Water Availability and Drought Conditions Report

May 2017

Executive Summary

- This Water Availability and Drought Conditions Report provides an update on drought conditions throughout Manitoba for May 2017.
- During the short term (one month) almost all of southern Manitoba saw below normal precipitation conditions ranging from moderately to extremely dry. Northern Manitoba saw conditions ranging from moderately dry (Churchill, Thompson) to above normal (Gillam).
- During the medium term (three months) most of agro-Manitoba observed a moderate precipitation deficit with portions of the central and eastern regions observing severely dry conditions. The region surrounding the south basin of Lake Winnipeg and most of the province north of Norway House observed normal to above normal precipitation.
- Over the long term (twelve months), most of Manitoba experienced normal to above normal precipitation with the exception of isolated pockets surrounding Arborg, Gimli and Gillam which registered moderate precipitation deficits.
- Streamflows and lake levels across the province are classified as normal to much above normal.
- There are currently no major concerns over water supply as reservoir and on-farm supplies are adequate across the province.
- As of May 30th, 2017, there have been forty-seven wildfires burning a total of 679 hectares. Hot, windy and dry conditions have increased wildfire danger levels and burning permits in eastern and central Manitoba have been cancelled.
- The precipitation deficit in agro-Manitoba has resulted in low soil moisture content (at 5 cm depth), particularly in the southwest, central and eastern regions. Lands with poor crop residue have observed some blowing and drifting of lighter soils. Most of agro-Manitoba would benefit from precipitation at this time.
- Environment and Climate Change Canada's seasonal temperature forecast for June, July and August 2017 is projected to be above normal across the southern-most and northern-most portions of Manitoba and normal across the centre of the province. 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.

Over the short term (one month), large portions of Manitoba saw below normal precipitation (Figure 2). Severe (40-60 % of median) to extreme (<40 % of median) precipitation conditions occurred over most of agro-Manitoba, extending north to Norway House and east to Island Lake. Northwest agro-Manitoba observed moderately dry (60 – 85 % of median) precipitation conditions, giving way to normal (85 – 115 % of median) to above normal (>115 % of median) precipitation surrounding The Pas and much of northwestern Manitoba, except for area surrounding Lynn Lake which experienced severely dry conditions. The remainder of northern Manitoba saw conditions ranging from moderately dry (Churchill, Thompson) to above normal (Gillam).

Over the medium term (three months), below normal precipitation persisted across agro-Manitoba. Almost all of agro-Manitoba observed moderately dry conditions with portions of the central and eastern regions observing severely dry conditions (Figure 3). An isolated area surrounding Morden observed extremely dry conditions. The region surrounding the south basin of Lake Winnipeg as well as most of the province north of Norway House observed normal to above normal precipitation, with the exception of small isolated areas surrounding Lynn Lake and Churchill which saw moderately dry conditions.

Over the long term (twelve months), most of Manitoba experienced normal to above normal precipitation conditions (Figure 4). Isolated areas centered over Arborg, Gimli and Gillam 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 5, representing hydrological conditions for May 31st, 2017.

After the flooding in April throughout much of the province, most southern Manitoba rivers and tributaries now have normal (25 – 75th percentile) to above normal (75 – 90th percentile) conditions. However, many of the lakes in the region (Winnipeg, Winnipegosis, Manitoba, St. Martin, Dauphin) are still at much above normal (> 90th percentile) levels.

Many of the rivers and tributaries in northern Manitoba peaked in mid to late May resulting in above normal to much above normal streamflow conditions for all of the northerly rivers and lakes on Figure 5 as of May 31st.

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

Agriculture and Agri-Food Canada and The National Drought Mitigation Centre monitor the spatial extent and intensity of drought conditions across Canada and the United States, respectively. They produce monthly map products available through the Canadian Drought Monitor and United States Drought Monitor websites including drought intensity mapping, which is based on a suite of data and drought indicators 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 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 Canada and Unites States Drought Monitors indicate that as of May 31st, 2017 (Figure 6) almost the entire Red River Basin is experiencing short-term abnormally dry conditions with some small pockets of moderate drought conditions in the southwest region of the watershed. The downstream portion of the Souris River Basin is experiencing abnormally dry conditions with pockets of moderate drought conditions. The southern regions of the Lake Manitoba and Lake Winnipeg basins are also classified as abnormally dry conditions, alongside the Manitoba portion of the Winnipeg River Basin.

