

# Water Availability and Drought Conditions Report

June 2017

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## Executive Summary

- This Water Availability and Drought Conditions Report provides an update on drought conditions throughout Manitoba for June 2017.
- During the short term (one month) large portions of the Interlake, central and northwest regions of agro-Manitoba observed moderately to severely dry precipitation conditions. Northern Manitoba was generally normal to above normal except for Churchill which experienced moderately dry conditions.
- During the medium term (three months) all of agro-Manitoba observed moderately dry precipitation conditions while portions of the central, eastern, and northwest regions were severely dry. Northern Manitoba generally experienced normal to above normal precipitation, except for Lynn Lake and Churchill which were moderately to severely dry.
- Over the long term (twelve months), most of Manitoba experienced normal to above normal precipitation with the exception of isolated pockets surrounding Arborg and Gimli which were moderately dry over this period.
- Streamflows and lake levels across the province are generally classified between normal and much above normal, except for the Whiteshell River at the outlet of Jessica Lake, the Bloodvein River above Bloodvein Bay, and the Burntwood River near Thompson which have dropped to below normal conditions.
- There are currently no major concerns over water supply as reservoir and on-farm supplies are adequate across the province. Several water treatment plants had issues meeting spikes in demand caused by agricultural spraying activities in early June. Affected communities asked water users to take temporary measures to conserve water.
- As of July 4<sup>th</sup>, 2017, there have been seventy-four wildfires burning a total of 16,333 hectares. The Wildfire Program recently issued a Fire Update indicating the warming conditions will raise the wildfire danger levels throughout the week.
- June rains helped to alleviate topsoil dryness in some regions of agro-Manitoba; however most of the southwest region and the western part of the central region would benefit from additional precipitation.
- Environment and Climate Change Canada's seasonal temperature forecast for July, August, and September 2017 is projected to be above normal across Manitoba. The seasonal precipitation forecast is projected to be normal across Manitoba.
- For more information on drought in Manitoba, please visit the [Manitoba Drought Monitor website](#).

## Drought Indicators

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

### *Precipitation Indicator*

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

Although not as severe as May 2017, throughout the month of June large portions of southern Manitoba continued to see below normal precipitation (Figure 1). Moderate (60 - 85 % of median) to severe (40 - 60 % of median) precipitation conditions occurred over large portions of agro-Manitoba, primarily within the Interlake, central and northwest regions. Most of northern Manitoba observed normal (85 – 115 % of median) to above normal (>115 % of median) precipitation during the month of June, except for an isolated area surrounding Churchill and the northeast tip of the province which both experienced moderately dry conditions.

Over the medium term (three months), the rainfall in June was not enough to overcome the low precipitation received during the preceding two months. All of agro-Manitoba experienced moderately dry precipitation conditions while portions of the central, eastern, and northwest regions were severely dry (Figure 2). The northern half of Manitoba generally experienced normal to above normal precipitation, with the exception of areas surrounding Lynn Lake and Churchill which saw moderately dry to severely dry conditions.

Over the long term (twelve months), most of Manitoba experienced normal to above normal precipitation conditions (Figure 3). Isolated areas centered over Arborg and Gimli experienced moderately dry conditions.

### *Streamflow Indicator*

The streamflow indicator is based on average daily flows compared to historical values for that particular day. This indicator is used to determine the severity of hydrological dryness in a watershed and is summarized on Figure 4, representing hydrological conditions for July 3<sup>rd</sup>, 2017.

As of the beginning of July, most southern Manitoba rivers and tributaries experienced normal (25 – 75<sup>th</sup> percentile) to above normal (75 – 90<sup>th</sup> percentile) conditions. However, many of the lakes in the region (Winnipeg, Winnipegosis, Manitoba, St. Martin) remained at much above normal (> 90<sup>th</sup> percentile) levels. The Whiteshell River at the outlet of Jessica Lake and the

Bloodvein River above Bloodvein Bay were experiencing below normal (10 – 25<sup>th</sup> percentile) streamflow conditions as of July 3<sup>rd</sup>.

After peaking in mid- to late-May at near record high flows at many locations, most of the rivers and tributaries in northern Manitoba are still experiencing above normal to much above normal streamflow conditions as of early July. The Hayes River below Gods River and the Weir River above the month have returned to within their normal ranges, while the Burntwood River has decreased to below normal (10 – 25<sup>th</sup> percentile) conditions, likely due to operations for hydro-power production.

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

### ***Canada and United States Drought Monitors***

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

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

- D0 (Abnormally Dry) – represents an event that occurs 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 50 year event; and
- D4 (Exceptional Drought) – 50+ year event.

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

The Canada and United States Drought Monitors indicate that as of the end of June (Figure 5) large regions of the Red River Basin, particularly the Manitoba portion, are experiencing abnormally dry conditions with some pockets of moderate drought conditions along the Manitoba-United States border. Most of the Assiniboine/Souris River Basin is experiencing abnormally dry to moderate drought conditions which further degrade to severe drought conditions in the south and western portions of the basin. The southern regions of the Lake Manitoba and Lake Winnipeg basins are also classified as abnormally dry conditions, alongside the western half of the Winnipeg River Basin. All drought conditions are classified as short-term.

## Water Availability

### Reservoir Conditions

Water supply reservoirs are close to or at full supply level (Table 2), with the exception of Rapid City which is at 79 %. Please note, however, the most recent measurement at this reservoir is from April 26<sup>th</sup>, 2017, and conditions may have improved since this point in time. Overall, there are no concerns over reservoir water supplies currently.

### On Farm Water Supply

Manitoba Agriculture's Crop Report: Issue 10 (July 4<sup>th</sup>, 2017) summarized farm water supply as adequate throughout agro-Manitoba (Table 1).

**Table 1: On Farm Water Supply (Dugout) Conditions**

Region	General Dugout Condition
Eastern	Adequate
Interlake	Adequate
Southwest	85 % full
Central	Adequate
Northwest	Not specified

### Drinking Water Systems

In early June 2017, several drinking water systems were not able to meet their demands due to the hot temperatures and dry weather conditions experienced during May and into early June. Consequently, several communities asked water users to voluntarily conserve water until conditions improved. Additional information on affected communities is provided within the Drought Impacts section of this report.

