on Figure 4.

The streamflow indicator for the month of July showed normal or above normal flows for southern Manitoba, including the Assiniboine River, Winnipeg River, Red River, Lake Manitoba, Lake Winnipeg and Saskatchewan River basins. The Souris River showed normal conditions near the confluence of the Assiniboine River and moderately low flows upstream near the International Border at Westhope.

Low flows occurred within portions of northern Manitoba during this period, particularly in the Churchill and Nelson River basins. The Churchill River below Fidler Lake experienced moderately low flow conditions during August, while the Cochrane River near Brochet saw severely low flows. Additionally, the Kettle River within the Nelson River basin experienced moderately low flow conditions. The remainder of the northern rivers included in this summary showed normal or above normal flow conditions for August. Lack of data prevented reporting on flow conditions within the Hayes and Bloodvein Rivers.

Canadian Drought Monitor

Agriculture and Agri-Food Canada monitors both the spatial extent and intensity of drought conditions across Canada. They produce monthly map products available through the Canadian Drought Monitor website including an interactive drought intensity map, which is based on precipitation, temperature, drought model index maps, and climate data as interpreted by federal, provincial and academic scientists. This map uses the same drought classification system as the larger North American Drought Monitor:

- D0 (Abnormally Dry) – represents an event that occurs once every 3-5 years;
- D1 (Moderate Drought) – 5 to 10 year event;
- D2 (Severe Drought) – 10 to 20 year event;
- D3 (Extreme Drought) – 20 to 25 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 Canadian Drought Monitor map for August (Figure 5) indicates that the drought conditions that developed throughout northern Manitoba in July have persisted, and increased moderately in spatial extent. By the end of August, generally the southeast and central portions of northern Manitoba experienced abnormally dry (D0) conditions. A small region along the coast of Hudson Bay spanning southeast from Churchill to the corner of the province experienced moderate drought (D1) conditions. This region of drought aligns with the 1-month and 3-month precipitation indicators discussed above.

Table 1: Drought Indicators by Major River Basin

Basin (in Manitoba)	Drought Indicators			
	Precipitation Indicators			Monthly Flow Indicators August 2016
	Percent of 1 Month Median August 2016	Percent of 3 Month Median June - August 2016	Percent of 12 Month Median July 2015 – August 2016	
Red River	Normal to above normal.	Normal to above normal.	Normal to above normal.	Normal to above normal.
Winnipeg River	Normal to above normal.	Normal to above normal.	Normal to above normal.	Above normal.
Assiniboine River-Souris River	Normal to above normal.	Normal to above normal.	Normal to above normal.	Moderately low flow conditions along the Souris River at Westhope, normal to above normal flows at Wawanesa.
Lake Manitoba	Normal to above normal.	Normal to above normal.	Normal.	Normal to above normal.
Lake Winnipeg	Normal to above normal.	Normal to above normal, except for a small region centred over Gimli experiencing moderately dry conditions.	Normal to above normal.	Above normal. Insufficient data for the Bloodvein River.
Saskatchewan River	Normal to above normal, with moderately to severely dry conditions centered over Flin Flon.	Normal to above normal.	Normal to above normal.	Normal.
Nelson River	Normal to above normal in the southern portion of the basin, moderately dry conditions in the northern portion, with severely dry conditions centred over Thompson.	Normal to above normal in the southern portion of the basin, moderately dry conditions in the northern portion, with severely dry conditions centred over Gillam.	Normal to above normal.	Moderately low flow conditions along the Kettle River, above normal flows throughout the remainder of the basin.
Hayes River	Normal to moderately dry conditions.	Normal to moderately dry conditions.	Normal.	Insufficient data.
Churchill River	Normal to moderately dry conditions.	Above normal conditions in the western portion of the basin and moderately dry conditions in the east.	Normal with moderately dry conditions towards Churchill.	Normal to moderately low flow conditions along the main stem of the Churchill River, severely low flow conditions along the Cochrane River near Brochet.
Seal River	Normal to moderately dry conditions.	Above normal conditions in the western portion of the basin and moderately dry conditions in the east.	Normal with moderately dry conditions towards Churchill.	Normal.

Water Availability

Reservoir Conditions

Water supply reservoirs are close to or at full supply level, with the exception of Elgin Reservoir which is at 71 % (as of mid July, 2016). Elgin Reservoir had been deliberately dewatered in the fall of 2015 for fish management purposes. Low snow accumulation over the winter in southwestern Manitoba resulted in a lack of runoff in the region to refill the reservoir to full supply level during the spring. However, above normal rainfall over the past few months is helping to replenish the reservoir. Future precipitation conditions will determine if full supply level will be reached this year. The reservoir is used primarily for recreation and low levels should not cause any significant impacts.

On Farm Water Supply

Manitoba Agriculture reports on dugout conditions across Agri-Manitoba in their weekly Crop Reports. General dugout conditions from Crop Report: Issue 18 (August 29th, 2016) are summarized in Table 2.

Table 2: On Farm Water Supply (Dugout) Conditions

Region	General Dugout Condition
Eastern	Adequate
Interlake	Adequate
Southwest	80 % full
Central	Adequate
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', even in short-term drought conditions.

Wildfires

Throughout the month of August, only eight wildfires fires occurred (two of which are still active) burning approximately 2500 hectares across the province, which is below average for this time of year. At the present time, fire activity is best characterized as being slow or stalled in the south and below

normal in remote areas of the north. Current fire activity can be viewed on the interactive Fireview map (http://www.gov.mb.ca/conservation/fire/Fire-Maps/fireview/fireview.html).