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 80 %. There are no concerns over reservoir water supplies at this time.

On Farm Water Supply

Manitoba Agriculture's Crop Report: Issue 5 (May 29th, 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	Full
Central	Adequate
Northwest	Not specified

Field staff indicated that irrigators across the province have not reported any difficulties in filling irrigation reservoirs this spring.

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

The Provincial Wildfire Program reported that as of May 30th, 2017, there have been forty-seven wildfires burning a total of 679 hectares. Most of the area burned is located in the northeast portion of the province (77 %), followed by the central (14 %) and eastern (7 %) regions. Towards the end of May, a fire near the community of Red Sucker Lake resulted in an evacuation of hundreds of residents. The fire has since been extinguished and the residents have returned home.

On June 2nd, 2017, the Wildfire Program issued a Fire Update indicating that hot, windy and dry conditions have increased wildfire danger levels throughout much of Manitoba (see Drought Code and Fire Risk on Figure 7) and therefore all burning permits in eastern and central Manitoba have been cancelled. 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 reported for the month of May.

Manitoba Agriculture's most recent Crop Report indicates that as of May 29th, other than the northwest region and some pockets of excess moisture in the central and eastern regions, agro-Manitoba could benefit from precipitation as soil moisture is classified as inadequate in some areas including the southwest corner of the province, and parts of the central and eastern regions. Dry topsoil conditions in lighter soils and poor crop residue resulted in blowing and drifting soils in some areas (Figure 1).

Figure 1: Blowing soils near south Elm Creek.

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 May, six municipalities in Manitoba registered drought impacts on agricultural operations with the Impact Reporter. The reporting RMs were spread across the southwest, central and eastern regions of Manitoba and reported impacts ranging from minimal to severe, including: Piney (severe), MacDonald (moderate), Sifton (moderate), Wallace (minimal), Oakland (minimal), and Killarney (minimal). The reports indicated that due to below average rains this spring, topsoil is very dry in some areas, though the subsoil generally has enough moisture. Most moisture for crops is from last fall, and therefore crops are growing

unevenly due to the spatial variability in soil moisture. These remarks are echoed by soil moisture data collected by Manitoba Agriculture, which show low per cent water content at 5 cm depth (and in some instances, at 20 cm depth) at numerous locations across agro-Manitoba, primarily in the southwest, central and eastern regions.

Future Weather

The current long range (June 5th to 15th, 2017) weather forecast for Manitoba from Environment and Climate Change Canada's Global Climate Model predicts 5 - 10 mm of precipitation across the southwest, central, Interlake and eastern regions of agro-Manitoba over the next ten days. Northwest agro-Manitoba is forecasted to receive 10 - 30 mm. Most of northern Manitoba could receive 30 mm to as much as 75+ mm of precipitation in some areas. 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 (June-July-August) projects temperatures to be above normal for most of Manitoba, except for the centre of the province which is projected to experience normal temperatures (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 and El Niño conditions are equally favoured throughout the Northern Hemisphere during the summer and fall of 2017.

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

Water Supply Reservoir Levels and Storages – June 1st, 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	1,402.60	June 1, 2017	0.10	300,000	301,170	100%
Lake Wahtopanah (Rivers)	Rivers	1,536.00	1,536.49	June 1, 2017	0.49	24,500	25,606	105%
Minnewasta (Morden)	Morden	1,082.00	1,081.86	June 1, 2017	-0.14	3,150	3,125	99%
Stephenfield	Carman	972.00	972.63	June 1, 2017	0.63	3,810	4,105	108%
Turtlehead (Deloraine)	Deloraine	1,772.00	1,772.04	June 1, 2017	0.04	1,400	1,404	100%
Vermilion	Dauphin	1,274.00	1,274.81	June 1, 2017	0.81	2,600	2,789	107%
Goudney (Pilot Mound)		1,482.00	1,482.29	June 1, 2017	0.29	450	464	103%
Jackson Lake		1,174.00	1,173.96	June 1, 2017	-0.04	2,990	2,980	100%
Kenton Reservoir		1,448.00	1,448.43	**April 26, 2017**	0.43	600	617	103%
Killarney Lake		1,615.00	1,617.29	**April 6, 2017**	2.29	7,360	8,411	114%
Lake Irwin		1,178.00	1,177.94	**March 9, 2017**	-0.06	3,800	3,766	99%
Manitou (Mary Jane)		1,537.00	1,537.08	June 1, 2017	0.08	1,150	1,152	100%
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*
- 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: Drought Watch: *http://www.agr.gc.ca/drought*
- United States Drought Monitor: *droughtmonitor.unl.edu/*
- North American Drought Monitor: *https://www.ncdc.noaa.gov/temp-and-precip/drought/nadm/maps*
- 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*

