

Water Availability and Drought Conditions Report

June 2016

Executive Summary

- This Water Availability and Drought Conditions Report provides an update on drought conditions throughout Manitoba for June 2016.
- Over the past month, precipitation conditions were variable with most of southern Manitoba experiencing normal or above normal precipitation. However, portions of the Lake Winnipeg, Lake Manitoba and Assiniboine River Basins saw moderately to severely dry precipitation conditions and the regions surrounding Thompson and Gillam experienced moderately and extremely dry conditions. Over the past three months, conditions were generally normal except some small isolated areas of southern Manitoba experienced moderately dry conditions and the central region of northern Manitoba was moderately to extremely dry.
- Over the long term (twelve months), most of Manitoba experienced normal to above normal precipitation conditions.
- All southern watersheds experienced normal to above normal flow conditions in June. In northern Manitoba, the Nelson River basin experienced severely low flows along the main stem, with its tributaries showing a variety of conditions ranging from normal to extremely low flows. The Churchill River and Seal River basins experienced moderately to severely low flow conditions.
- There are currently no major concerns over water supply as reservoir and on-farm supplies are generally adequate across the province.
- Drier conditions in northern Manitoba resulted in an increase in the number of lightening caused wildfires towards the end of June; however, the number of wildfires and total area burned are well below average for this time the year. Easterville and Chemawawin First Nation were evacuated in late June due to threat of fires and smoke issues. However, no suppression issues are expected.
- In Alberta and Saskatchewan, both the South Saskatchewan and North Saskatchewan Rivers are experiencing very low flow conditions. These low flows upstream translate into low flows along the Saskatchewan River in Manitoba. Sustainable Development is in communication with Saskatchewan Water Security Agency regarding future reservoir operations and assessing potential impacts if flows continue to decrease.
- Environment and Climate Change Canada's seasonal temperature forecast for July, August and September is projected to be above normal across Manitoba. The seasonal precipitation forecast for July, August and September 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>.

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 variable with most of southern Manitoba experiencing normal or above normal precipitation conditions. However, moderately dry conditions with isolated pockets of severely dry conditions developed within the Interlake region and surrounding Cypress River, Swan River, Dauphin and McCreary. Precipitation conditions in northern Manitoba were generally normal to above normal in June, with the exception of the regions surrounding Thompson and Gilliam which experienced moderately to extremely dry conditions, respectively.

Over the medium term (three months), much of southern Manitoba experienced normal or above normal precipitation conditions. However, the regions surrounding Swan River, Dauphin, Cypress River, and Fisher Branch saw moderately dry conditions. Additionally, the central portion of northern Manitoba experienced moderately dry conditions, with extremely dry conditions centered over Gillam. The remainder of northern Manitoba showed normal to above normal precipitation conditions.

Over the long term (twelve months), most of Manitoba experienced normal to above normal precipitation conditions. Isolated areas centered over Fisher Branch and Cypress River 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 June 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 across much of northern Manitoba during this period. The Churchill River experienced severely low streamflow conditions and the Cochrane and Seal Rivers were moderately low. Additionally, the Nelson River basin, with the exception of the Taylor River tributary, experienced moderately low to extremely low flow conditions during the month of June.

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 June map (Figure 5) indicates that a large portion of northern Manitoba is experiencing abnormally dry (D0) conditions, with the north-east portion of the province upgraded to short-term moderate drought (D1) conditions. This region of moderate 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 June 2016
	Percent of 1 Month Median June 2016	Percent of 3 Month Median April - June 2016	Percent of 12 Month Median May 2015 – June 2016	
Red River	Normal to above normal.	Normal to above normal.	Normal to above normal.	Normal to above normal.
Winnipeg River	Above normal.	Above normal.	Above normal.	Normal to above normal.
Assiniboine River- Souris River	Mostly above normal, with severely dry conditions isolated near Cypress River.	Normal to above normal with moderately dry conditions isolated near Cypress River.	Normal to above normal with moderately dry conditions isolated near Cypress River.	Normal to above normal.
Lake Manitoba	Normal to moderately dry conditions.	Generally normal with moderately dry conditions centered over Swan River and Dauphin.	Normal.	Normal to above normal.
Lake Winnipeg	Normal to above normal throughout much of the basin, moderately to severely dry conditions throughout the Interlake region.	Generally normal with moderately dry conditions surrounding Fisher Branch and within the north portion of the basin.	Normal to above normal with moderately dry conditions isolated near Fisher Branch.	Normal to above normal.
Saskatchewan River	Normal to above normal.	Normal to above normal.	Normal.	Normal.
Nelson River	Normal to above normal conditions throughout much of the basin, except for moderately dry conditions surrounding Thompson and extremely dry conditions surrounding Gillam.	Normal to moderately dry conditions, with severely dry conditions centered over Gillam.	Normal.	Normal along the Taylor River, moderately dry in the Nelson East Channel, severely dry along the Burntwood River and extremely dry along the downstream tributaries such as the Kettle River.
Hayes River	Normal to above normal, moderately dry conditions towards Gillam.	Normal to moderately dry conditions, with above normal precipitation at Island Lake.	Normal to above normal.	Insufficient data.
Churchill River	Normal to above normal, moderately dry conditions towards Gillam.	Normal to above normal in the western portion of the basin, moderately dry conditions in the east.	Normal.	Moderately to severely dry.
Seal River	Normal to above normal.	Normal.	Normal.	Moderately dry.

Water Availability

Reservoir Conditions

Water supply reservoirs are close to or at full supply level, with the exception of the Elgin Reservoir which is 59 % of full supply volume. This 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 10 (July 4th, 2016) are summarized in Table 2.