The risk of wildfires is generally low to moderate for Manitoba (Figure 6), with a pocket of high/extreme risk in the southwest corner of the province. Currently there are no burning bans in place. Wildfire conditions and restrictions, including burning bans, are available at the Wildfire Program's website (www.gov.mb.ca/wildfire).

Drought Impacts

Overall, there have been limited drought impacts during the month of August.

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 August, 2016, municipalities in Manitoba did not register any drought impacts with the Agroclimate Impact Reporter. Overall, it appears that across agro-Manitoba excessive moisture is the primary concern and drought conditions are not present.

Future Weather

Environment and Climate Change Canada's seasonal forecast for the next three months (September-October-November) projects temperatures to be above normal across the province (Figure 7) and precipitation to be above normal for western Manitoba and normal for the remainder of the province (Figure 8). The National Oceanic and Atmospheric Administration indicate that ENSO neutral conditions are present and La Niña is favored to develop during August to October of 2016 within the Northern Hemisphere, with a 55 to 60 % chance of La Niña during the fall and winter of 2016-17. La Niña conditions represent increased storminess and precipitation, and an increased frequency of significant cold-air outbreaks throughout large portions of central North America, including Manitoba.

The long-term forecast for Manitoba from Environment and Climate Change Canada's Global Climate Model indicates precipitation over western Manitoba and portions of the Interlake over the next few days, with totals up to 50 mm. Southern Manitoba is forecasted to receive some precipitation as well, with amounts ranging from traces of rain to 15 mm. Portions of northern and central Manitoba are forecasted to see showers early next week (September 12 and 13th), with amounts varying between 5 to 50 mm. Long range precipitation forecasts have considerable uncertainty and are likely to change in the upcoming days.

Table 3: Reservoir Status (Southern and Western Manitoba).

Water Supply 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	1,529.62	**July 18, 2016**	-2.38	520	368	71%
Lake of the Prairies (Shellmouth)*	Brandon, Portage	1,402.50	1,402.72	August 30, 2016	0.22	300,000	302,626	101%
Lake Wahtopanah (Rivers)	Rivers	1,536.00	1,536.88	August 30, 2016	0.88	24,500	26,477	108%
Minnewasta (Morden)	Morden	1,082.00	1,081.70	August 30, 2016	-0.30	3,150	3,098	98%
Stephenfield	Carman	972.00	972.27	August 30, 2016	0.27	3,810	3,936	103%
Turtlehead (Deloraine)	Deloraine	1,772.00	1,771.95	August 30, 2016	-0.05	1,400	1,397	100%
Vermilion	Dauphin	1,274.00	1,274.62	August 30, 2016	0.62	2,600	2,744	106%
Goudney (Pilot Mound)		1,482.00	1,482.32	August 30, 2016	0.32	450	466	104%
Jackson Lake		1,174.00	1,173.49	August 30, 2016	-0.51	2,990	2,862	96%
Kenton Reservoir		1,448.00	1,447.97	**July 19, 2016**	-0.03	600	598	100%
Killarney Lake		1,615.00	1,615.77	**July 11, 2016**	0.77	7,360	7,712	105%
Lake Irwin		1,178.00	1,178.01	**May 2, 2016**	0.01	3,800	3,804	100%
Manitou (Mary Jane)		1,537.00	1,536.53	August 2, 2016	-0.47	1,150	1,107	96%
Rapid City		1,573.50	1,573.85	**July 19, 2016**	0.35	200	225	112%
St. Malo		840.00	841.00	**July 6, 2016**	1.00	1,770	1,935	109%

* Summer target level and storage.

** Reservoir was deliberately de-watered for fish management in the fall of 2015.

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

- Agriculture and Agri-Food Canada: Agroclimate Impact Recorder:
  http://www.agr.gc.ca/air

- Agriculture and Agri-Food Canada: Drought Watch:
  http://www.agr.gc.ca/drought

