Water Availability and Drought Conditions Report

July 2016

Executive Summary

- This Water Availability and Drought Conditions Report provides an update on drought conditions throughout Manitoba for July 2016.
- Over the past month, precipitation conditions were normal or above normal throughout of Manitoba, with portions of northeastern Manitoba and the region surrounding Churchill experiencing moderately dry conditions. Over the past three months, conditions were generally normal to above normal except for the Interlake region and an area surrounding Gillam extending to Churchill that were moderately dry.
- Over the long term (twelve months), most of Manitoba experienced normal to above normal precipitation conditions with the exception of portions of the Interlake and the region surrounding Churchill.
- All southern watersheds experienced normal to above normal flow conditions in July. In northern Manitoba, several rivers and tributaries within the Churchill and Nelson River basins experienced severe to extreme low flow conditions. The Cochrane and Seal Rivers experienced 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, with only 11 wildfires currently active, all in northeastern Manitoba.
- Environment and Climate Change Canada's seasonal temperature forecast for August, September and October is projected to be above normal across Manitoba. The seasonal precipitation forecast for August, September and October is projected to be normal across the province.
- For more information on drought in Manitoba, please visit the Manitoba Drought Monitor website at http://www.gov.mb.ca/drought.

August 5th, 2016

Manitoba
Sustainable Development

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 generally normal to above normal across most of Manitoba. However, moderately dry conditions developed within portions of the Hayes River Basin and surrounding Gillam and Churchill in the north, and small areas near McCreary and Sprague in the south.

Similarly, over the medium term (three months), much of Manitoba experienced normal or above normal precipitation conditions. Conversely, the region surrounding Dauphin and portions of the Interlake saw moderately dry conditions. In northern Manitoba, an area surrounding Gillam extending to Churchill experienced moderately dry conditions, with extremely dry conditions centered over Gillam.

Over the long term (twelve months), most of Manitoba experienced normal to above normal precipitation conditions. Isolated areas centered over Fisher Branch, Dauphin, McCreary, and 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, Souris River, Winnipeg River, Red River, Lake Manitoba, Lake Winnipeg and Saskatchewan River basins.

Conversely, low flows occurred within portions of northern Manitoba during this period. The Churchill River experienced severe to extreme low flow conditions during July. Additionally, many of the rivers and tributaries within the Nelson River basin experienced moderately low to extremely low flow conditions during the month of July. Conversely, the Cochrane and Seal Rivers had normal flow conditions. Lack of data prevented reporting on flow conditions within the Taylor, Saskatchewan and Hayes 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 July (Figure 5) indicates that the drought conditions that developed throughout northern Manitoba in June have been downgraded in both spatial extent and magnitude. By the end of July, the southeast portion of northern Manitoba was experiencing abnormally dry (D0) conditions, alongside a small region between Norway House and Island Lake. Generally this region of moderate drought aligns with the 1-month and 3-month precipitation indicators discussed above; however there is some dissimilarity between indicator maps. This is likely caused by differences in the types and sources data used to develop the indicators and an overall lack of data available for northern Manitoba.

Table 1: Drought Indicators by Major River Basin

Basin (in Manitoba)	Drought Indicators			
	Precipitation Indicators			Monthly Flow Indicators July 2016
	Percent of 1 Month Median July 2016	Percent of 3 Month Median May - July 2016	Percent of 12 Month Median June 2015 – July 2016	
Red River	Normal to above normal, with moderately dry conditions surrounding Sprague.	Normal to above normal.	Normal to above normal.	Above normal.
Winnipeg River	Normal to above normal.	Normal to above normal.	Above normal.	Above normal.
Assiniboine River-Souris River	Normal to above normal.	Normal to above normal.	Normal to above normal.	Normal to above normal.
Lake Manitoba	Normal to above normal, with areas of moderately dry conditions in the Interlake region and surrounding McCreary.	Generally normal with moderately dry conditions surrounding Dauphin.	Normal with moderately dry conditions isolated near Dauphin and McCreary.	Above normal.
Lake Winnipeg	Normal to above normal, with moderately dry conditions surrounding Gimli.	Generally normal with moderately dry conditions throughout the Interlake region.	Normal to above normal with moderately dry conditions surrounding Fisher Branch.	Normal to above normal.
Saskatchewan River	Above normal.	Normal to above normal.	Normal to above normal.	Insufficient data (see Drought Impacts section).
Nelson River	Normal to above normal, with moderately dry conditions surrounding Gillam.	Above normal conditions in the western portion of the basin and moderately dry conditions in the east, with severely dry conditions centered over Gillam.	Normal to above normal.	Severely dry conditions at the Burntwood River at Thompson extremely dry conditions along the Nelson River East Channel and the Kettle River, insufficient data at Taylor River.
Hayes River	Normal to moderately dry conditions.	Normal to moderately dry conditions.	Normal to above normal.	Insufficient data.
Churchill River	Normal to above normal, moderately dry conditions surrounding Churchill.	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 conditions along the Cochrane River near Brochet, severely to extremely dry conditions along the Churchill River.
Seal River	Normal to above normal.	Above normal conditions in the western portion of the basin and moderately dry conditions in the east.	Normal to moderately dry.	Normal.

Water Availability

Reservoir Conditions

Water supply reservoirs are close to or at full supply level, with the exception of the Elgin and Vermilion Reservoirs which are at 59 % (as of mid June, 2016) and 87 % of full supply volume, respectively. 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 14 (August 2nd, 2016) are summarized in Table 2.