Table 2: On Farm Water Supply (Dugout) Conditions

Region	General Dugout Condition
Eastern	Adequate
Interlake	Adequate
Southwest	90 % capacity
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

Timely rains dampened most activity through the month of June making what looked like a busy year slow down to a below average year. To date (July 7th) 160 fires have burned 23,836 hectares; this compares to a 15 year average of 288 fires and 115,036 hectares for this date. At the present time fire activity is best characterized as being slow or stalled in the south and normally active in remote areas of the north. Current fire activity is best viewed on the interactive Fireview map (<http://www.gov.mb.ca/conservation/fire/Fire-Maps/fireview/fireview.html>).

As of July 7th, 30 wildfires are still actively burning. All active fires are occurring in the northern portion of the province, primarily in the northeast (29 fires), and are a result of lightning. During the last week of June, the number of wildfires increased from eight to 34. However, no suppression issues are expected as wildfire crews continue suppression work within the region. The community of Easterville and Chemawawin First Nation were evacuated on June 23rd due to smoke and the threat from the wildfires. However, no structures within these communities have been identified as damaged or lost to the fires.

As of early July, the risk of wildfires is generally low for Manitoba (Figure 6). An approaching low from Western Canada will bring additional rain to northern and central areas over the next week resulting in an even wetter fire regime which will aid in suppressing any new lightning fires that may be produced as it passes. As of July 7th, 2016, there are currently no burning bans in place. 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, there have been moderate drought impacts during the month of June.

Manitoba Agriculture's most recent Crop Report indicates that as of July 4th, severe weather systems over the past weeks including strong winds, heavy rains and hail have caused damage to crops within several regions of Manitoba. Overall, it appears that across agro-Manitoba excessive moisture is the primary concern, as crops begin to show signs of yellowing and in some instances death due to wet and saturated soil conditions.

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. One municipality within the Interlake region (Grahamdale) registered moderate drought impacts on agricultural operations and a second municipality in north-west agro-Manitoba (Minitonas) reported minimal drought impacts with the Impact Reporter. Drought impacts in these municipalities were related to short-term dryness slowing crop/pasture growth and potentially moderate damage to crops due to drought conditions. Additionally, water shortages are anticipated if conditions persist.

Upstream in Alberta and Saskatchewan, both the South Saskatchewan and North Saskatchewan Rivers (and many of their tributaries) are experiencing very low flow conditions. Flows are at historical lows for this time of year in some areas. These low flows upstream translate into flows decreasing along the Saskatchewan River in Manitoba. At the end of June, the flow at The Pas was at approximately the 15th percentile for that date. Although the larger Saskatchewan River Basin is very dry, the Manitoba reach of the River is benefitting from above normal flows entering the Saskatchewan River system from the Sturgeon-Weir and Carrot Rivers, and observed lake levels at Cedar Lake, Cormorant Lake and South Moose Lake are above normal for this time of year. Sustainable Development is in communication with Saskatchewan Water Security Agency regarding future reservoir operations and assessing potential impacts if flows continue to decrease. For additional information on conditions in Saskatchewan, please refer to Water Security Agency's July Water Supply Conditions and Outlook Report (available at: <https://www.wsask.ca/Lakes-and-Rivers/Provincial-Forecast/>).

Future Weather

Environment and Climate Change Canada's seasonal forecast for the next three months (June-July-August) 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 summer 2016 within the Northern Hemisphere, with a 75 % 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 that southern Manitoba may receive 30 – 70 mm over the next ten days; however, portions of the Interlake are forecasted to receive less than 20 mm. Northern Manitoba is forecasted to experience substantial rainfall over the upcoming week, particularly in the east and central regions, where estimates are as high as 100 – 150 mm by Wednesday, July 13th. 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	1,525.68	June 20, 2016	-3.71	520	305	59%
Lake of the Prairies (Shellmouth)*	Brandon, Portage	1,402.50	1,403.21	June 29, 2016	0.71	300,000	309,107	103%
Lake Wahtopanah (Rivers)	Rivers	1,536.00	1,536.72	June 29, 2016	0.72	24,500	26,130	107%
Minnewasta (Morden)	Morden	1,082.00	1,082.02	June 29, 2016	0.02	3,150	3,151	100%
Stephenfield	Carman	972.00	972.96	June 29, 2016	0.96	3,810	4,261	112%
Turtlehead (Deloraine)	Deloraine	1,772.00	1,772.21	June 29, 2016	0.21	1,400	1,423	102%
Vermilion	Dauphin	1,274.00	1,274.69	June 29, 2016	0.69	2,600	2,762	106%
Goudney (Pilot Mound)		1,482.00	1,482.28	June 29, 2016	0.28	450	464	103%
Jackson Lake		1,174.00	1,173.95	June 29, 2016	-0.05	2,990	2,976	100%
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	1,537.05	June 29, 2016	0.05	1,150	1,152	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>