- Saskatchewan Water Security Agency:
  https://www.wsask.ca/

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

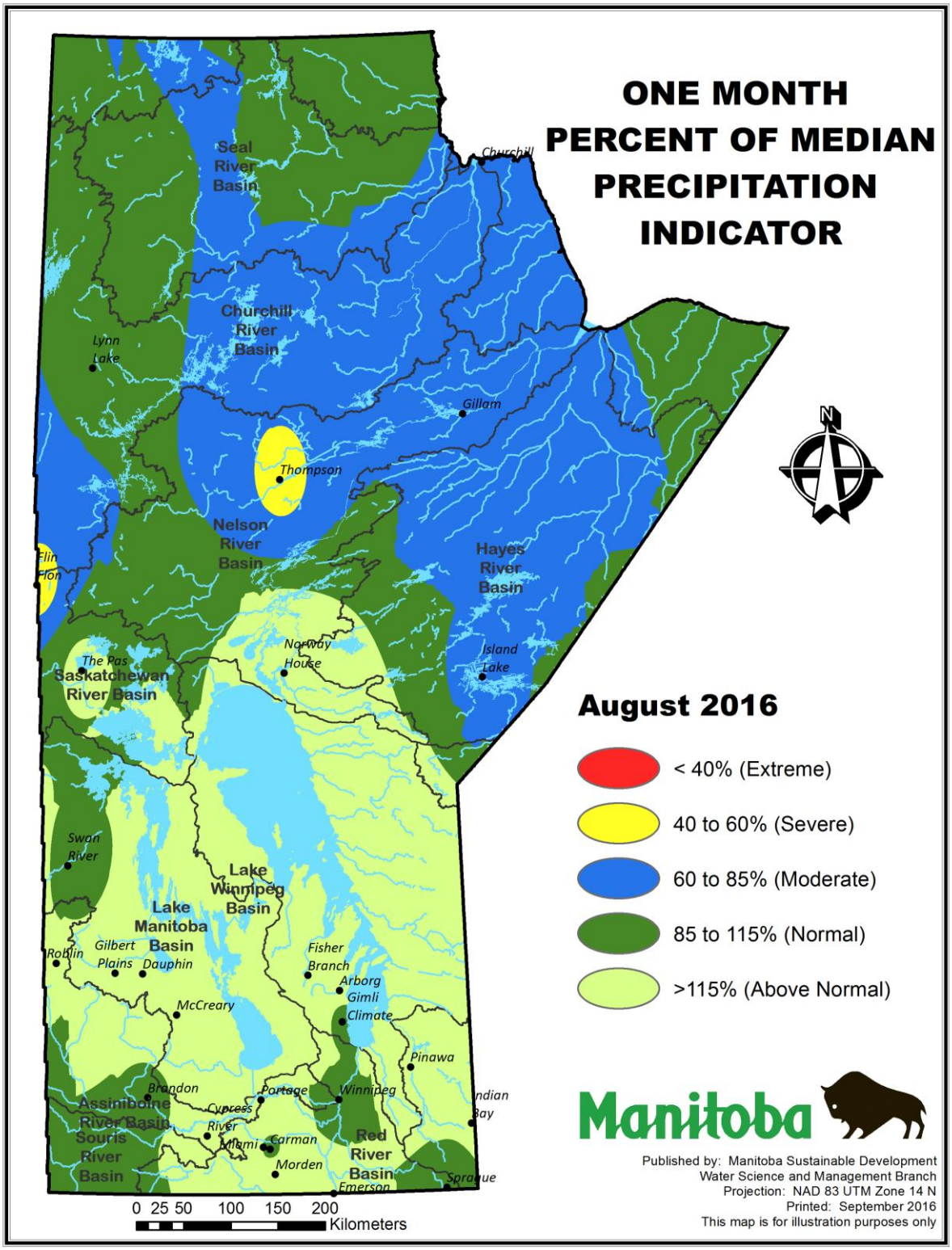


Figure 1: Precipitation Indicator (percent of one month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

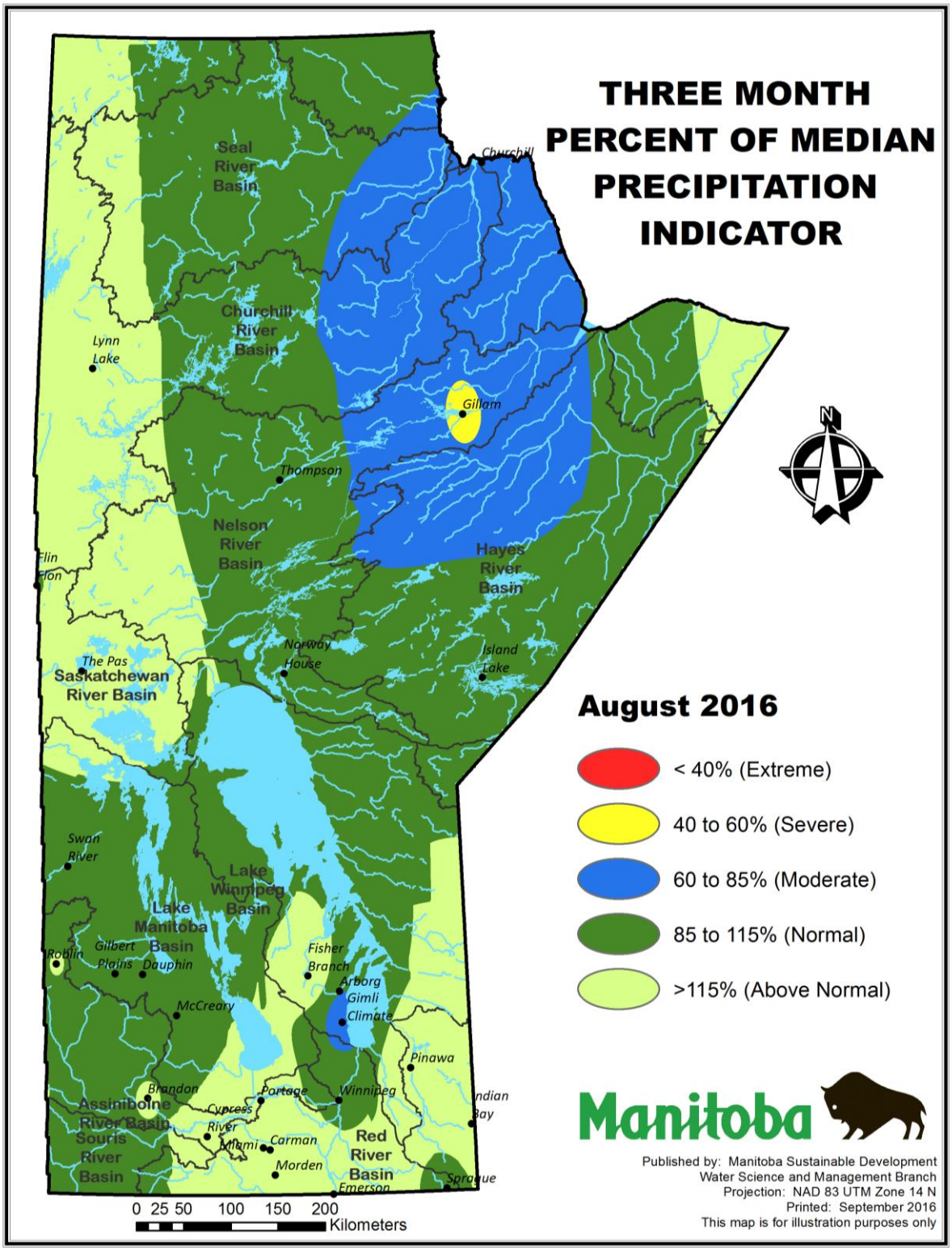


Figure 2: Precipitation Indicator (percent of three month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