Table 2: On Farm Water Supply (Dugout) Conditions

Region	General Dugout Condition
Eastern	Adequate
Interlake	Adequate
Southwest	100 % full
Central	Adequate
Northwest	Not reported

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

As of August 3rd, 179 fires have burned 33, 886 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 due to rainfall and high humidity. Current fire activity can be viewed on the interactive Fireview map (http://www.gov.mb.ca/conservation/fire/Fire-Maps/fireview/fireview.html).

As of August 3rd, 11 wildfires are still actively burning in the northeastern portion of the province. The risk of wildfires is generally low to moderate for Manitoba (Figure 6), and there are currently no burning bans in place. Current 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 very limited drought impacts during the month of July.

Manitoba Agriculture's most recent Crop Report (August 2nd) reports that severe weather systems over the past few weeks including strong winds, heavy rains and hail have caused crop lodging within several regions of Manitoba. Overall, it appears that across agro-Manitoba excessive moisture is the primary concern and drought conditions are not present.

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 July, 2016, no municipalities in Manitoba registered any drought impacts with the Agroclimate Impact Reporter.

As discussed in the June 2016 Water Availability and Conditions Report, in Alberta and Saskatchewan the South Saskatchewan and North Saskatchewan Rivers (and many of their tributaries) were experiencing extremely low flow conditions – some of which were historical lows for the time of year. There were concerns that the low flows upstream might translate into flows decreasing along the Saskatchewan River in Manitoba. Although upstream conditions are still dry, there was an increase in flows during the second half of July due to above normal rainfall throughout much of the Prairies that helped to alleviate some of the dry conditions. As of the end of July, the flow at The Pas was at approximately the 40th percentile for that date due to above normal flows entering the Saskatchewan River system from the Sturgeon-Weir and Carrot Rivers and the increased flows along the Saskatchewan River main stem.

Future Weather

Environment and Climate Change Canada's seasonal forecast for the next three months (August-September-October) projects temperatures to be above normal (Figure 7) and precipitation to be normal (Figure 8) for Manitoba. The National Oceanic and Atmospheric Administration indicate that ENSO neutral conditions are present and La Niña is favored to develop during August - October of 2016 within the Northern Hemisphere, with a 55 - 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 most of southern Manitoba over the next ten days, with the southeast forecasted to receive 10 – 40 mm, and the southwest forecasted to receive 20 – 75 mm. Less precipitation is expected across northern Manitoba, with forecasted amounts ranging from 0 – 10 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	1,528.29	**June 20, 2016**	-3.71	520	305	59%
Lake of the Prairies (Shellmouth)*	Brandon, Portage	1,402.50	1,403.54	August 2, 2016	1.04	300,000	313,939	105%
Lake Wahtopanah (Rivers)	Rivers	1,536.00	1,536.90	August 2, 2016	0.90	24,500	26,528	108%
Minnewasta (Morden)	Morden	1,082.00	1,081.99	August 2, 2016	-0.01	3,150	3,146	100%
Stephenfield	Carman	972.00	972.66	August 2, 2016	0.66	3,810	4,121	108%
Turtlehead (Deloraine)	Deloraine	1,772.00	1,772.06	August 2, 2016	0.06	1,400	1,407	101%
Vermilion	Dauphin	1,274.00	1,272.67	August 2, 2016	-1.33	2,600	2,252	87%
Goudney (Pilot Mound)		1,482.00	1,482.33	August 2, 2016	0.33	450	467	104%
Jackson Lake		1,174.00	1,173.93	August 2, 2016	-0.07	2,990	2,972	99%
Kenton Reservoir		1,448.00	1,447.93	**April 28, 2016**	-0.07	600	594	99%
Killarney Lake		1,615.00	1,615.58	**April 21, 2016**	0.58	7,360	7,625	104%
Lake Irwin		1,178.00	1,178.01	**May 2, 2016**	0.01	3,800	3,804	100%
Manitou (Mary Jane)		1,537.00	1,537.11	August 2, 2016	0.11	1,150	1,153	100%
Rapid City		1,573.50	1,573.42	**April 28, 2016**	-0.08	200	194	97%
St. Malo		840.00	841.50	**April 19, 2016**	1.50	1,770	2,018	114%