### Aquifers

Groundwater levels in major aquifers are generally good. Some aquifers are near maximum recorded levels or in some instances have set new maximum recorded levels during the spring of 2017. Groundwater hydrographs from 2014 to the end of June 2017 for the Assiniboine Delta aquifer, the Oak Lake aquifer, and the Carbonate aquifer near Anola are provided on Figure 6.

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

The Provincial Wildfire Program reported that as of July 4<sup>th</sup>, 2017, there have been seventy-four wildfires burning a total of 16,333 hectares. Almost all of the area burned is located in the northeast portion of the province (99 %), with the remaining regions accounting for the final one per cent. As of July 4<sup>th</sup>, there were nine fires still actively burning, all within the northeastern portion of the province.

As of July 5<sup>th</sup>, the Fire Risk and Drought Code maps (Figure 7) indicate regions of moderate to high fire risk (particularly for man-caused potential ignition), but more low to moderate Drought Code values. On July 4<sup>th</sup>, 2017, the Wildfire Program issued a Fire Update indicating warming conditions will raise the wildfire danger levels through the upcoming week. They suggest being very careful with outdoor activities and exercising caution when in or near forested areas. More up to date wildfire conditions and restrictions, including burning bans, are available at the Wildfire Program's website ([www.gov.mb.ca/wildfire](http://www.gov.mb.ca/wildfire)).

## Drought Impacts

Overall, there have been moderate drought impacts reported within Manitoba for the month of June.

On June 6<sup>th</sup>, Pembina Valley Water Co-op asked the public to conserve water as the increased demand (primarily for crop spraying) temporarily exceeded the capacity of the Letellier plant to treat raw water supply from the Red River. The affected regions included the RMs of Moncalm, Rhineland, Stanley, Emerson Franklin, and the Town of Altona and the City of Winkler. The request to conserve water has since been lifted. A similar situation arose on June 8<sup>th</sup> when the Municipality of Westlake-Gladstone cut bulk water off from the Langruth treatment plant due to an increase in people hauling water – also primarily for the spraying of crops. The shut-down lasted a couple of days to allow the reservoir to return back to acceptable levels. The town's water supply was not affected. On June 7<sup>th</sup>, the town of Niverville residents were asked to conserve water by putting off watering lawns and gardens and filling swimming pools until further notice. The town saw spikes in water usage that were unprecedented, with the mayor stating that current water usage was double the capacity of the treatment system.

Manitoba Agriculture's most recent Crop Report indicates that as of July 4<sup>th</sup>, most areas of the southwest region and the western part of the central region would benefit from precipitation. However, overall crops in most regions of agro-Manitoba are in good to excellent condition at this time. 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 June, two municipalities in Manitoba registered minimal drought impacts on agricultural operations with the Impact Reporter. The reporting RMs were Portage la Prairie and Killarney.

The United States National Drought Mitigation Centre's Impact Reporter is reporting high numbers of impacts to agriculture (crops, pasture and livestock) and increased number and risk

of wildland fires in North Dakota (and surrounding states). On June 22<sup>nd</sup>, the Governor of North Dakota declared a drought emergency to reactivate a water supply assistance program for livestock producers in 26 counties: 15 experiencing extreme drought conditions and the 11 adjacent counties experiencing moderate drought conditions. Most of the impacted counties are located in the western half of the state and not directly along the Manitoba portion of the Canada-United States border. However, if conditions persist, hydrologic drought impacts may begin to occur within the upstream and mid-reaches of the Souris River Basin which may potentially have downstream implications for Manitoba.

## Future Weather

The short-range (Tuesday, July 11<sup>th</sup> to Thursday July 13<sup>th</sup>) weather forecast for Manitoba from Environment and Climate Change Canada's Regional Climate Model forecasts precipitation over southern Manitoba with amounts totalling as little as 2 – 10 mm in the southwest up to 75 mm in the southeast. Most of southern Manitoba is forecasted to receive about 10 – 20 mm on average. The next major systems are forecasted to track across portions of the far north and northeastern Manitoba on Monday, July 17<sup>th</sup> through Tuesday, July 18<sup>th</sup>. However, long range precipitation forecasts have considerable uncertainty and are likely to change in the upcoming days.

Environment and Climate Change Canada's seasonal forecast for the next three months (July-August-September) projects temperatures to be above normal across Manitoba (Figure 8). Precipitation over the next three months is forecasted to be normal (Figure 9). The National Oceanic and Atmospheric Administration indicate that ENSO neutral conditions are currently present. ENSO neutral conditions are favoured throughout the Northern Hemisphere during fall of 2017.

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

Water Supply Reservoir Levels and Storages – June 30 <sup>th</sup> , 2017.								
Lake or Reservoir	Community Supplied	Target Level (feet)	Latest Observed Level (feet)	Observed date	Supply Status (Recent - Target) (feet)	Storage at Target Level (acre-feet)	Storage at Observed Level (acre-feet)	Supply Status (observed storage/target storage) (%)
Elgin	Elgin	1,532.00	1,534.33	April 25, 2017	2.33	520	680	131%
Lake of the Prairies (Shellmouth)*	Brandon, Portage	1,402.50	1,403.04	June 30, 2017	0.54	300,000	306,643	102%
Lake Wahtopanah (Rivers)	Rivers	1,536.00	1,536.61	June 30, 2017	0.61	24,500	25,871	106%
Minnewasta (Morden)	Morden	1,082.00	1,081.86	June 1, 2017	-0.14	3,150	3,125	99%
Stephenfield	Carman	972.00	972.44	June 30, 2017	0.44	3,810	4,017	105%
Turtlehead (Deloraine)	Deloraine	1,772.00	1,771.88	June 30, 2017	-0.12	1,400	1,394	100%
Vermilion	Dauphin	1,274.00	1,274.24	June 30, 2017	0.24	2,600	2,656	102%
Goudney (Pilot Mound)		1,482.00	1,482.27	June 30, 2017	0.27	450	463	103%
Jackson Lake		1,174.00	1,173.80	June 30, 2017	-0.20	2,990	2,939	98%
Kenton Reservoir		1,448.00	1,448.43	April 26, 2017	0.43	600	617	103%
Killarney Lake		1,615.00	1,615.48	May 5, 2017	0.48	7,360	7,583	103%
Lake Irwin		1,178.00	1,177.94	March 9, 2017	-0.06	3,800	3,766	99%
Manitou (Mary Jane)		1,537.00	1,536.87	June 30, 2017	-0.13	1,150	1,138	99%
Rapid City		1,573.50	1,572.90	April 26, 2017	-0.60	200	158	79%
St. Malo		840.00	840.31	March 1, 2017	0.31	1,770	1,822	103%

\* Summer target level and storage.