For further information, please contact:

Carly Delavau, Ph.D, P.Eng.
Water Supply and Drought Management Engineer
Surface Water Management Section, Water Science and Watershed Management Branch
Manitoba Sustainable Development
Box 14, 200 Saulteaux Crescent
Winnipeg, Manitoba R3J 3W3
Ph. (204) 806-4557, Fax (204) 945-7419
E-mail Carly.Delavau@gov.mb.ca

Past reports are available on the Manitoba Drought Monitor website.

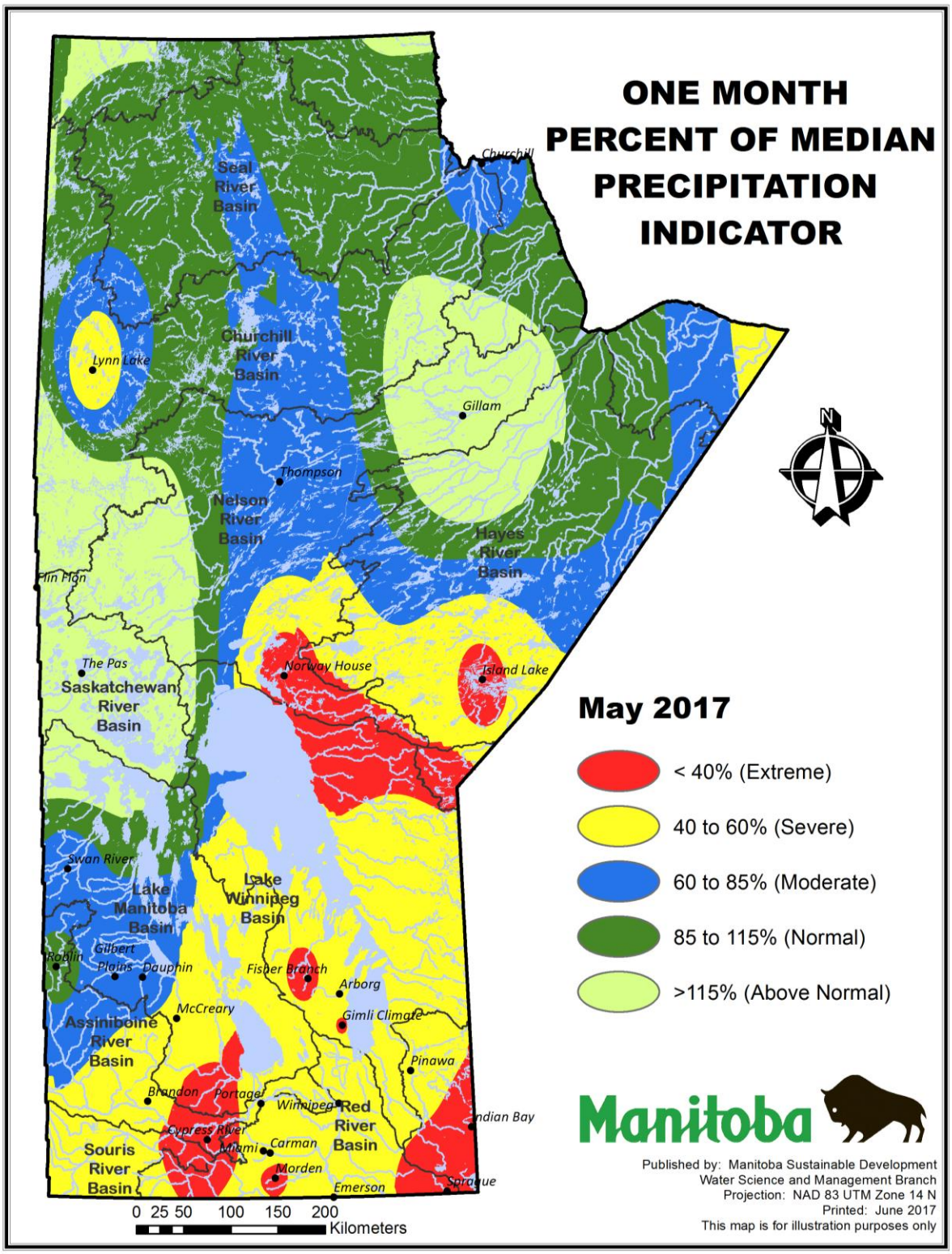


Figure 2: Short term precipitation indicator (percent of one month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

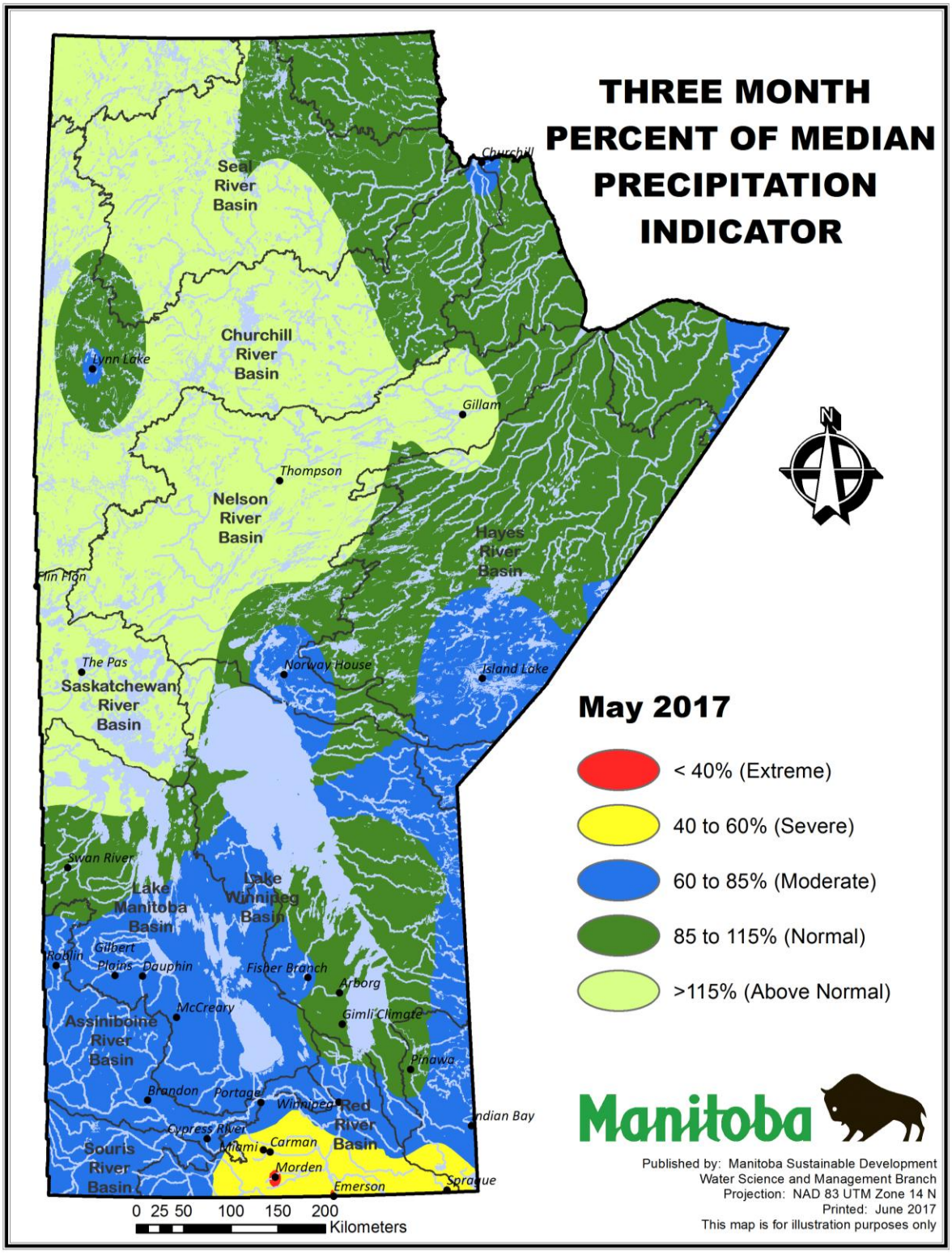


Figure 3: Medium term precipitation indicator (percent of three month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