* 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

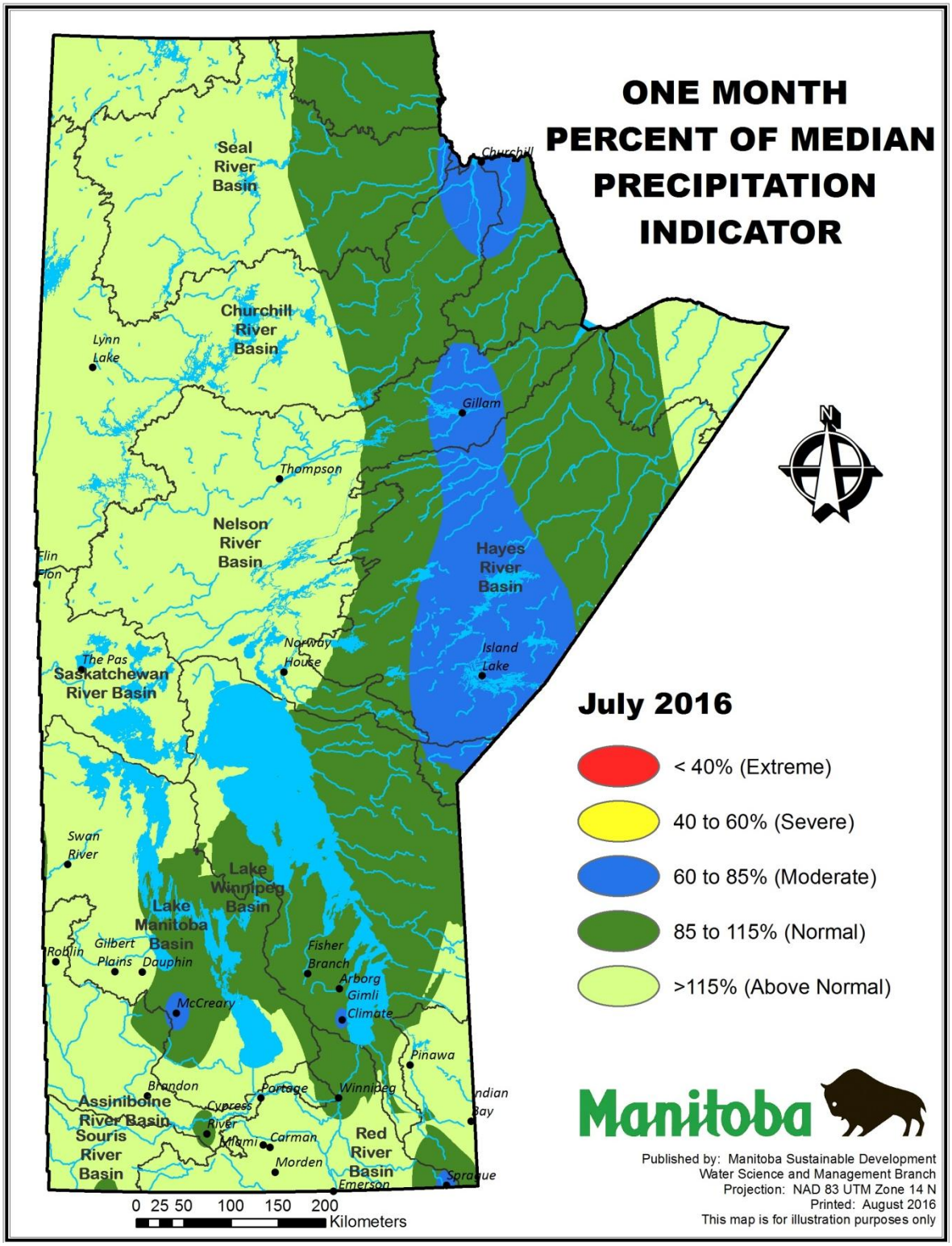


Figure 1: Precipitation Indicator (percent of one month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

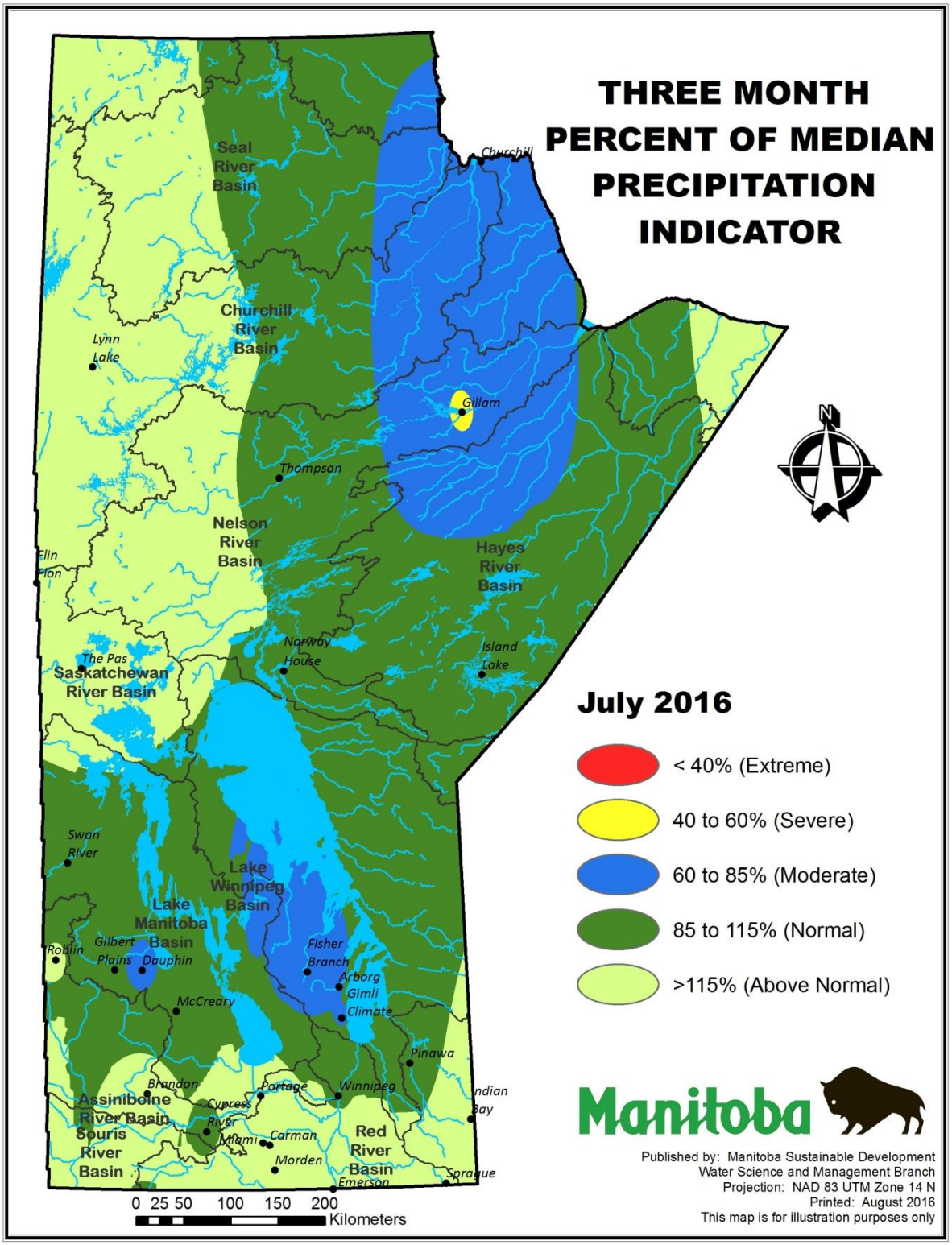


Figure 2: Precipitation Indicator (percent of three month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