## 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](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](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](http://weatheroffice.gc.ca/saisons/index_e.html)
- Manitoba Agriculture:  
<http://www.gov.mb.ca/agriculture/crops/seasonal-reports/crop-report-archive/index.html>
- AAFC Drought Watch (including the Canadian Drought Monitor):  
<http://www.agr.gc.ca/drought>
- United States Drought Monitor:  
[droughtmonitor.unl.edu/](http://droughtmonitor.unl.edu/)
- National Oceanic and Atmospheric Administration: ENSO: Recent Evolution, Current Status and Predictions:  
[http://www.cpc.ncep.noaa.gov/products/analysis\\_monitoring/lanina/enso\\_evolution-status-fcsts-web.pdf](http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf)

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Past reports are available on the [Manitoba Drought Monitor website](#).

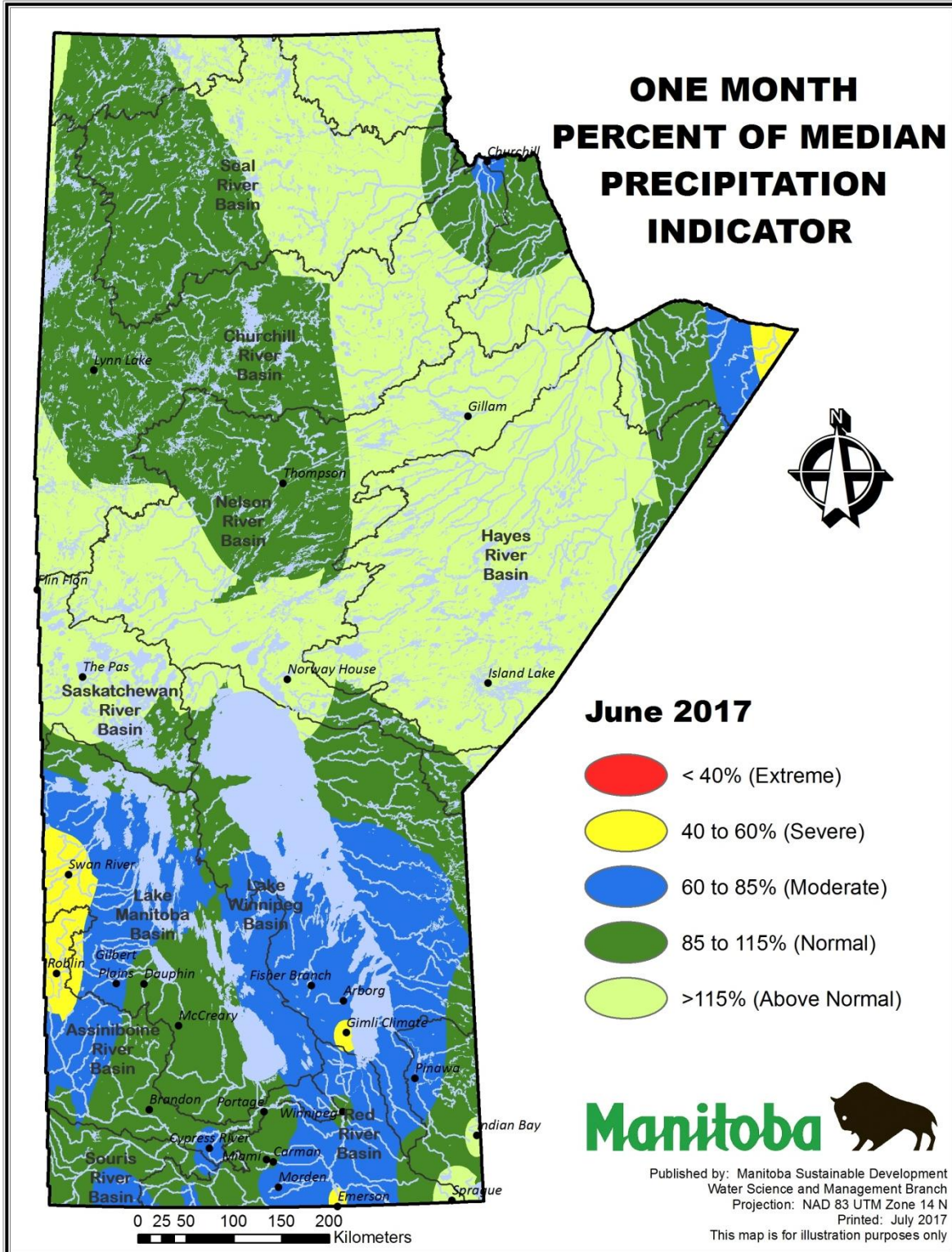


Figure 1: Short term precipitation indicator (percent of one month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).