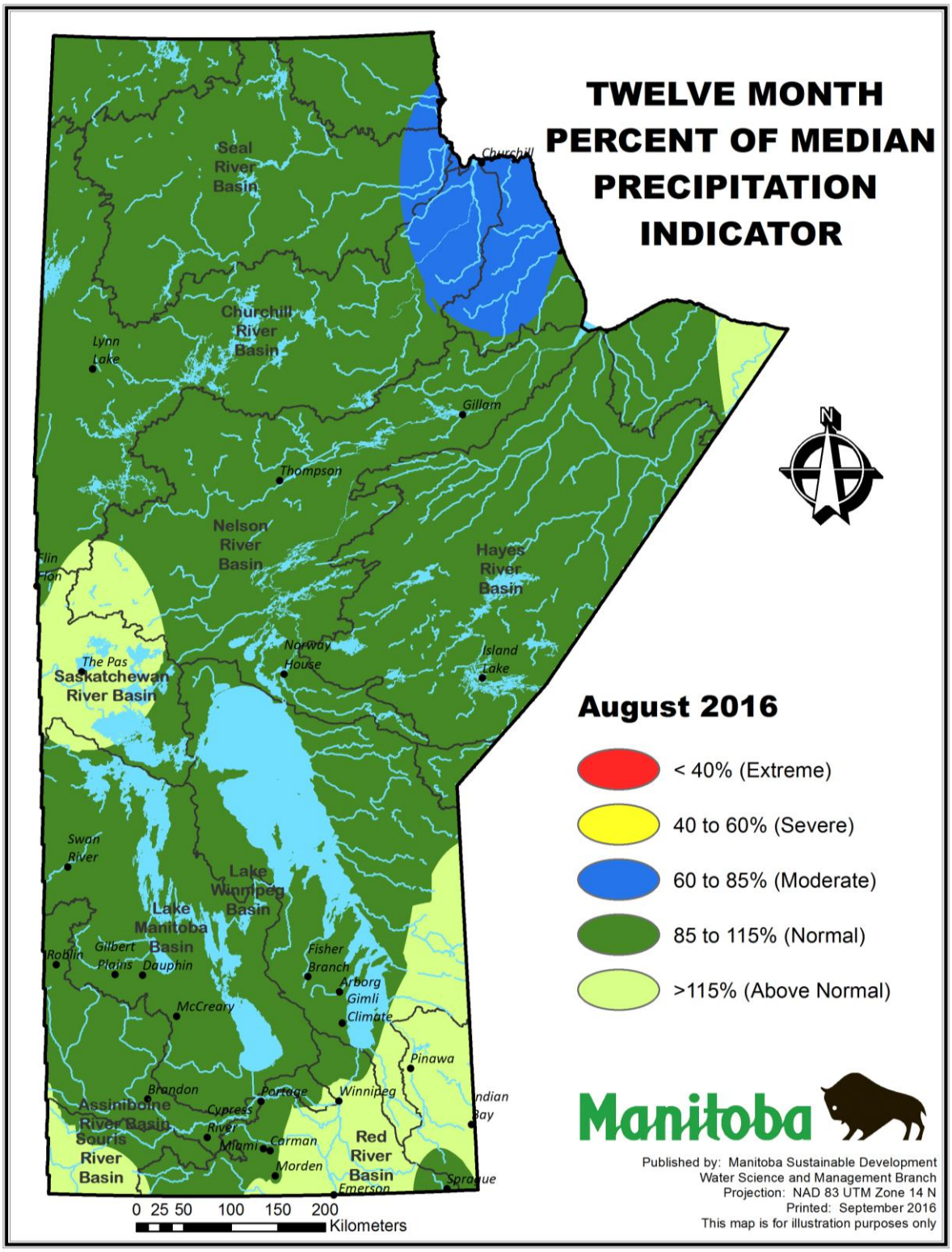


Figure 3: Precipitation Indicator (percent of twelve month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