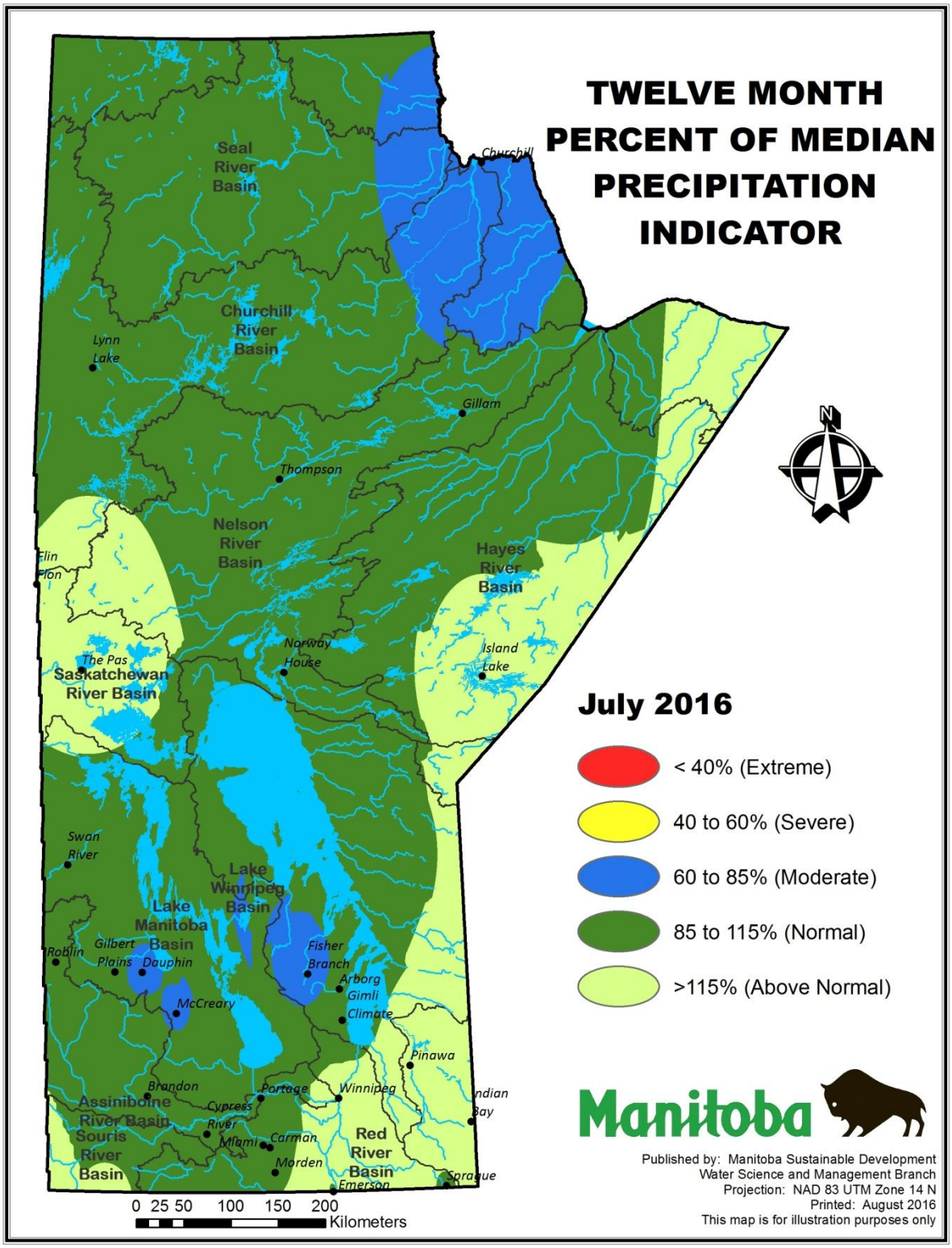


Figure 3: Precipitation Indicator (percent of twelve month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