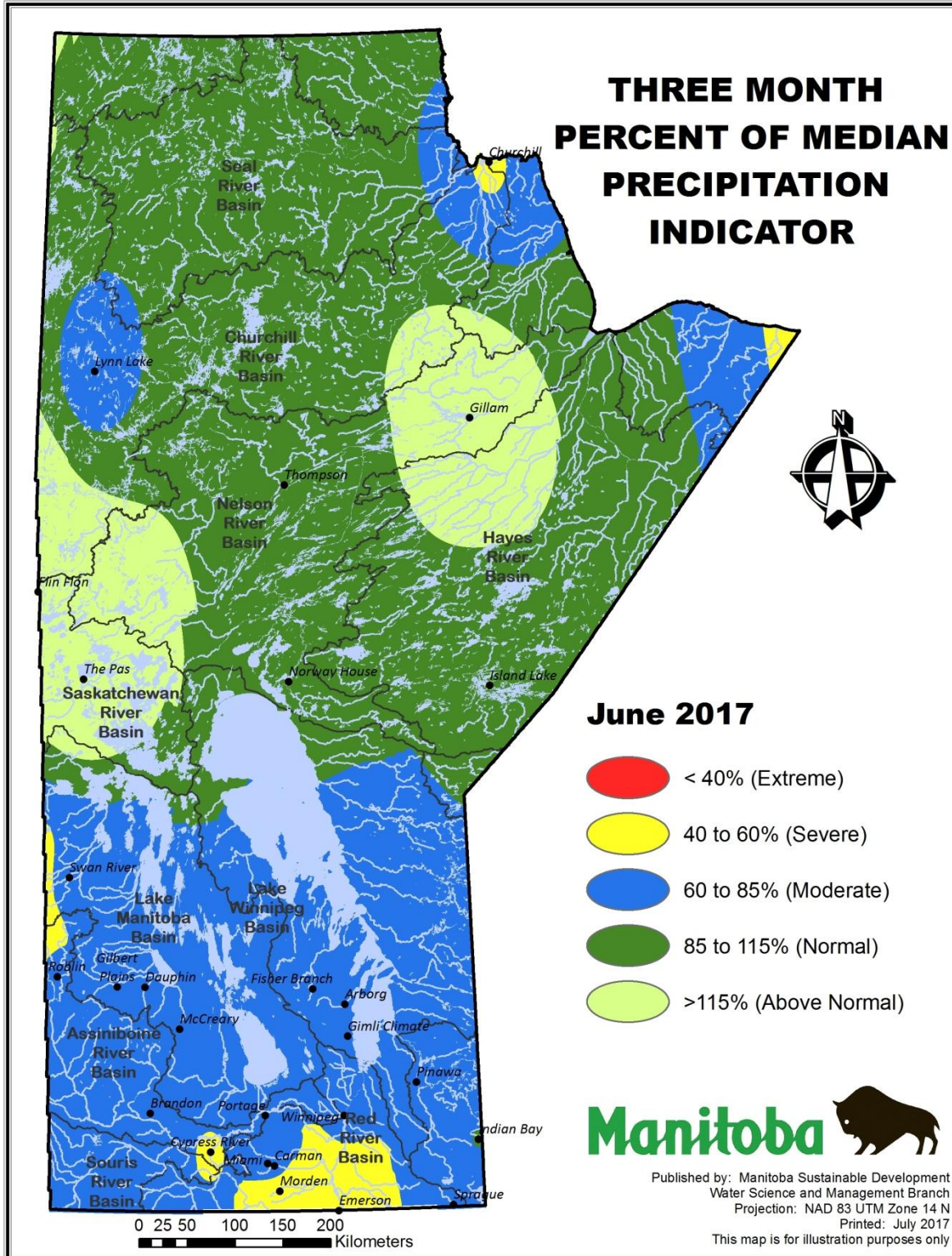


Figure 2: Medium term precipitation indicator (percent of three month median precipitation).  
Baseline medians are computed from 45 years of data (1971 – 2015).



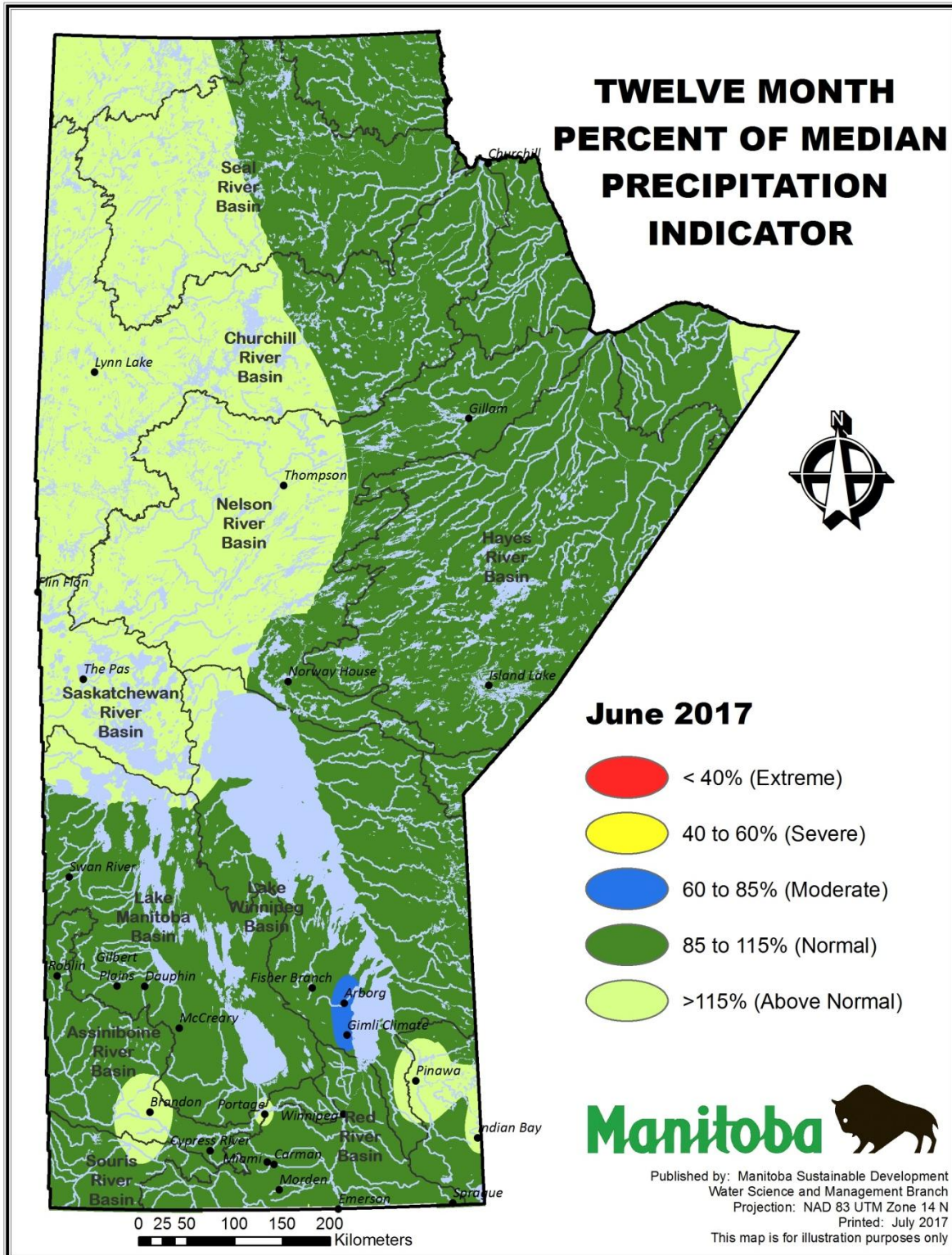


Figure 3: Long term precipitation indicator (percent of twelve month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