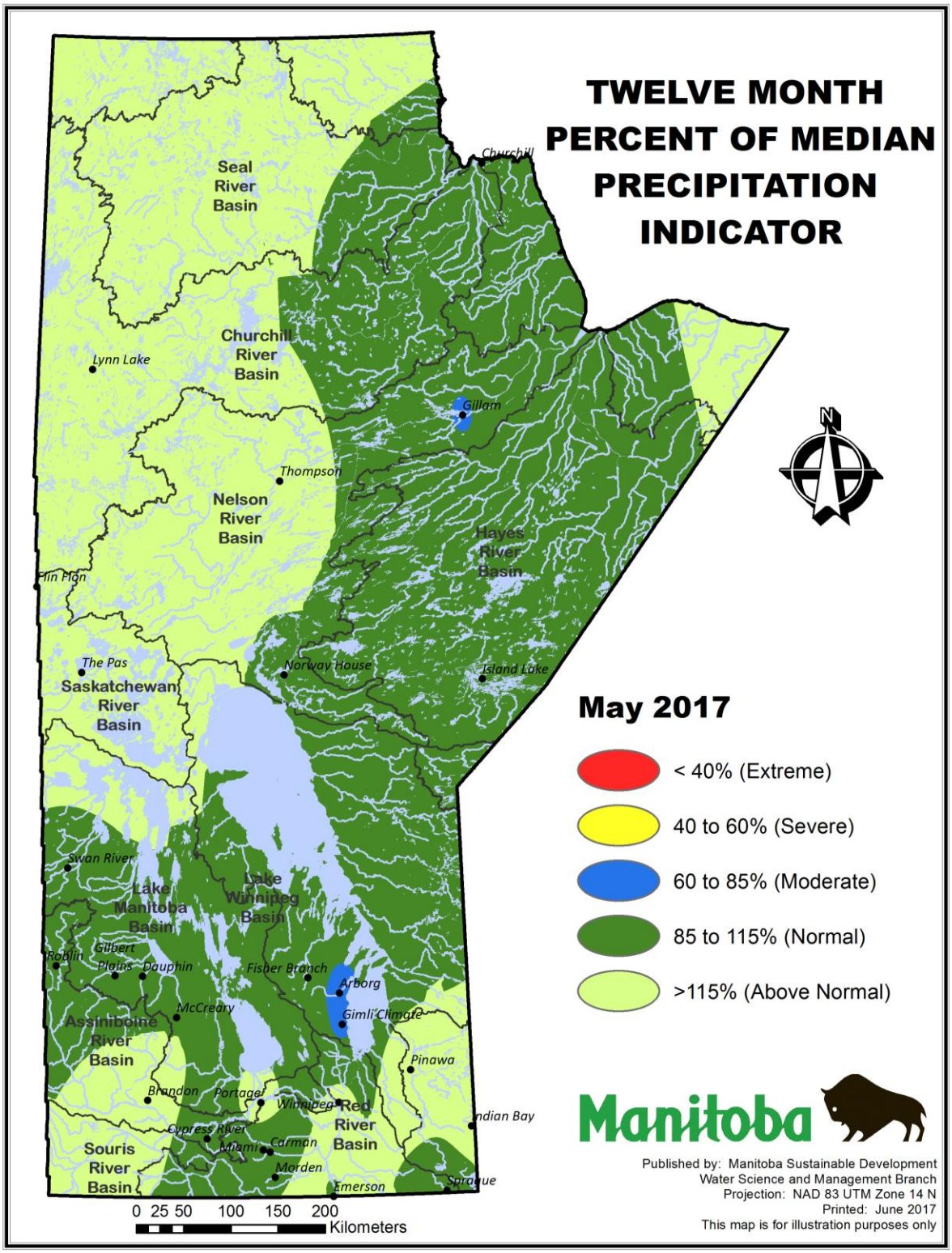


Figure 4: Long term precipitation indicator (percent of twelve month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