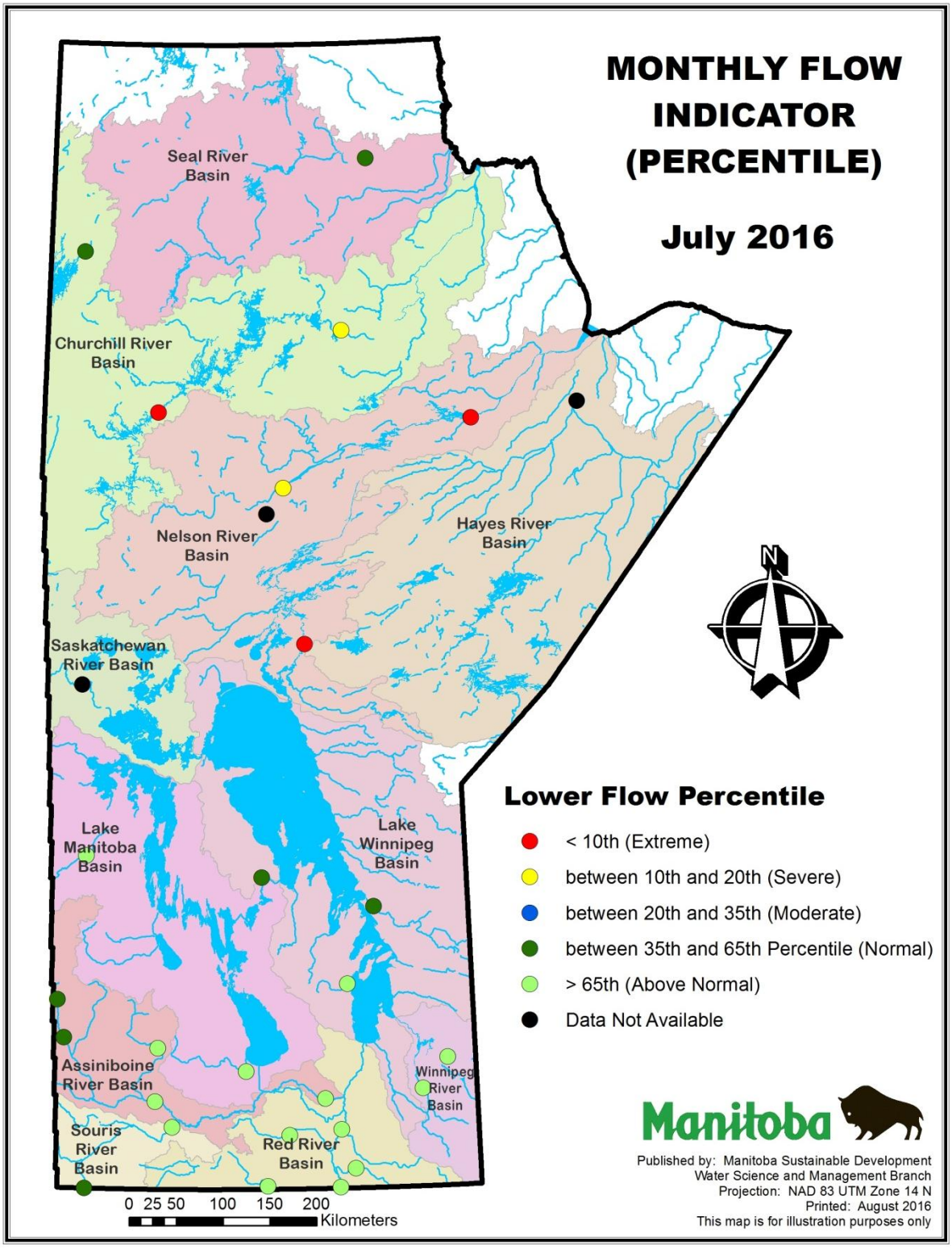


Figure 4: Monthly flow indicator for July, 2016.