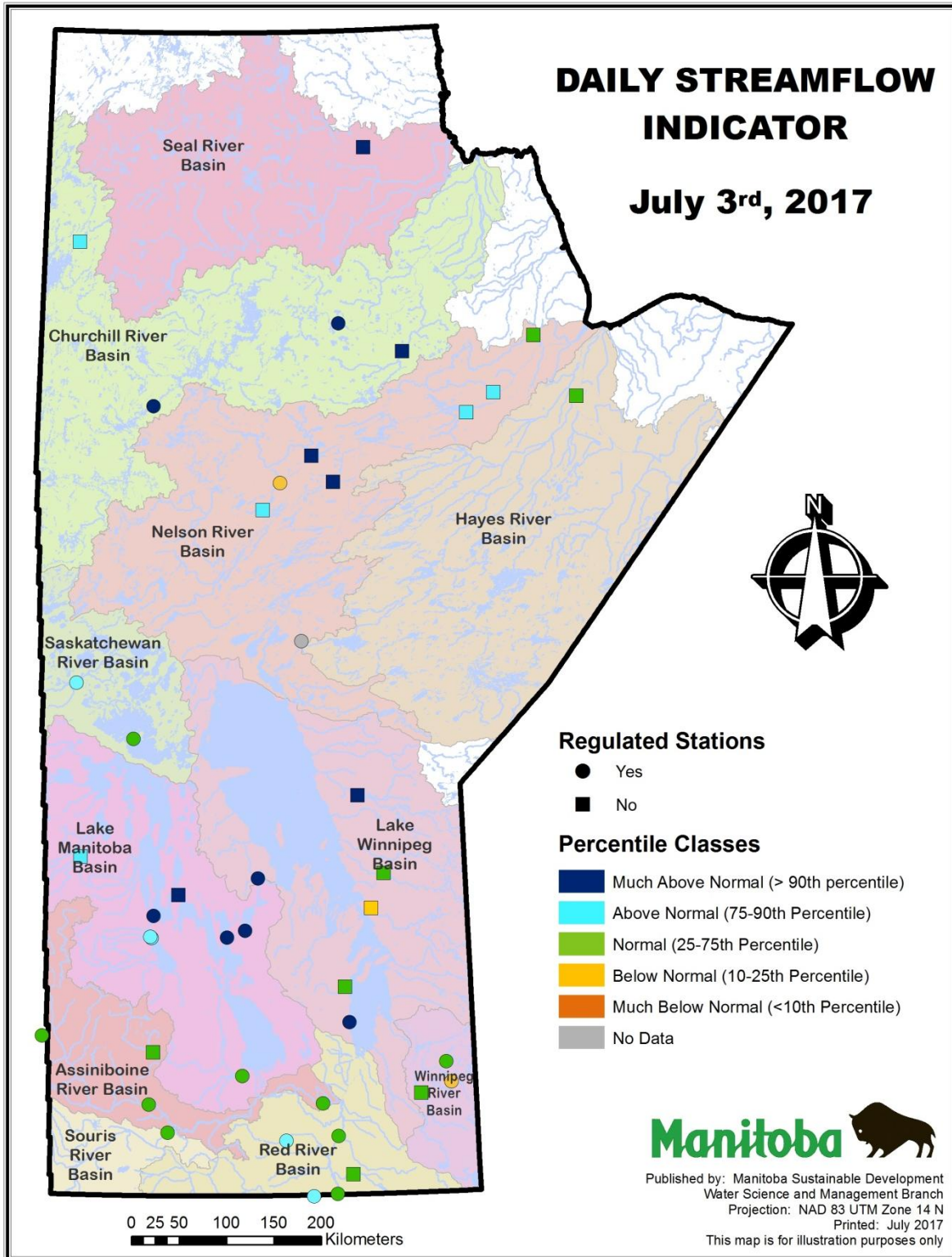


Figure 4: Daily streamflow indicator for July 3<sup>rd</sup>, 2017. Real-time daily streamflow and water levels are compared to historical values for the specified day.