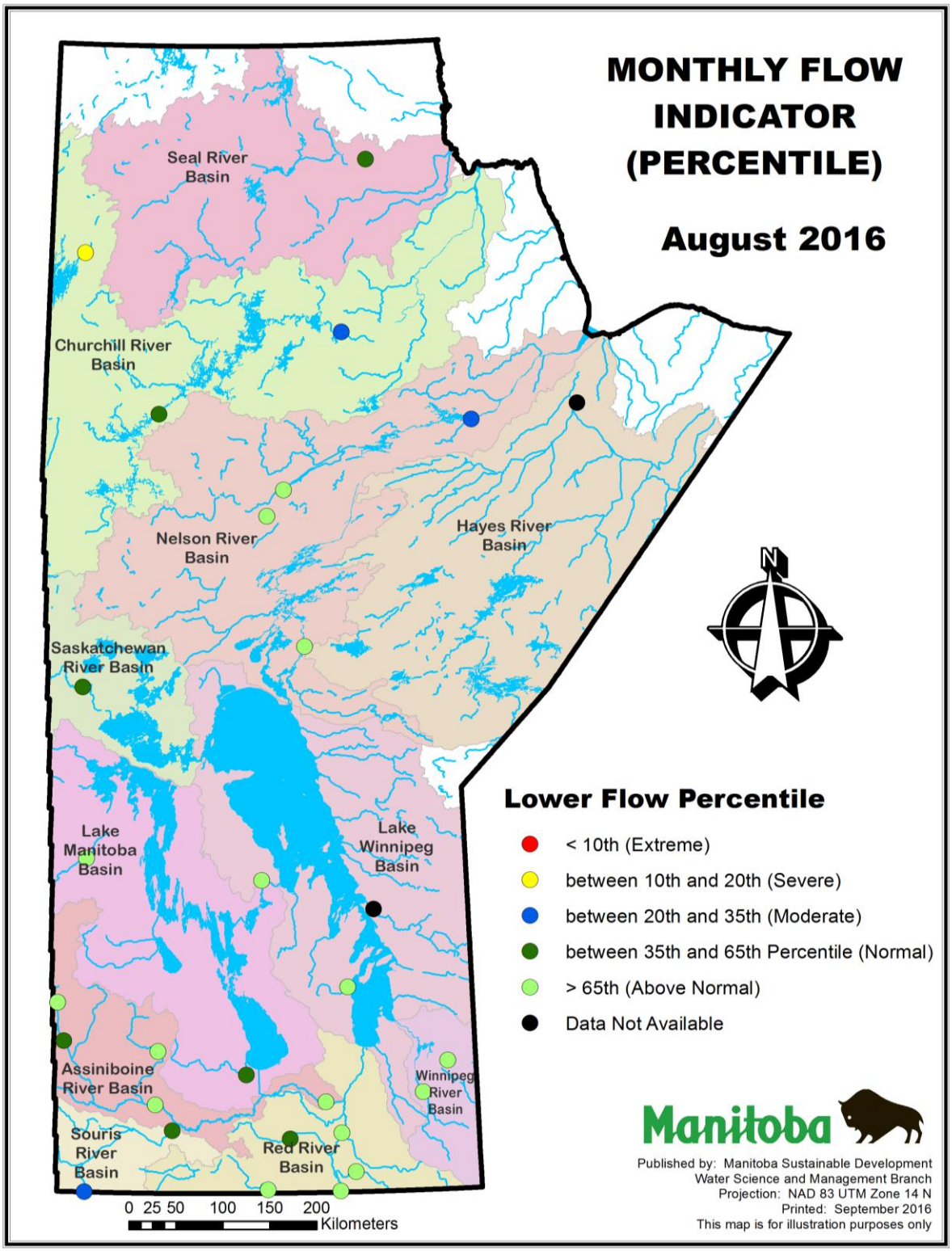


Figure 4: Monthly flow indicator for August, 2016.