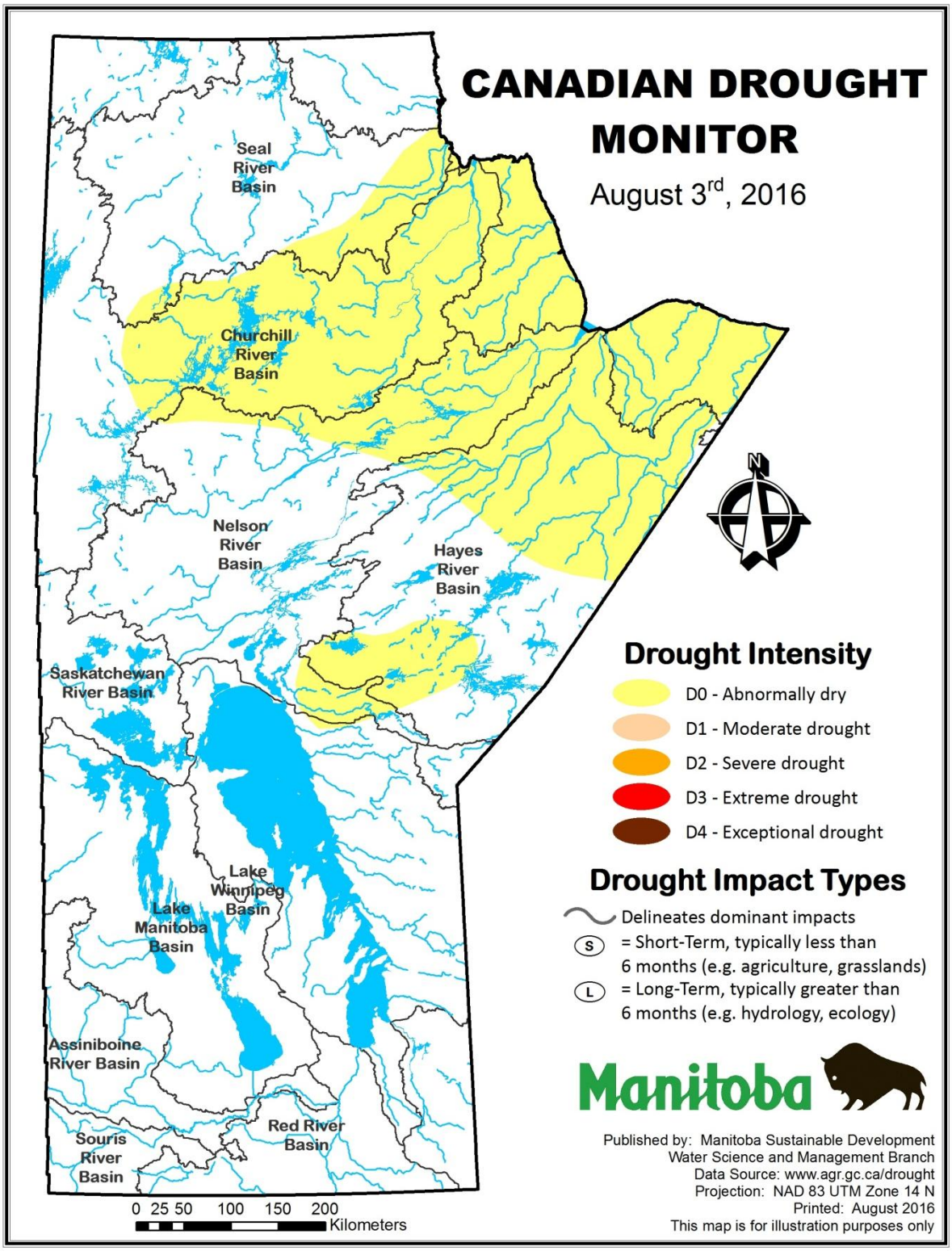
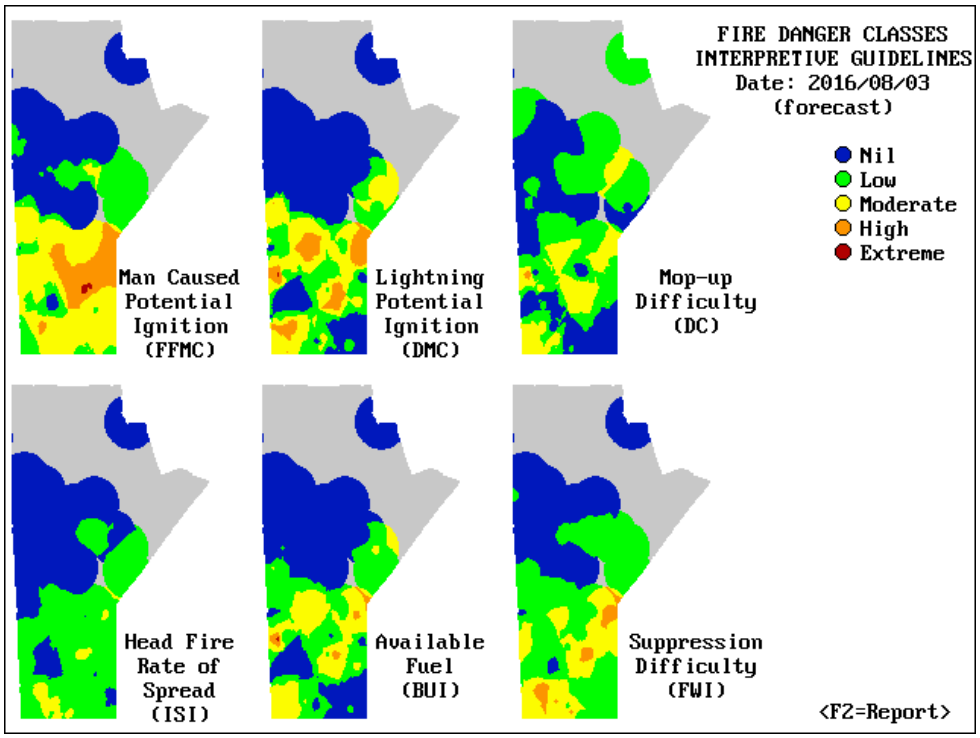
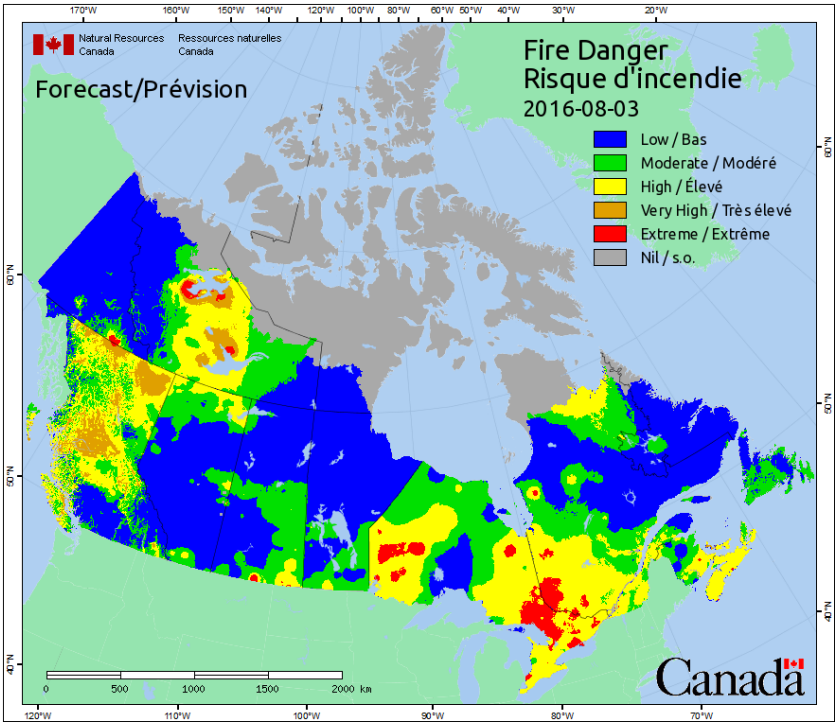


Figure 5: Agriculture and Agri-Food Canada's Canadian Drought Monitor mapping of short-term (S) and long-term (L) drought conditions as of August 3rd, 2016.



(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.