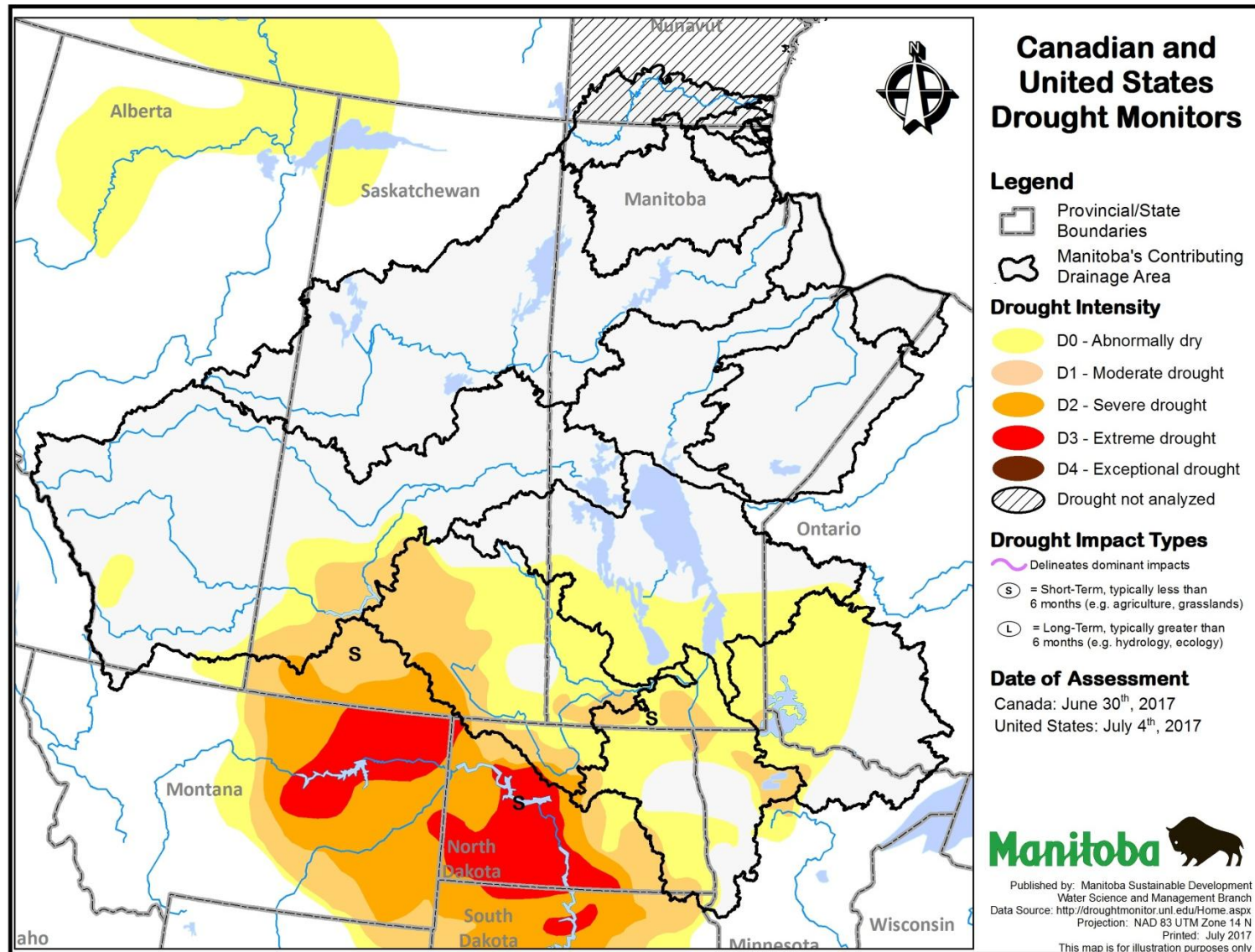


Figure 5: Canadian and United States Drought Monitors' classification of short-term (S) and long-term (L) drought conditions. Canadian Drought Monitor assessment date is June 