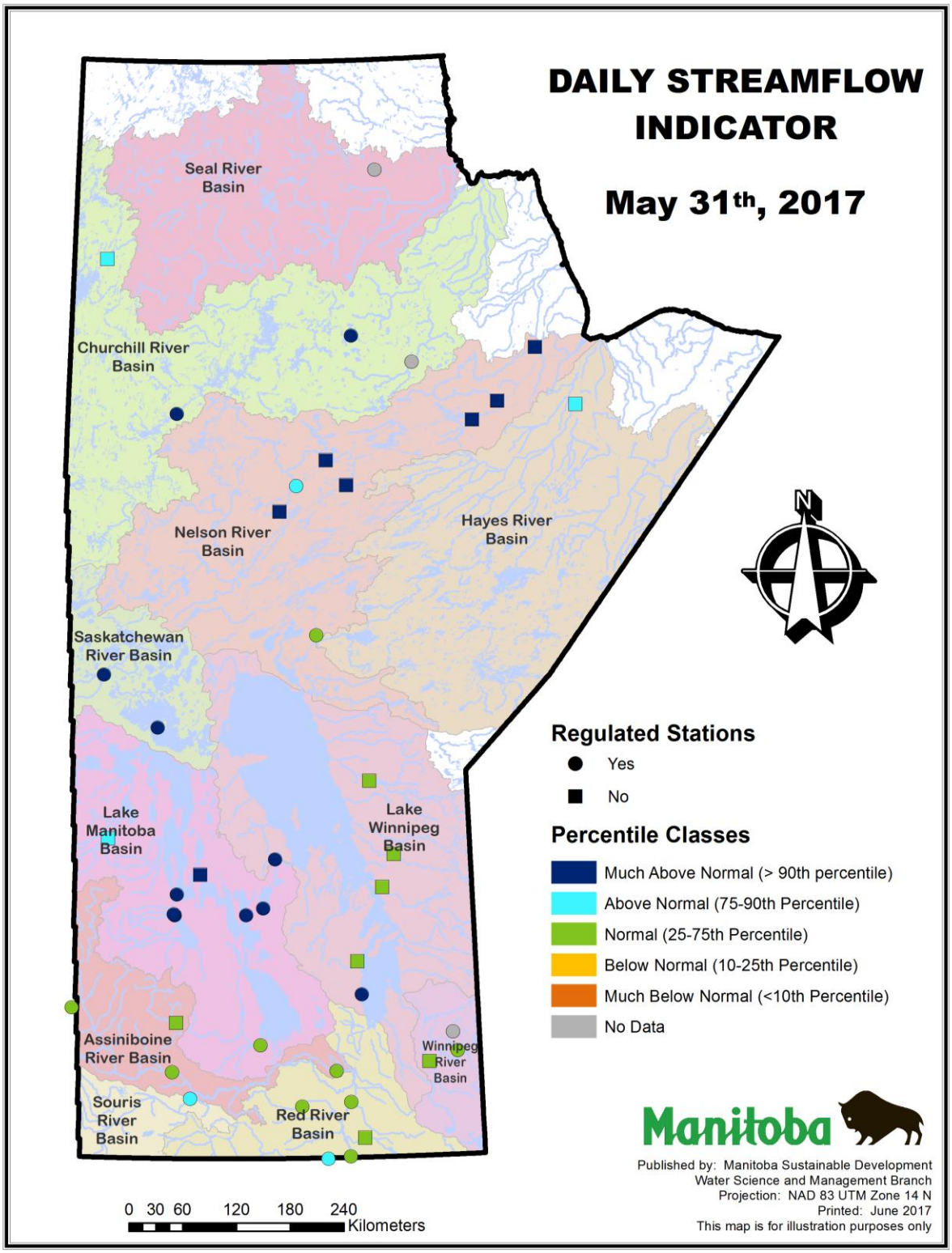


Figure 5: Daily streamflow indicator for May 31st, 2017. Real-time daily streamflow and water levels are compared to historical values for the specified day.