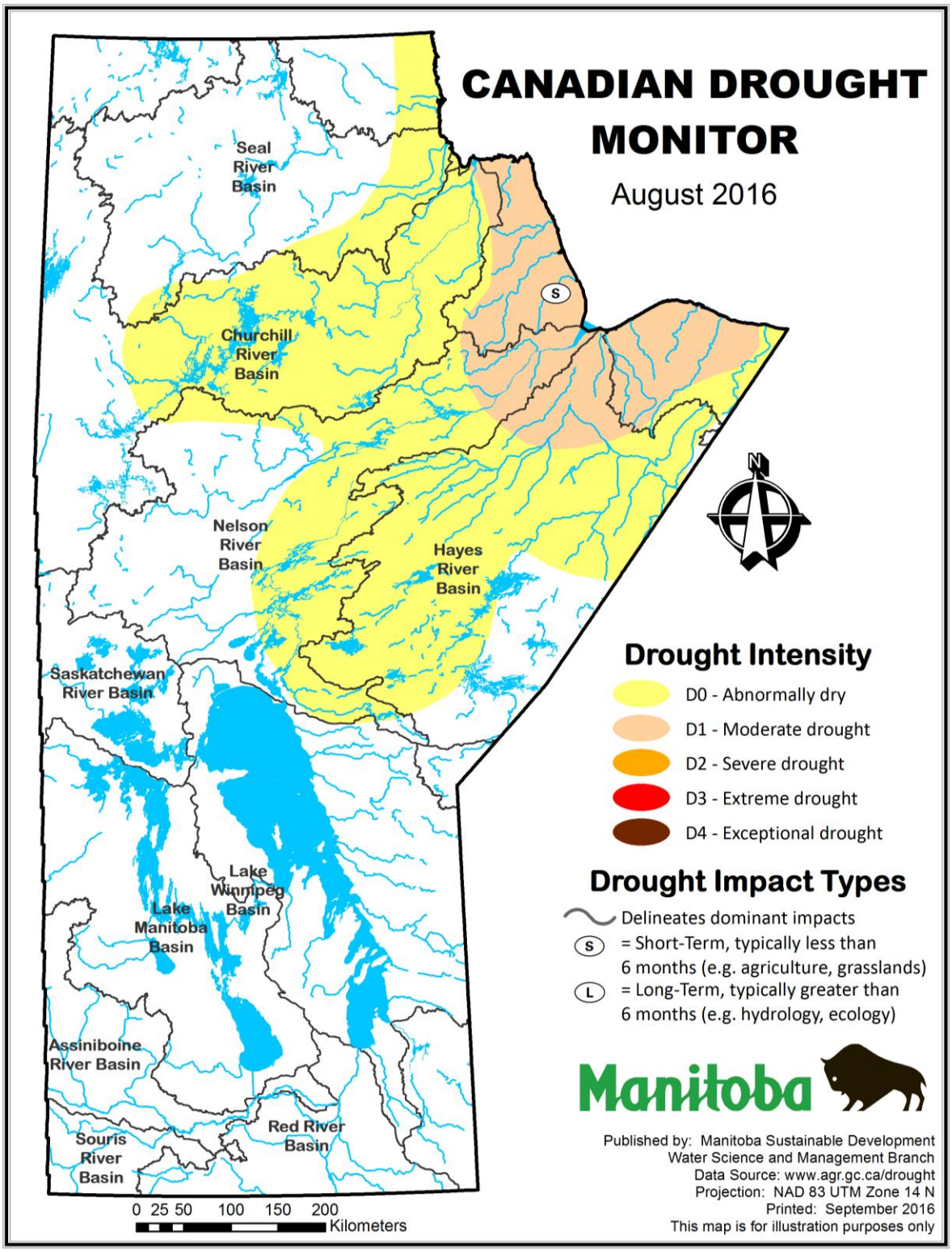
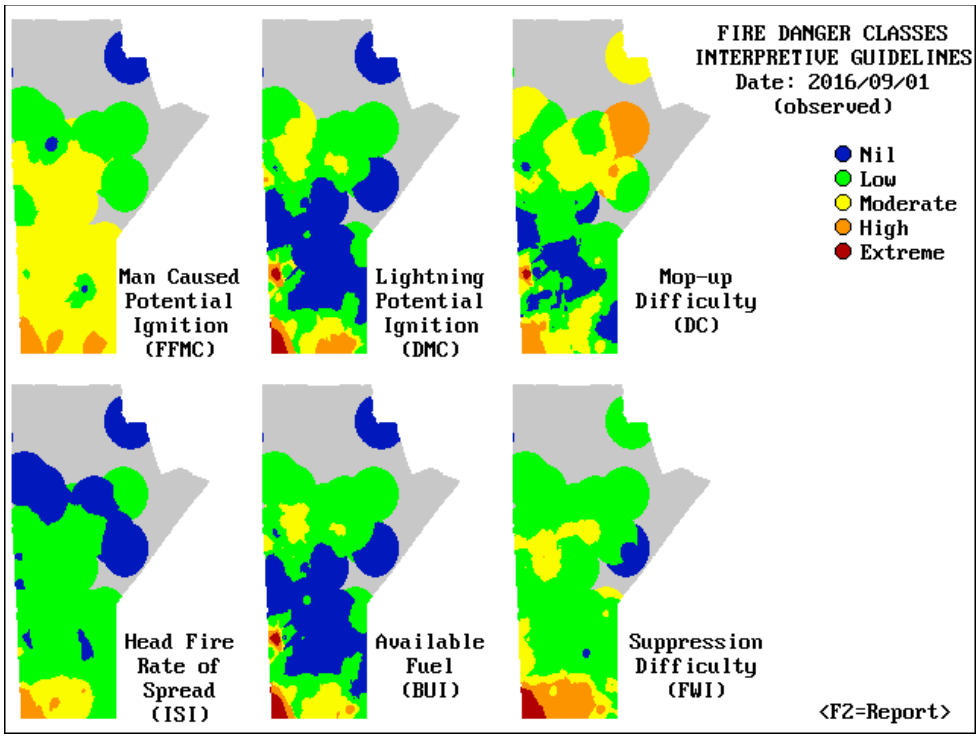
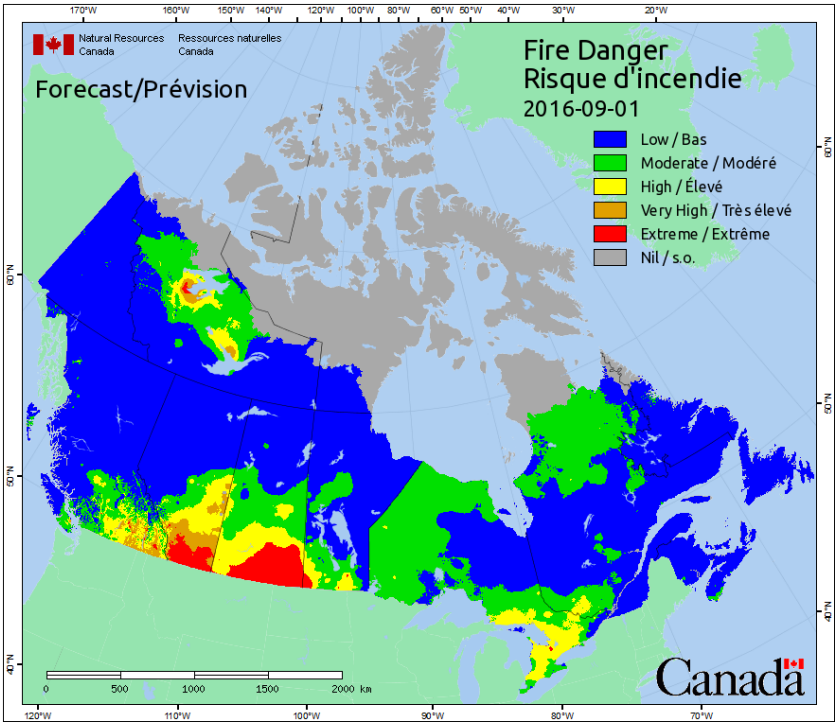


Figure 5: Agriculture and Agri-Food Canada's Canadian Drought Monitor mapping of short-term (S) and long-term (L) drought conditions for August, 2016.



(a)



(b)

Figure 6: Wildfire hazard maps, including (a) the six components of the Canadian Forest Fire Weather Index System generated by the Provincial Fire Program, and (b) Fire Danger mapping from Natural Resources Canada.