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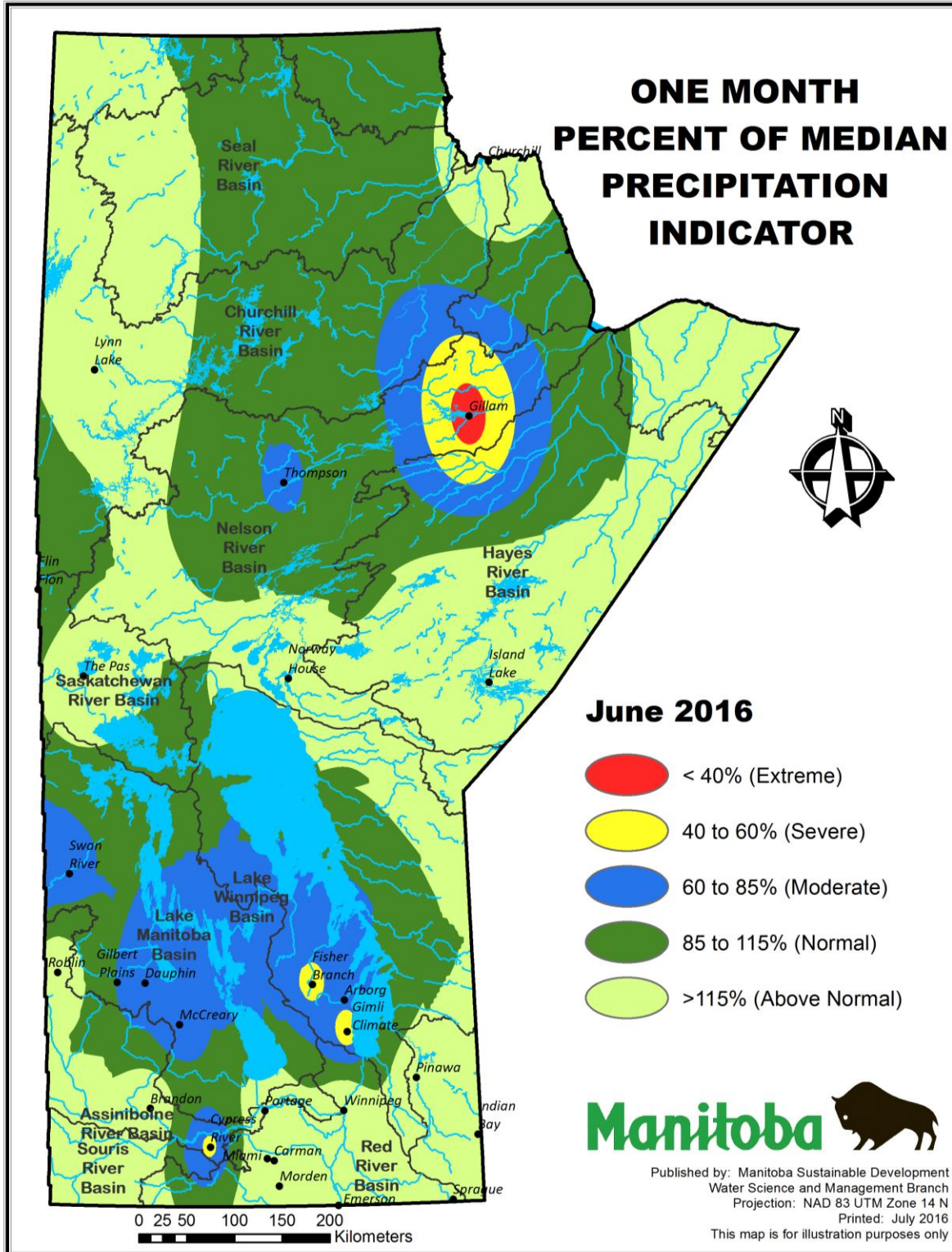


Figure 1: Precipitation Indicator (percent of one month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