30<sup>th</sup>, 2017. United States Drought Monitor assessment date is July 4<sup>th</sup>, 2017.

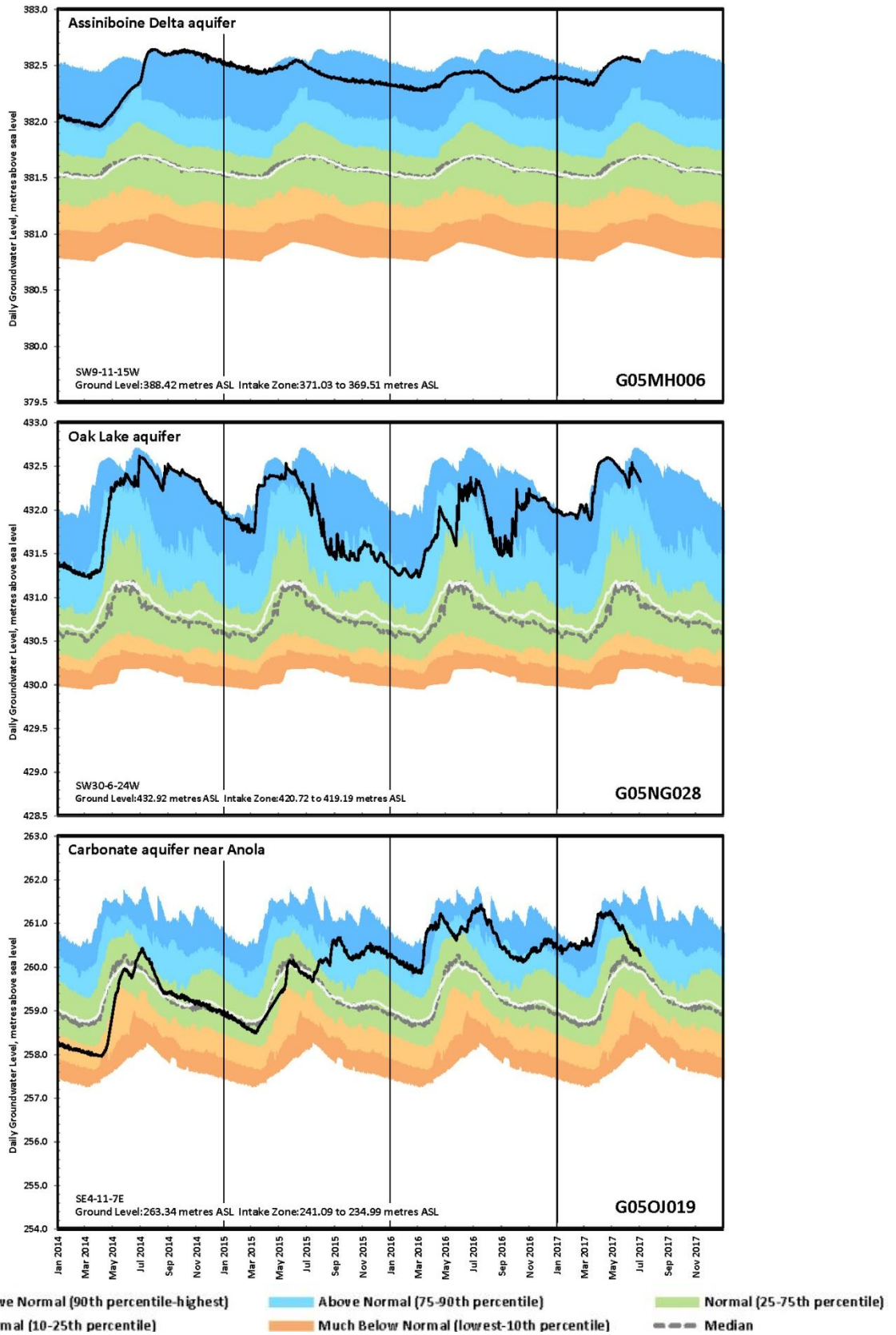
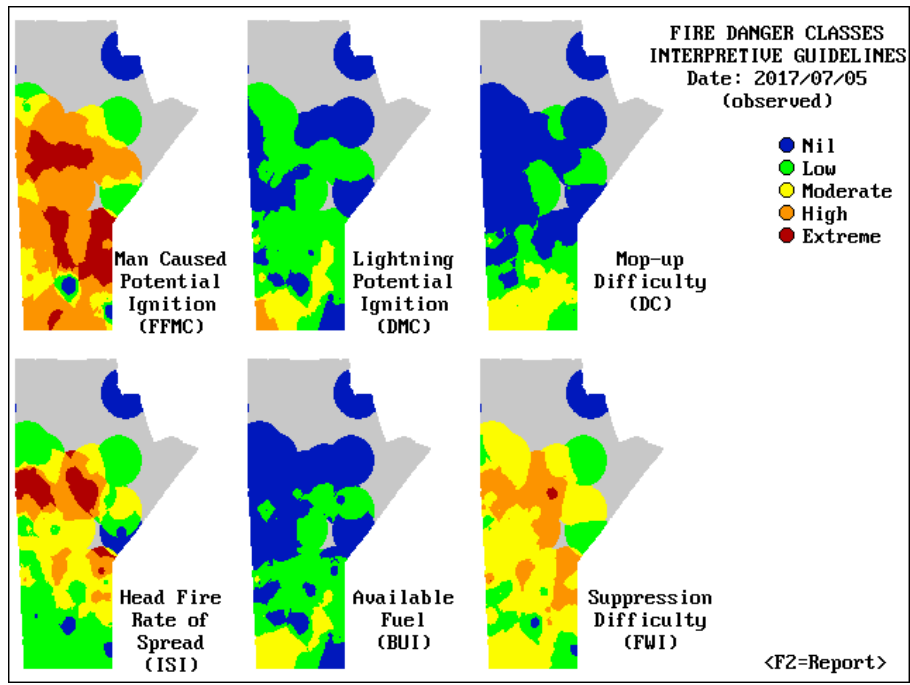
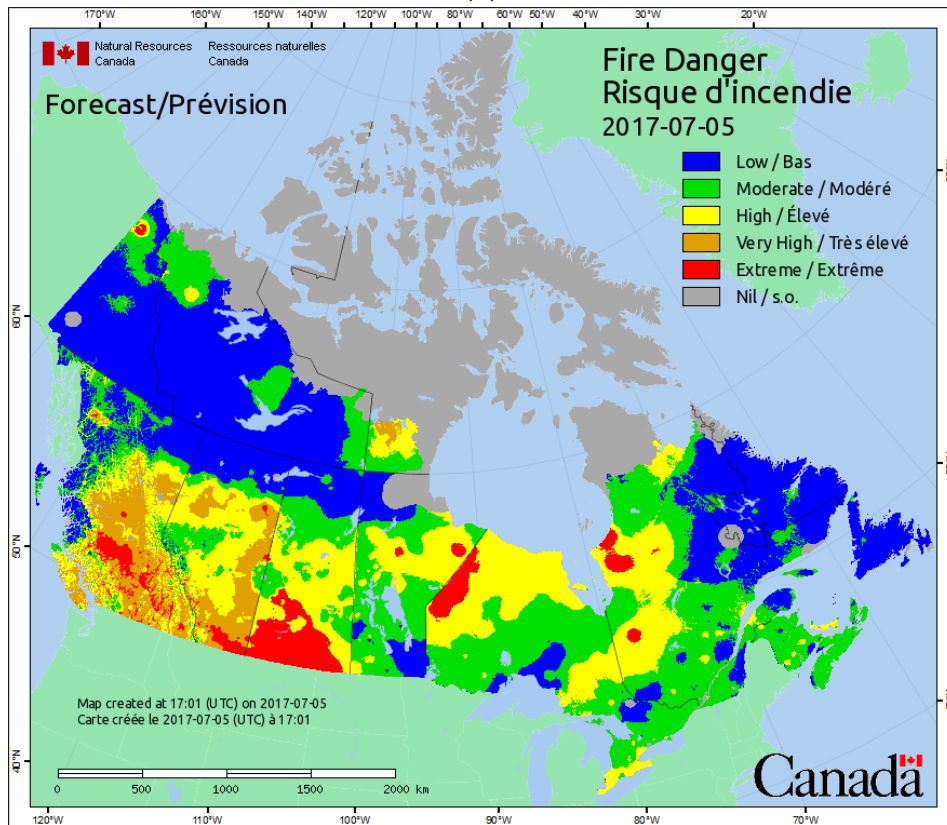