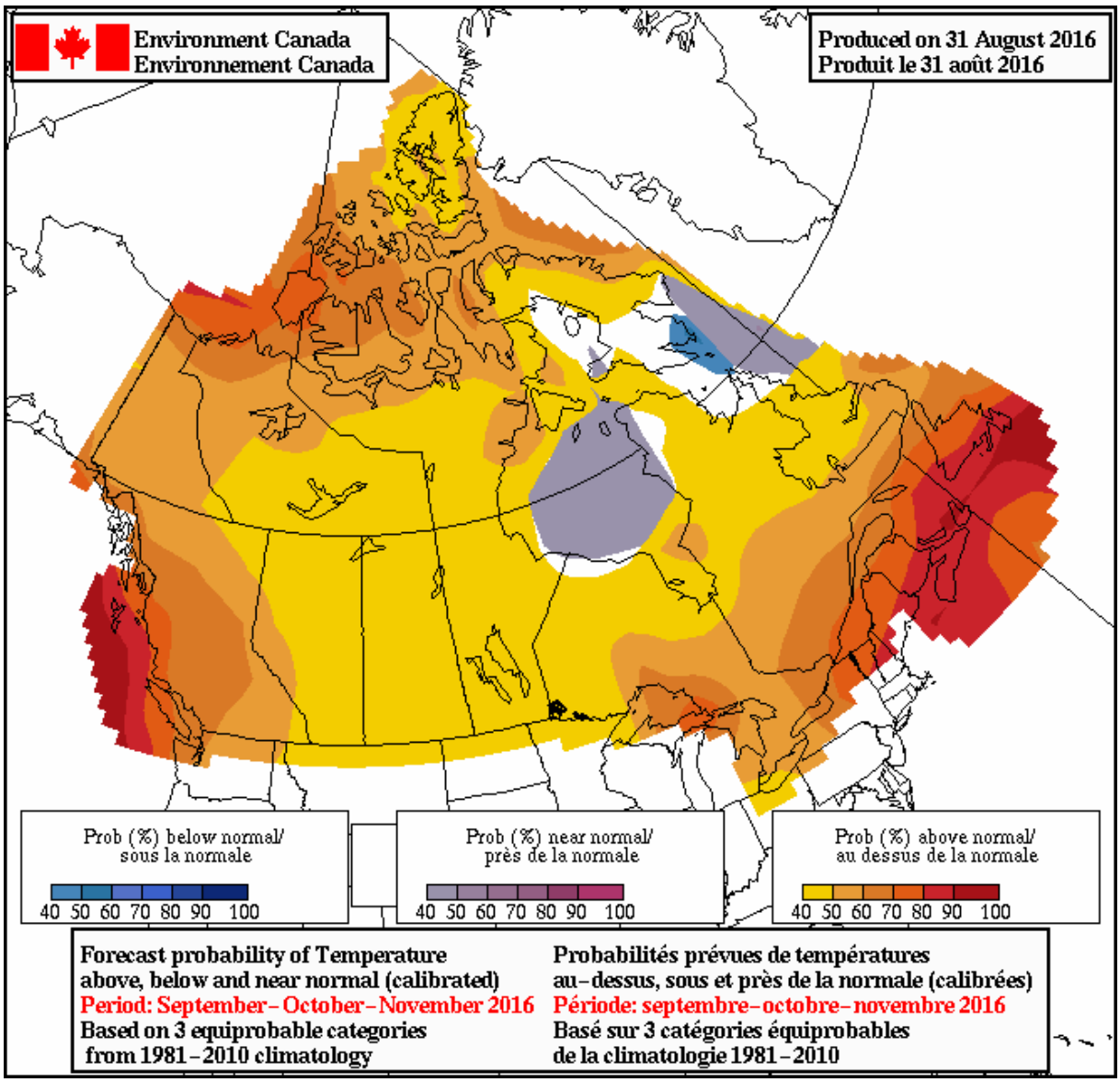


Figure 7: Environment and Climate Change Canada Seasonal (3 month) Temperature Outlook for September-October-November.