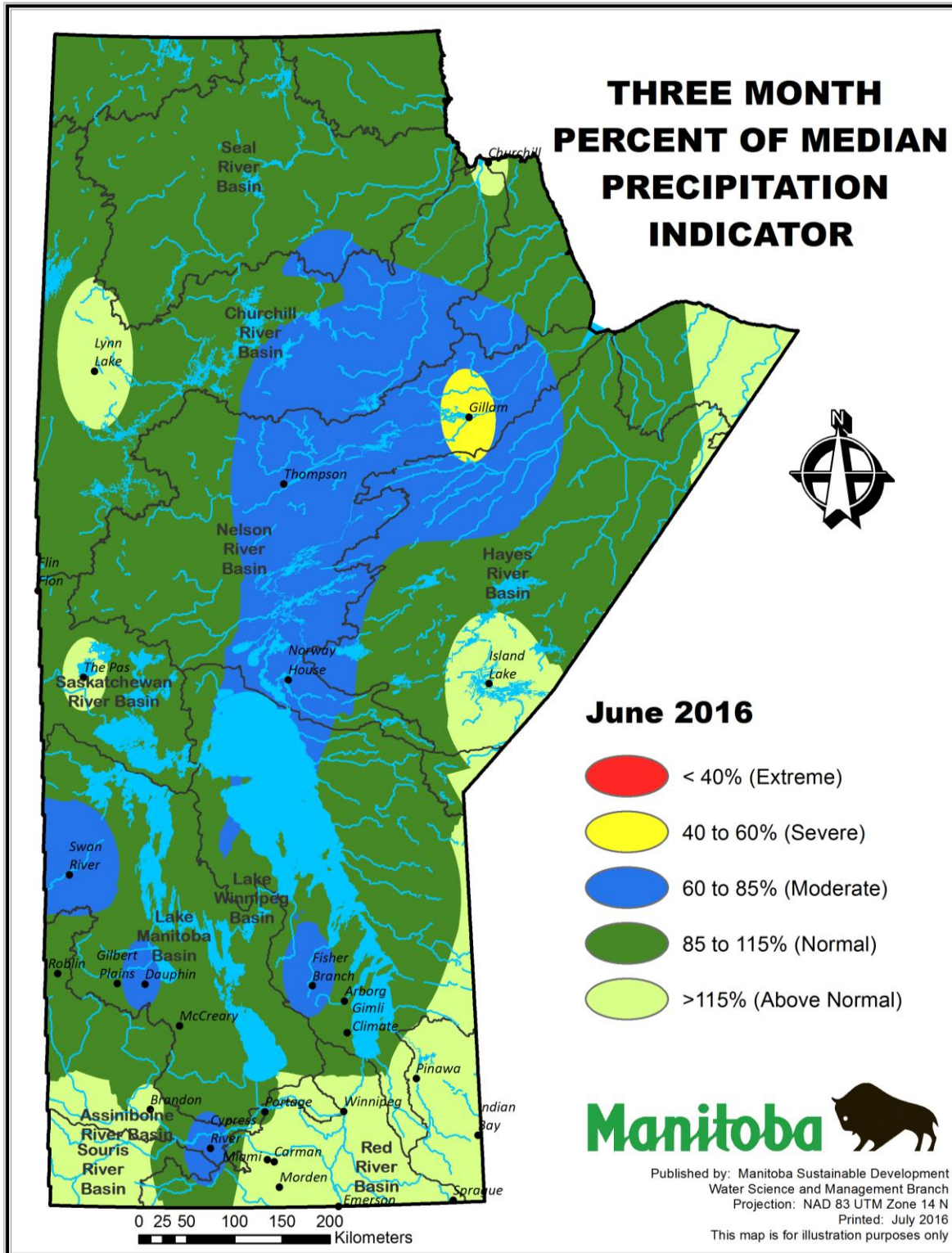


Figure 2: Precipitation Indicator (percent of three month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

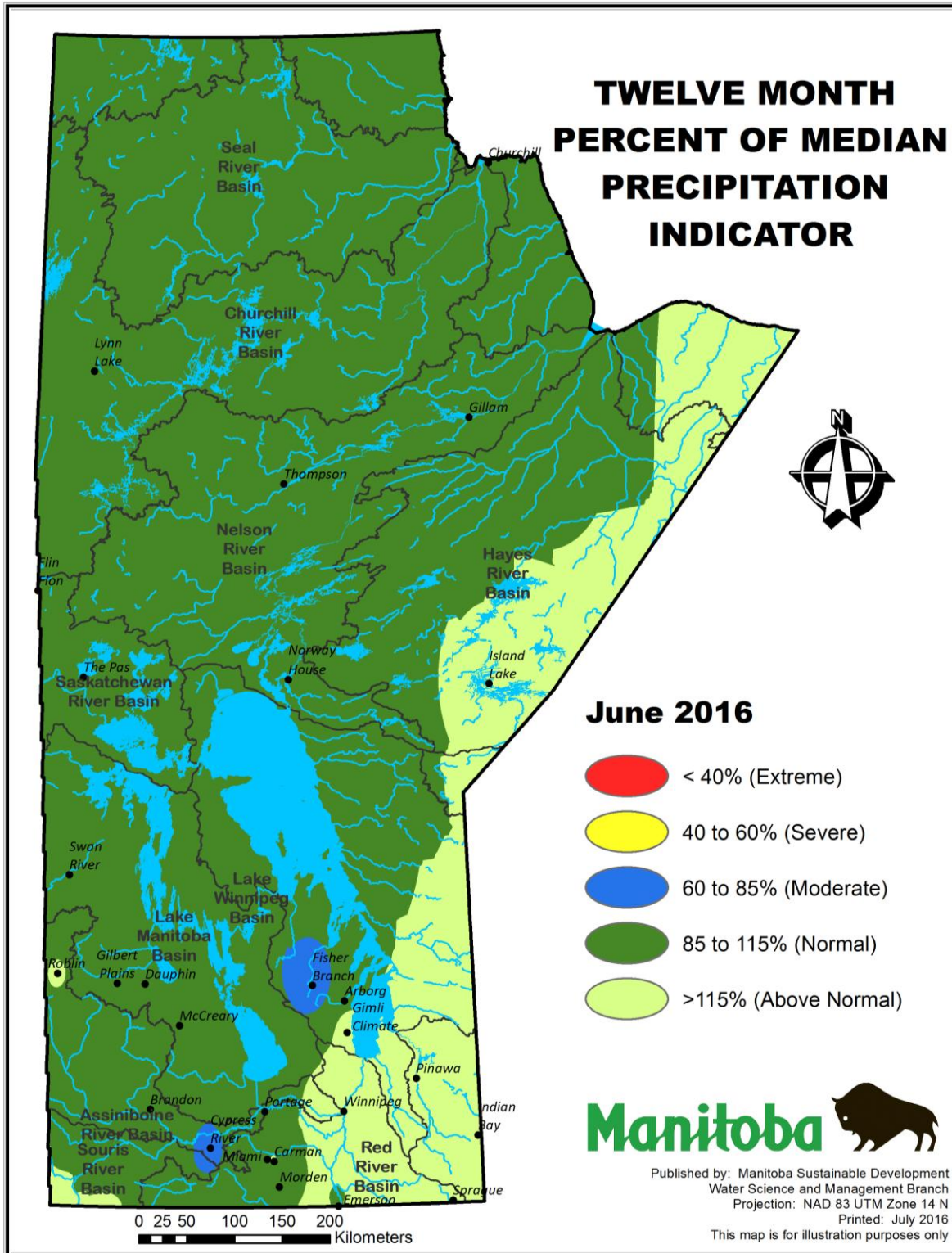


Figure 3: Precipitation Indicator (percent of twelve month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