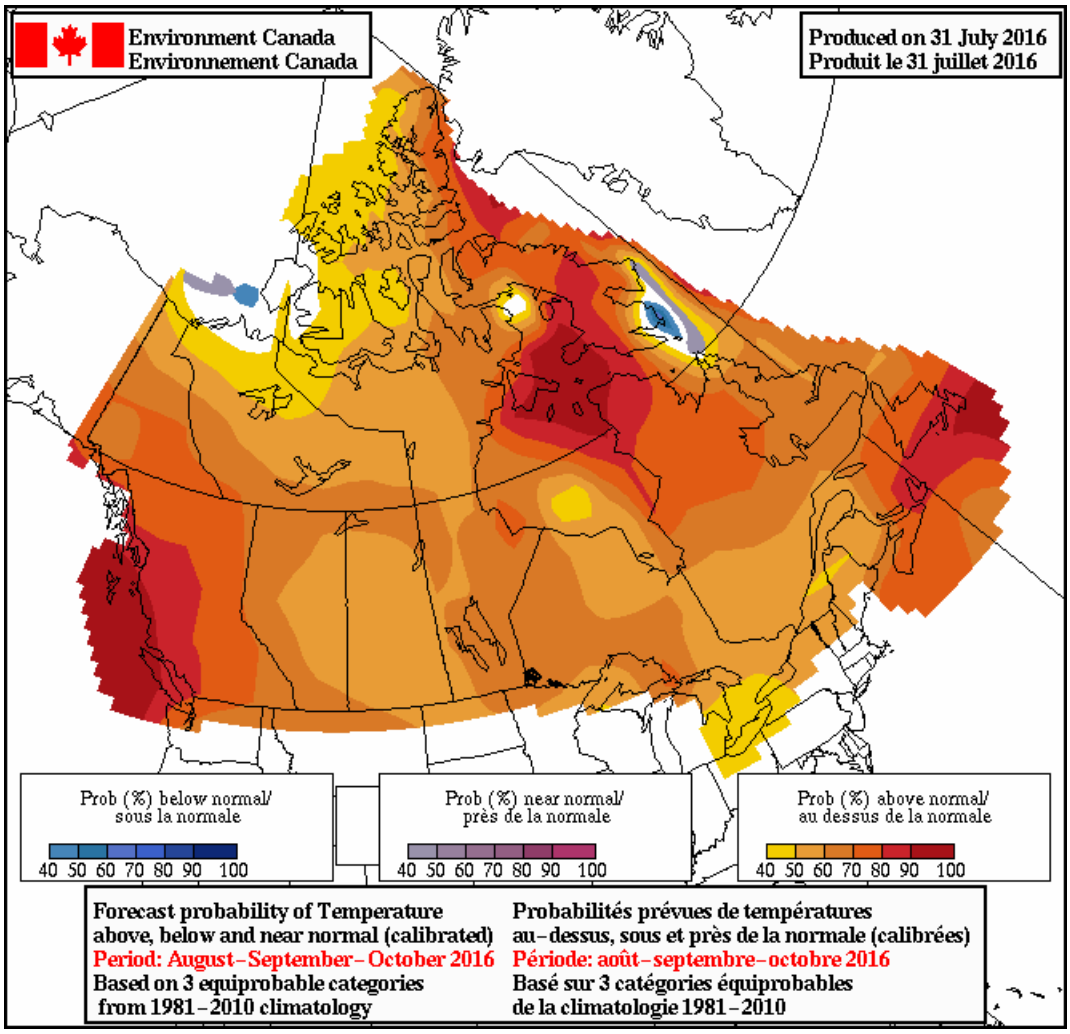


Figure 7: Environment and Climate Change Canada Seasonal (3 month) Temperature Outlook for August-September-October.