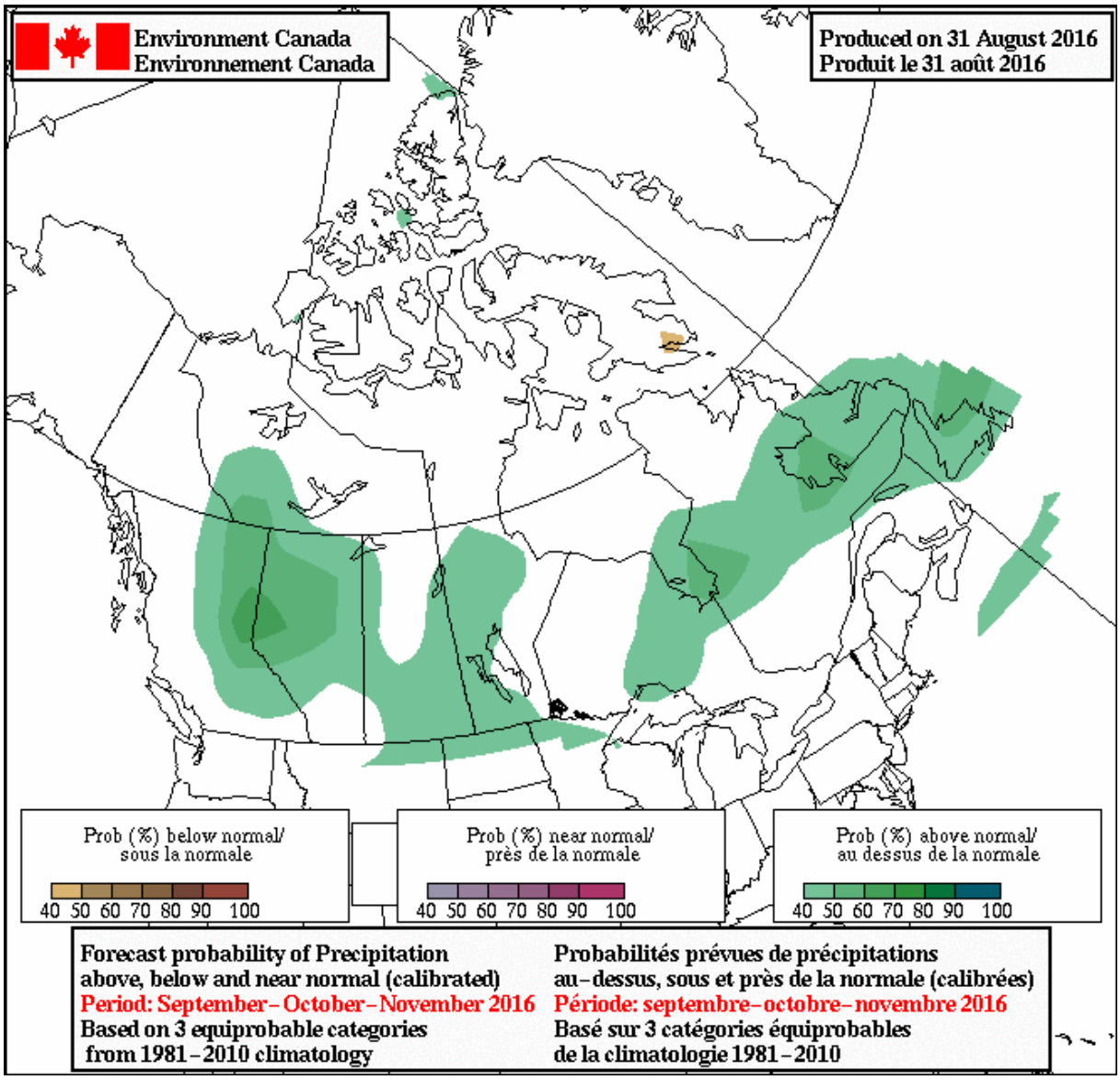


Figure 8: Environment and Climate Change Canada Seasonal (3 month) Precipitation Outlook for September-October-November.

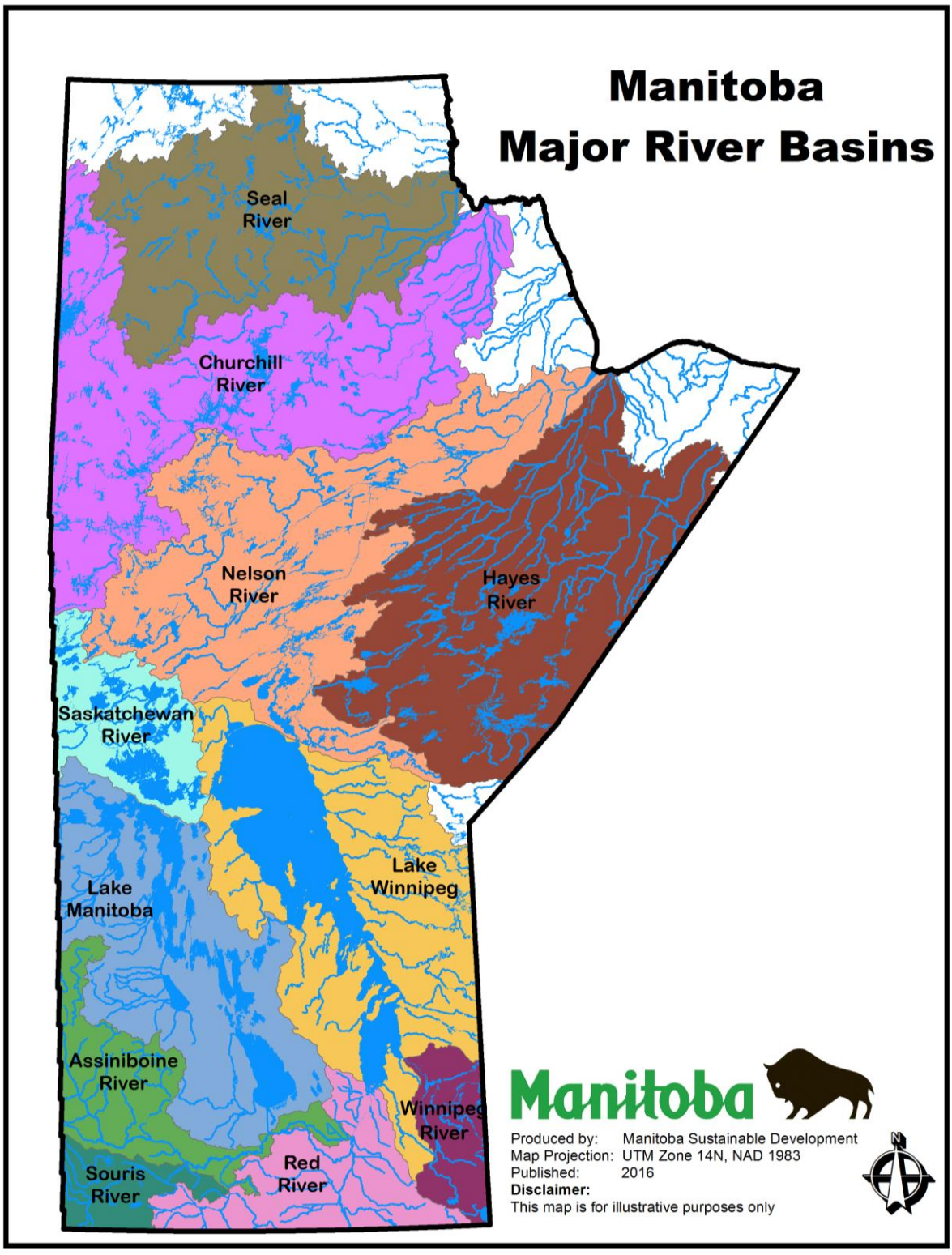


Figure 9: Major Manitoba river basins.