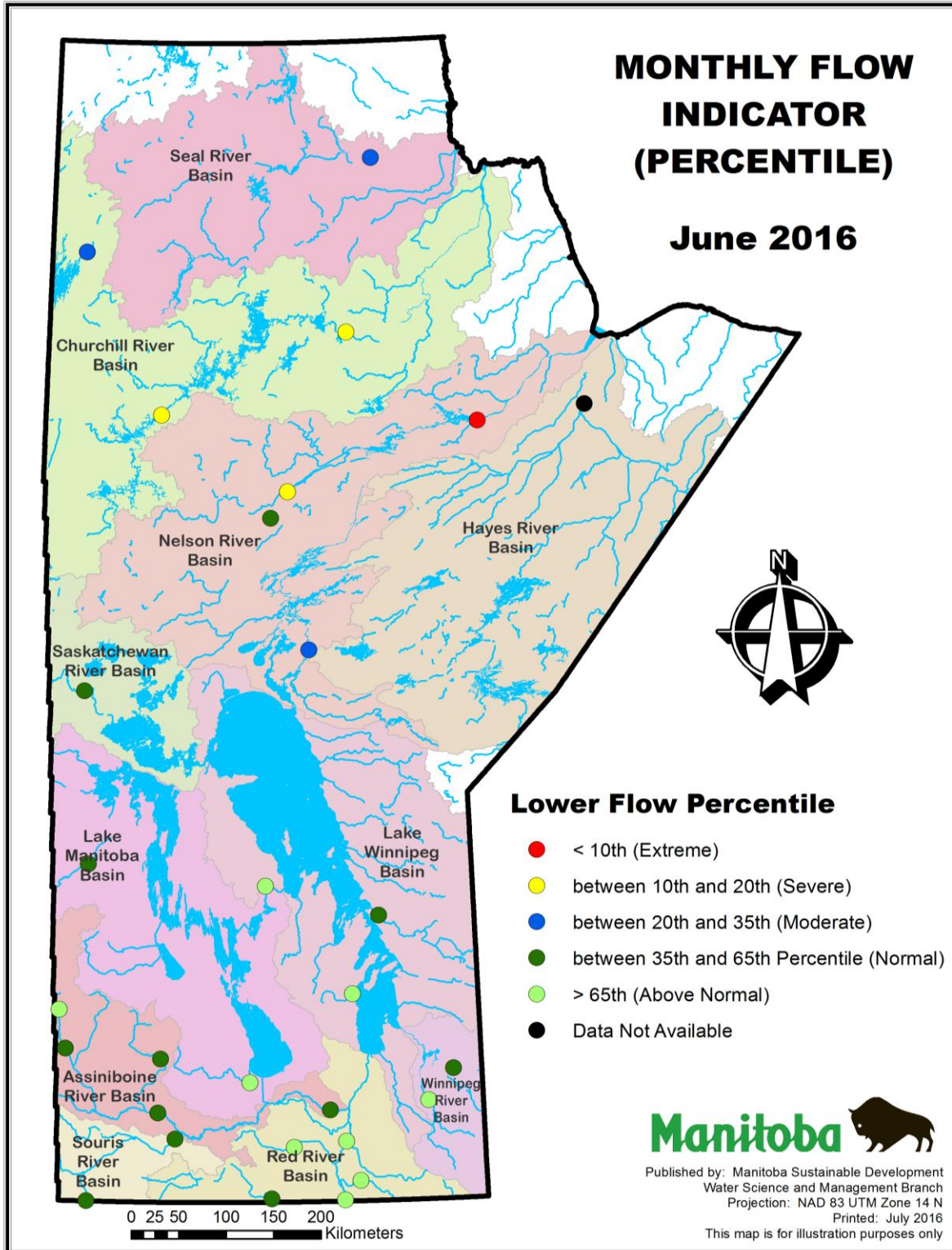


Figure 4: Monthly flow indicator for June, 2016.