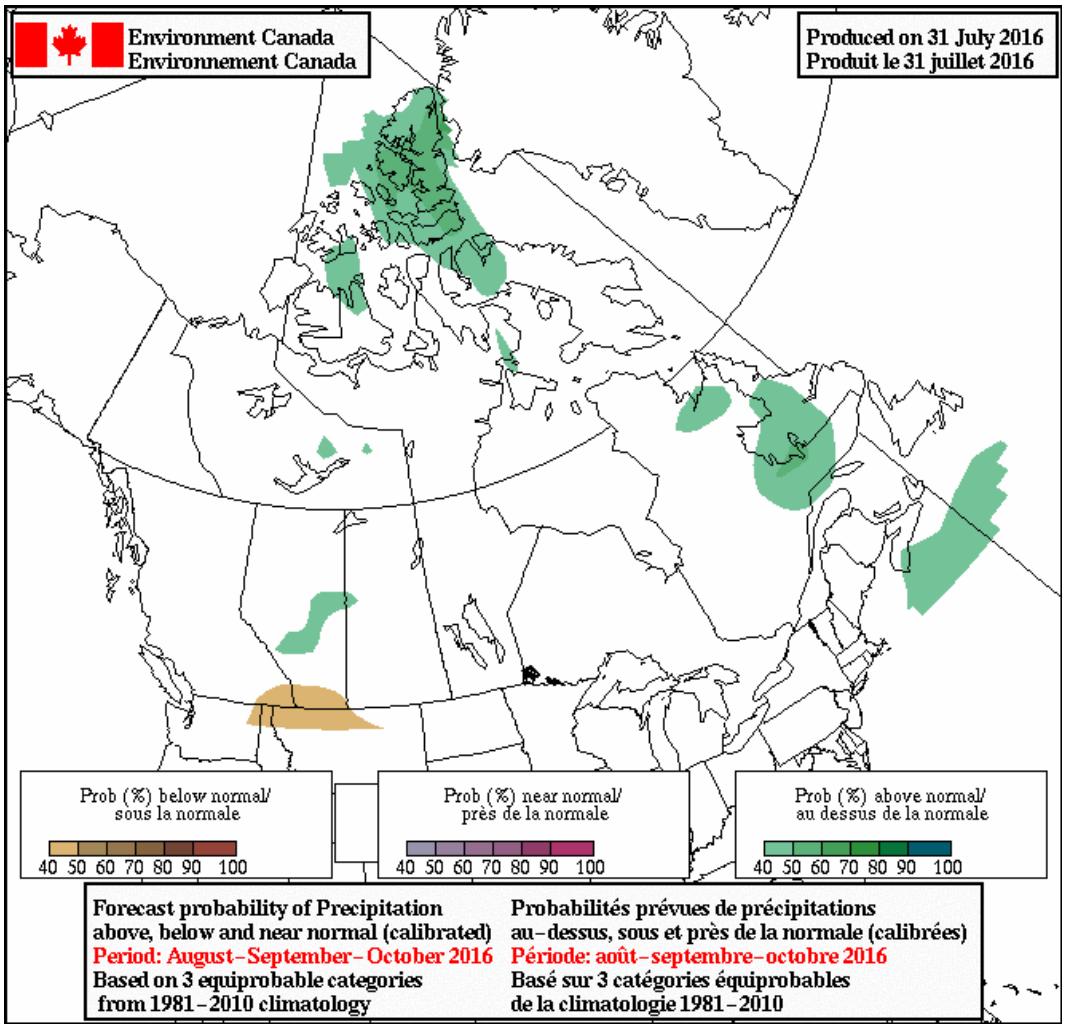


Figure 8: Environment and Climate Change Canada Seasonal (3 month) Precipitation Outlook for August-September-October.

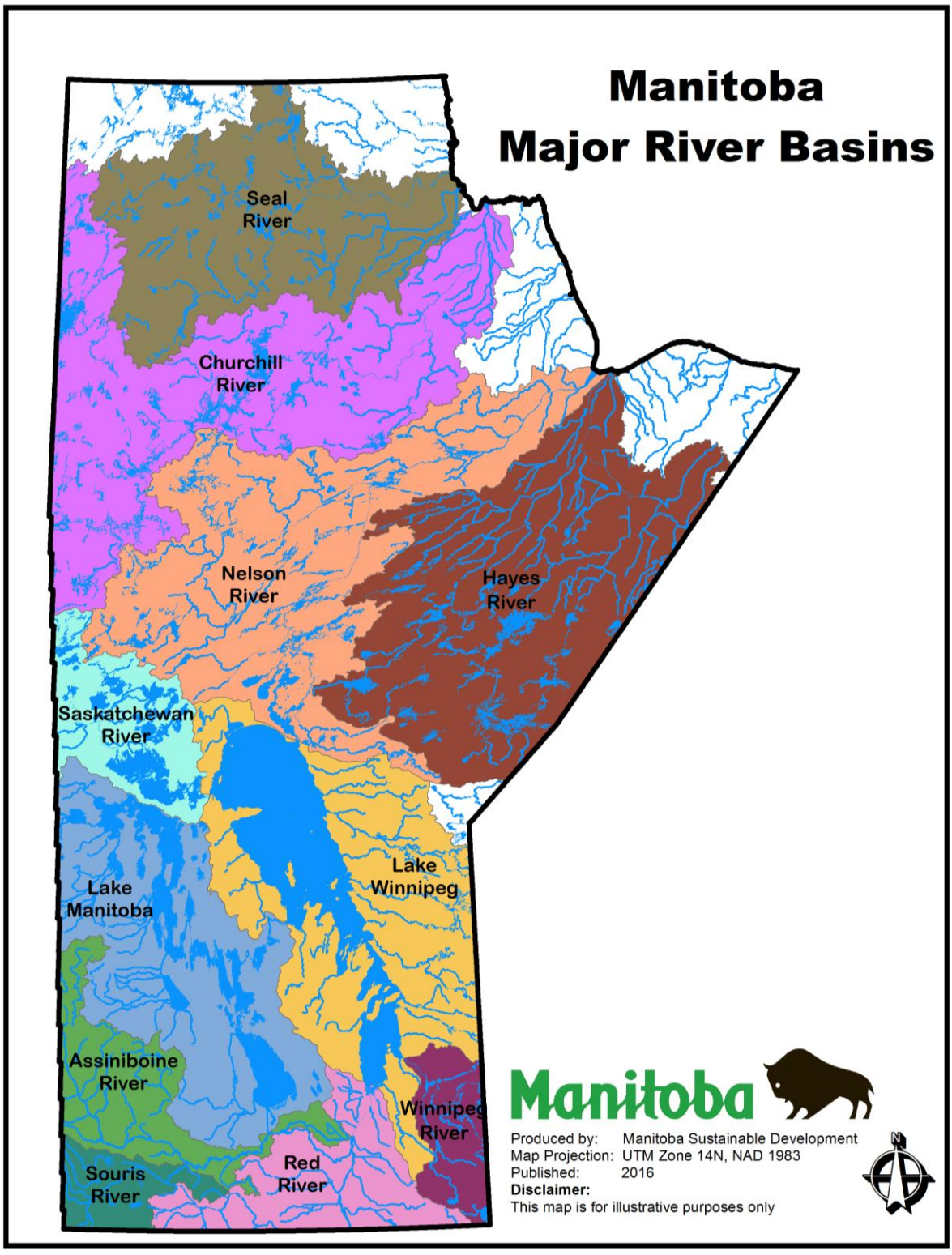


Figure 9: Major Manitoba river basins.