Figure 6: Groundwater hydrographs from 2014 – current for the Assiniboine Delta aquifer, the Oak Lake aquifer, and the Carbonate aquifer near Anola.





(a)



(b)

Figure 7: Wildfire hazard maps, including (a) the six components of the Canadian Forest Fire Weather Index System generated by the Manitoba Fire Program, and (b) Fire Danger mapping from Natural Resources Canada.

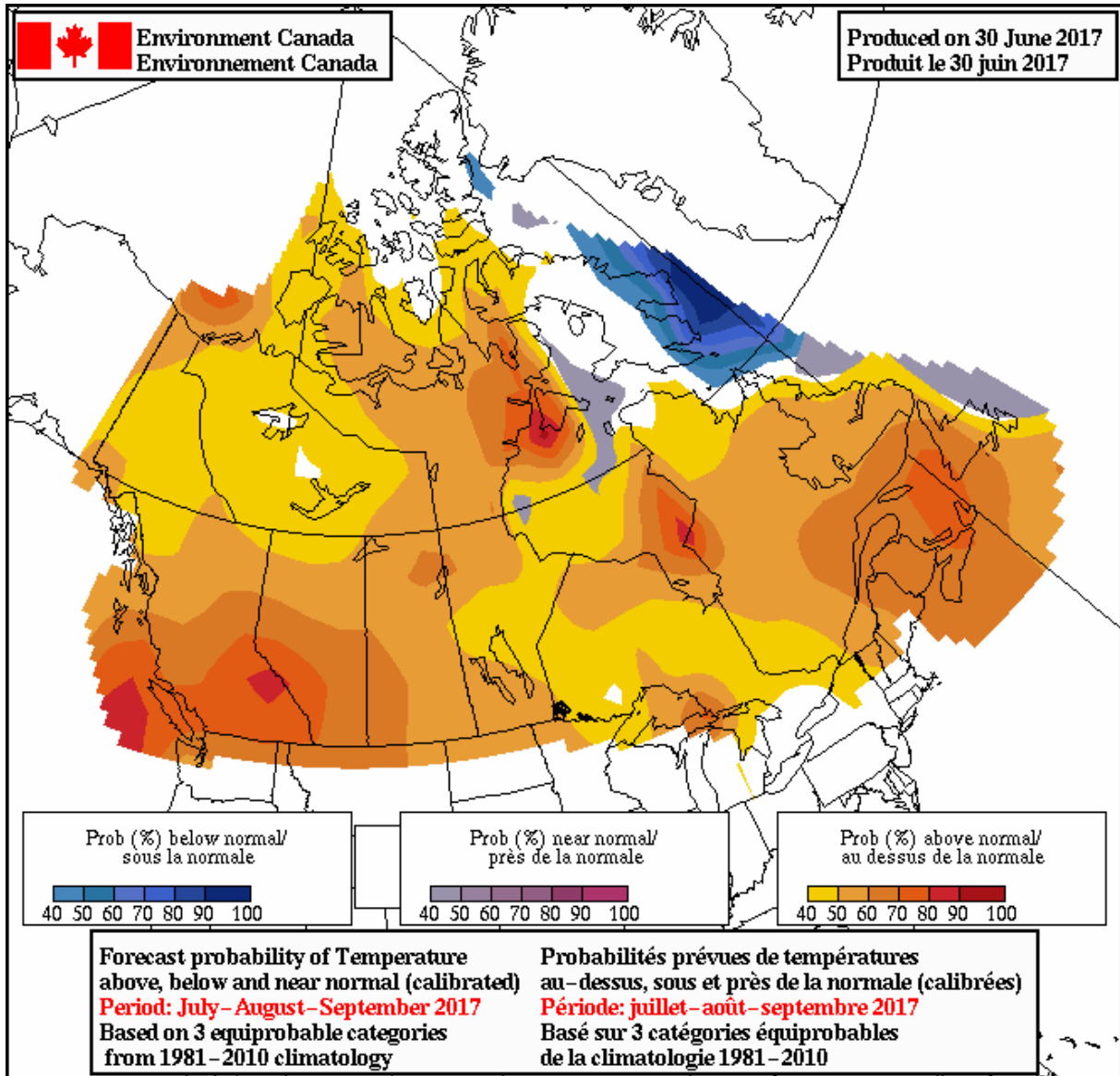


Figure 8: Environment and Climate Change Canada's seasonal (three month) temperature outlook for July-August-September.

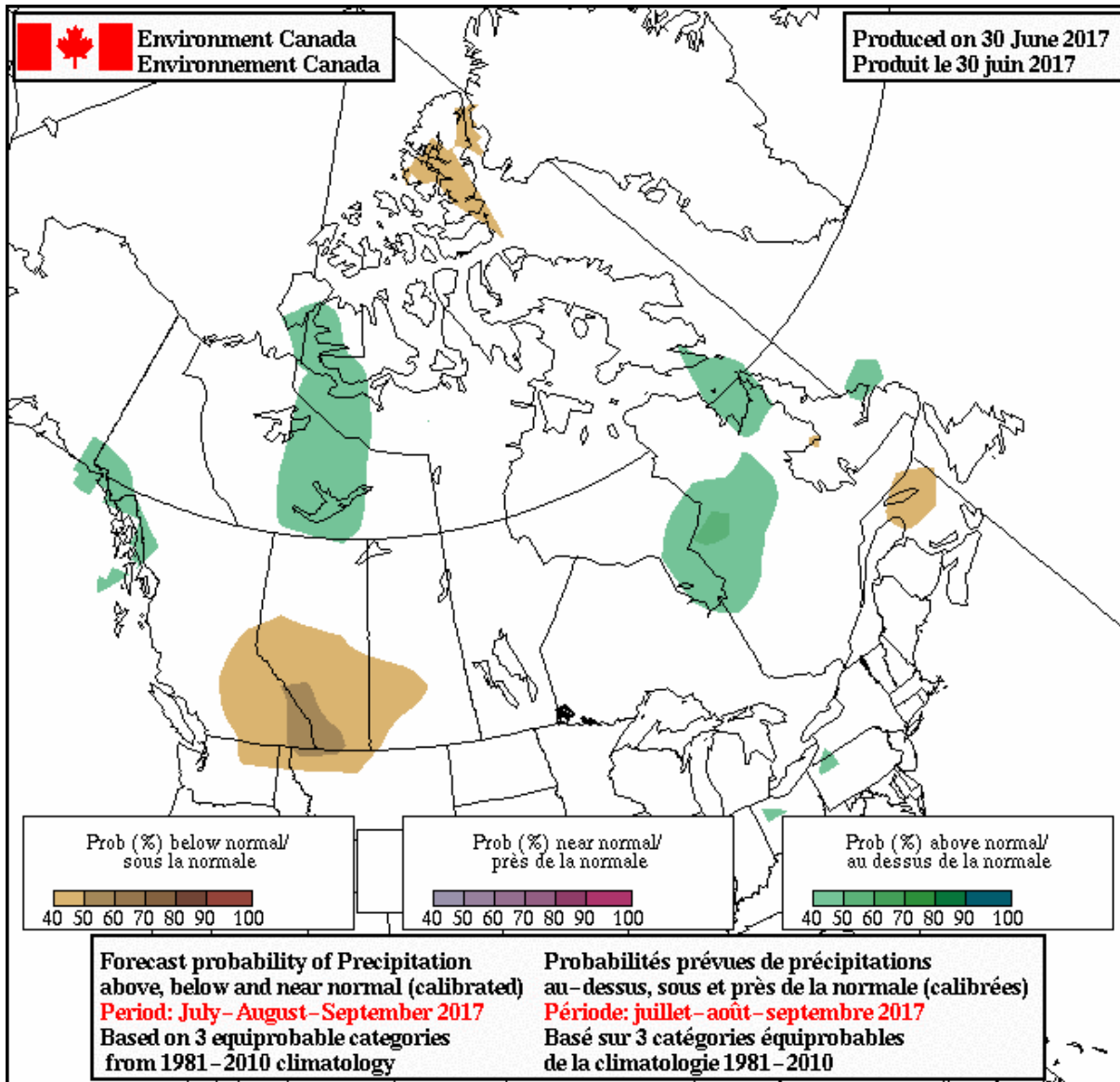


Figure 9: Environment and Climate Change Canada's seasonal (three month) precipitation outlook for July-August-September.