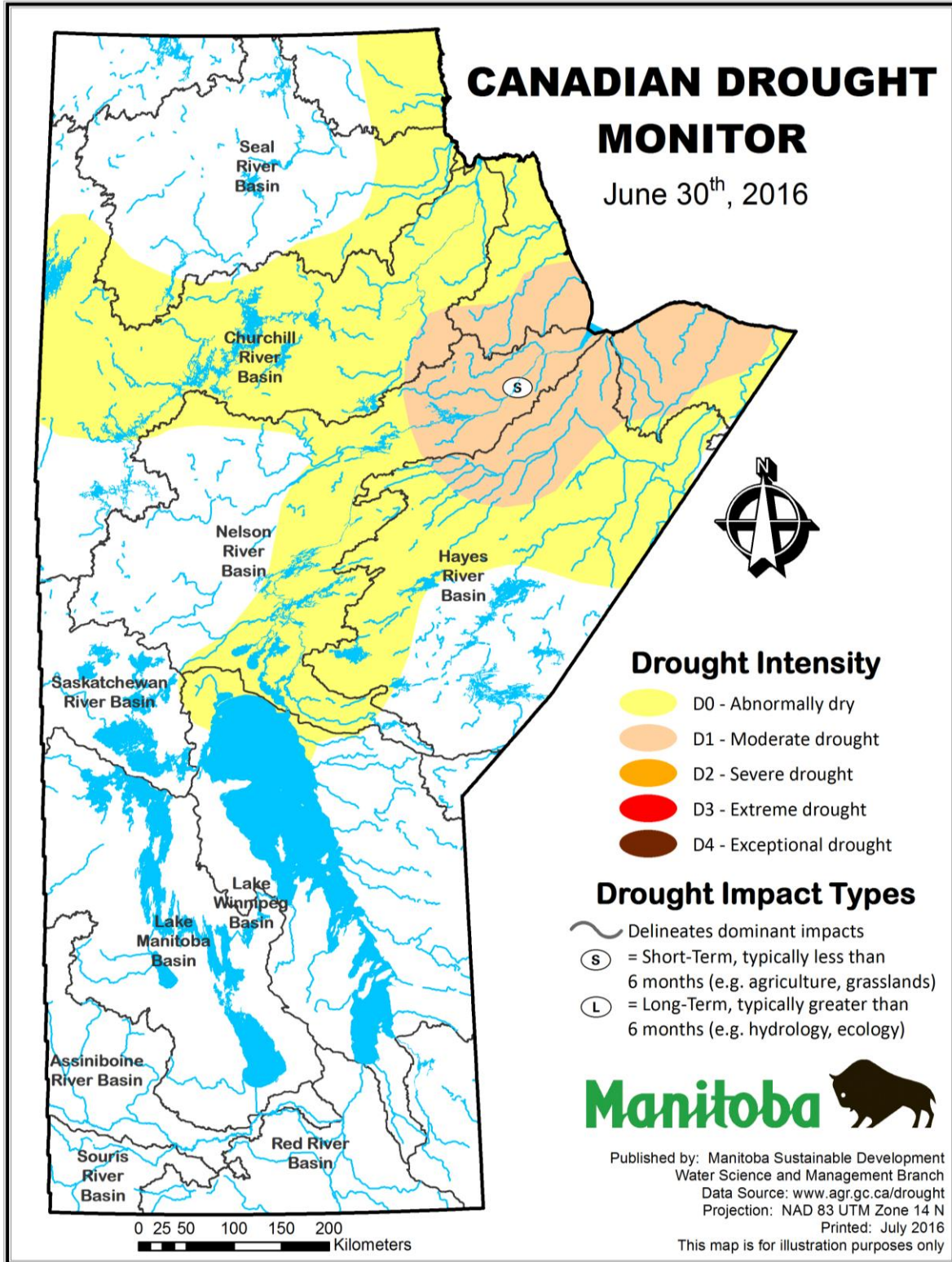
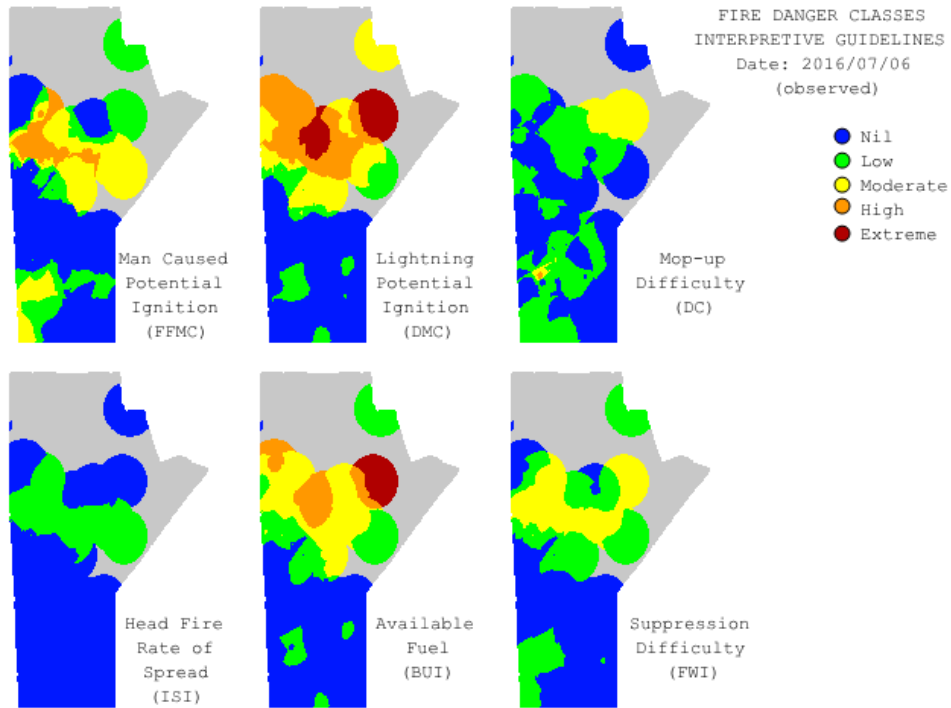
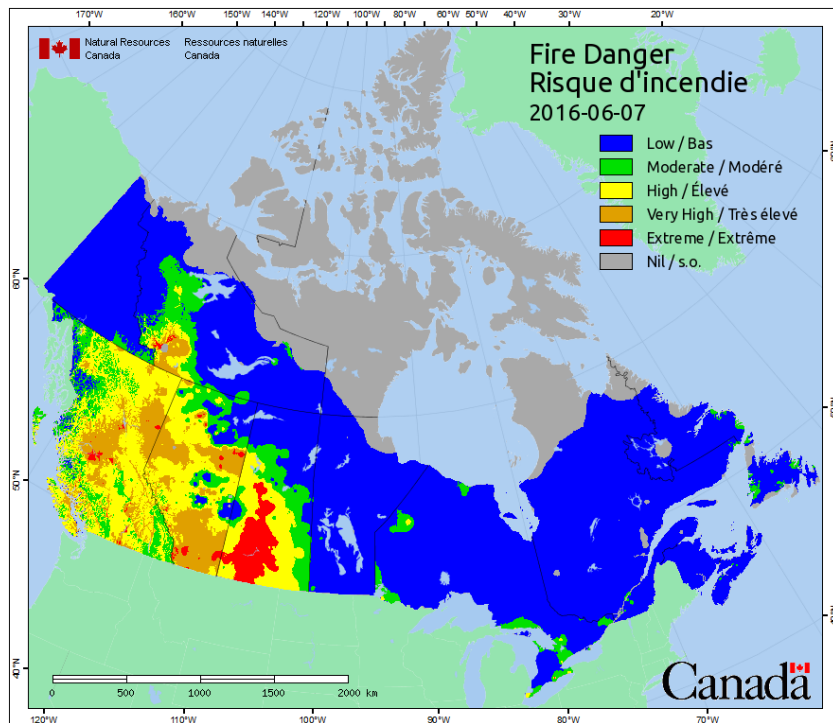


Figure 5: Agriculture and Agri-Food Canada’s Canadian Drought Monitor mapping of short-term (S) and long-term (L) drought conditions as of June 30th, 2016.



(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.

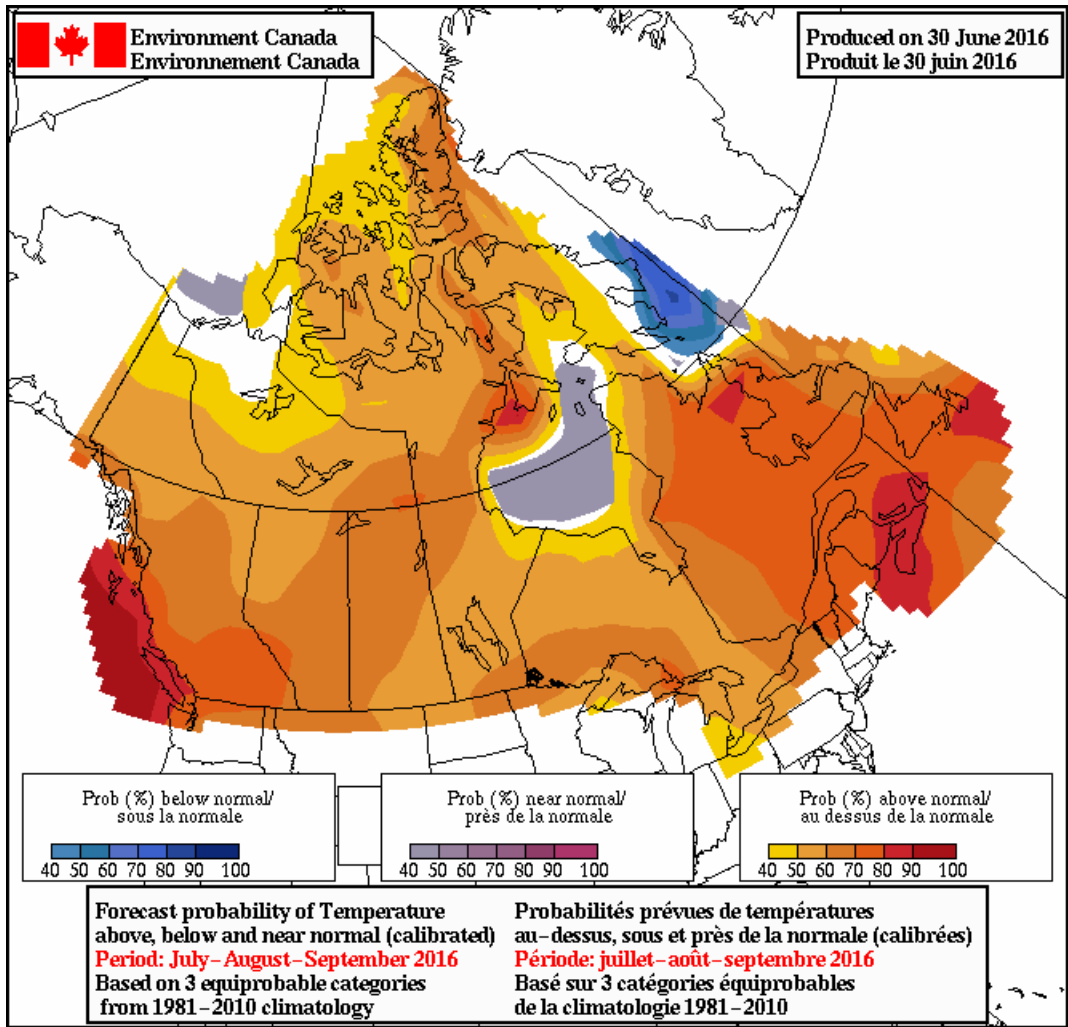


Figure 7: Environment and Climate Change Canada Seasonal (3 month) Temperature Outlook for July – August – September.

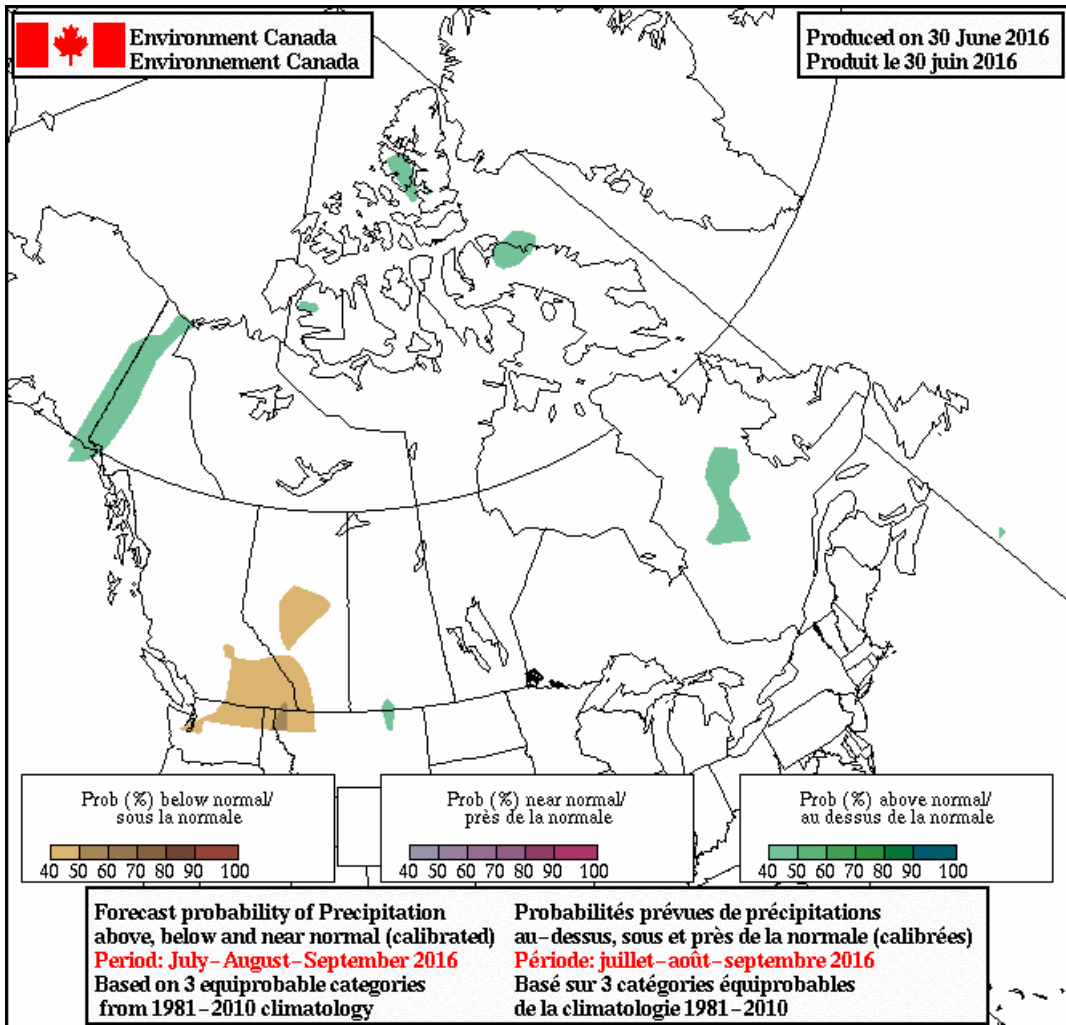


Figure 8: Environment and Climate Change Canada Seasonal (3 month) Precipitation Outlook for July – August – September.

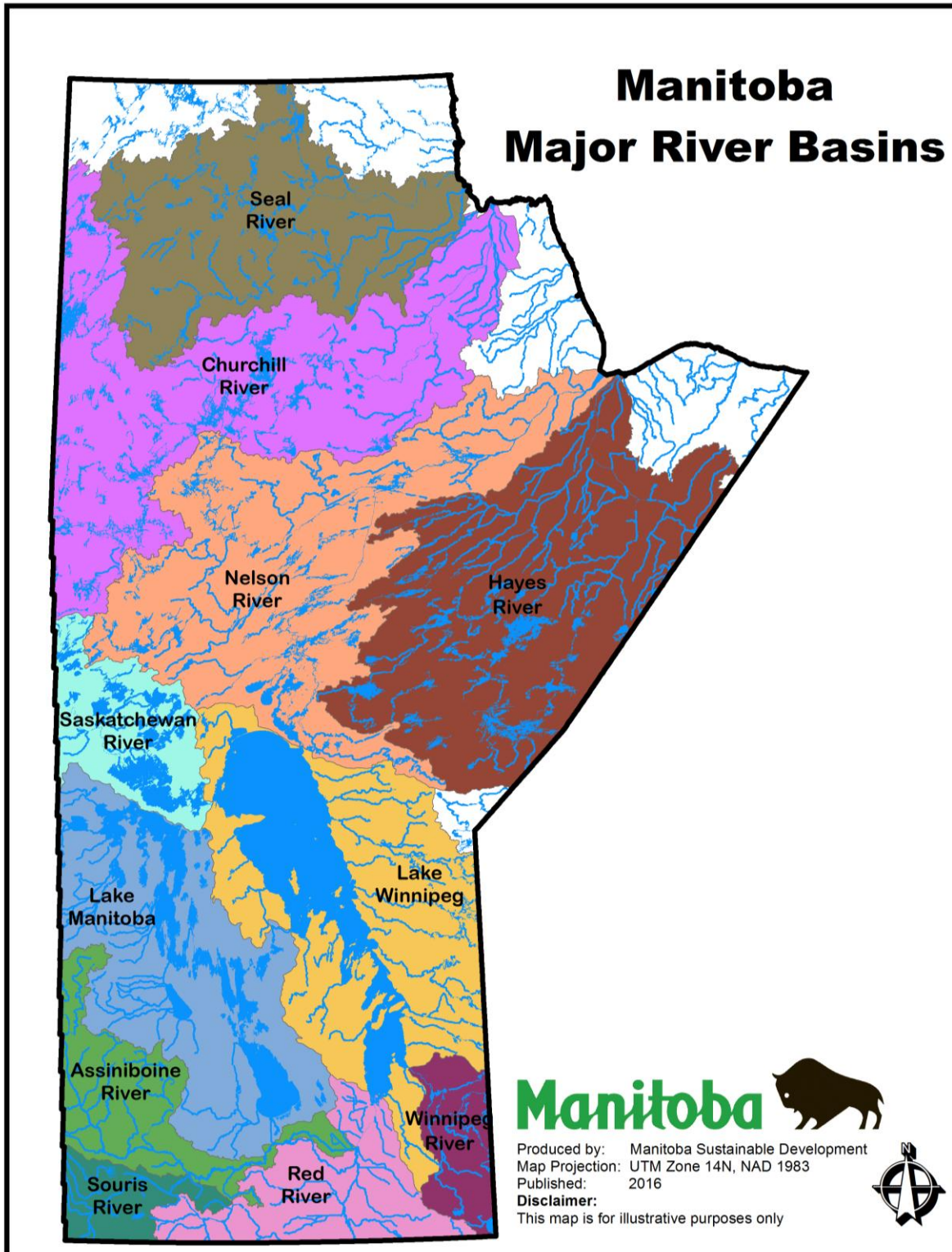


Figure 9: Major Manitoba river basins.