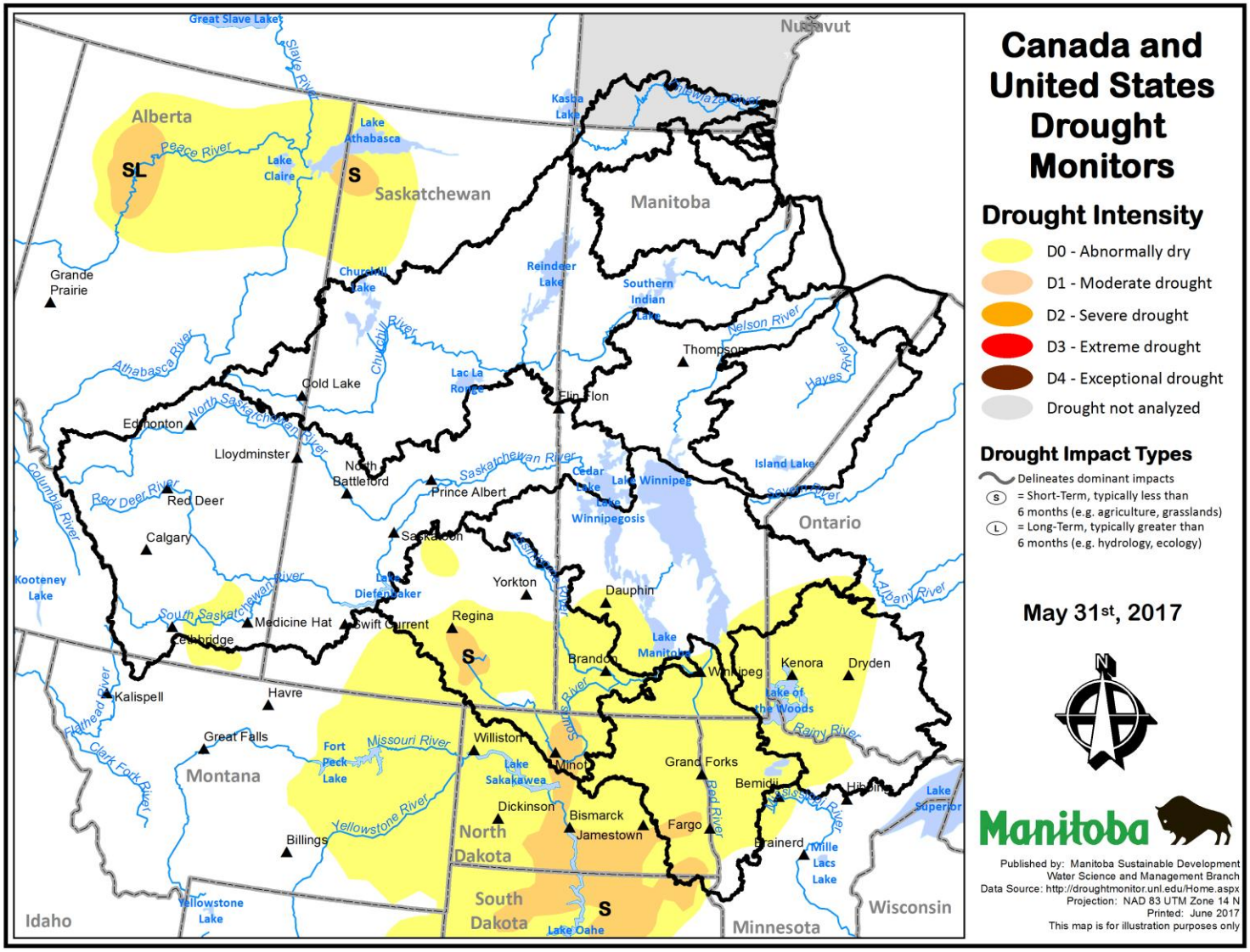
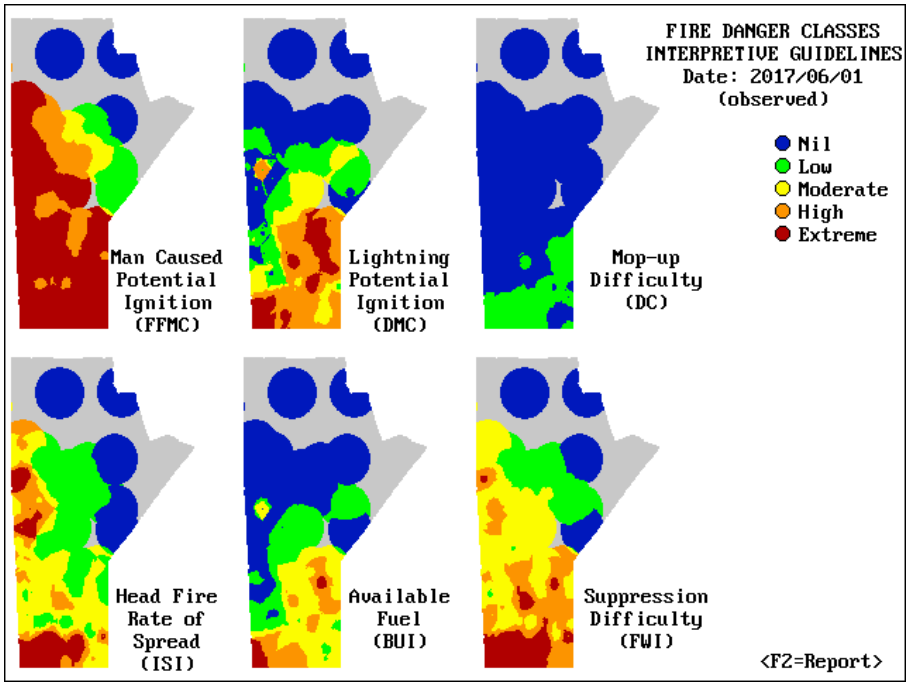
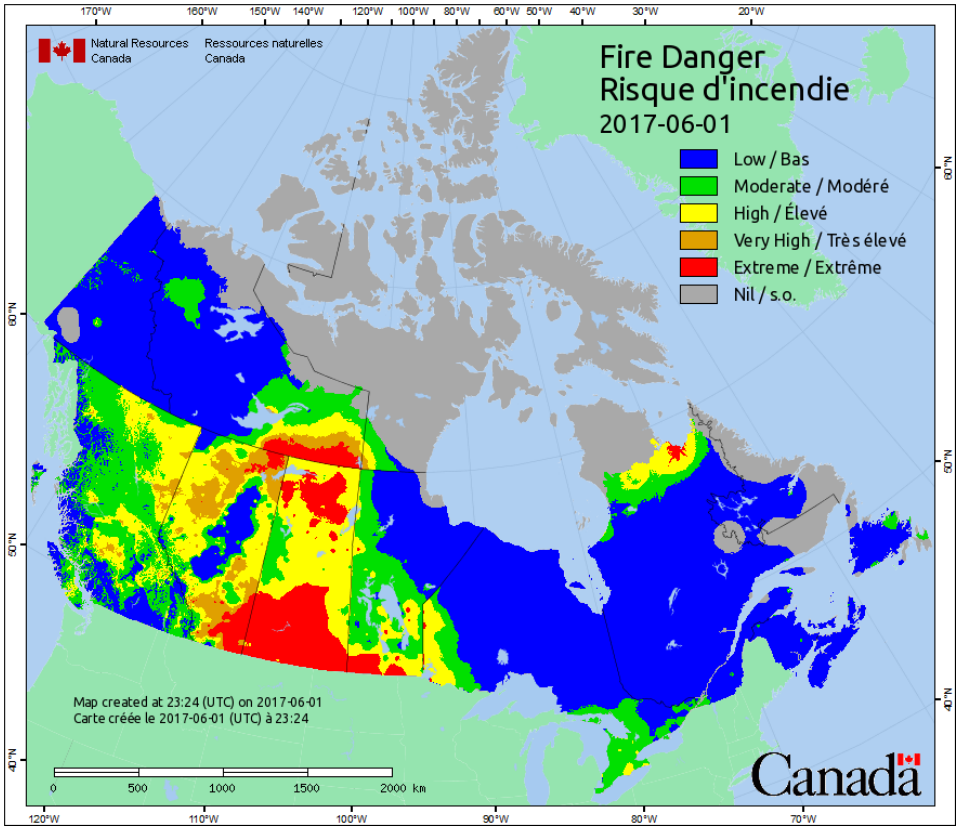


Figure 6: Canada and United States Drought Monitors short-term (S) and long-term (L) drought conditions as of May 31st, 2017.



(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.

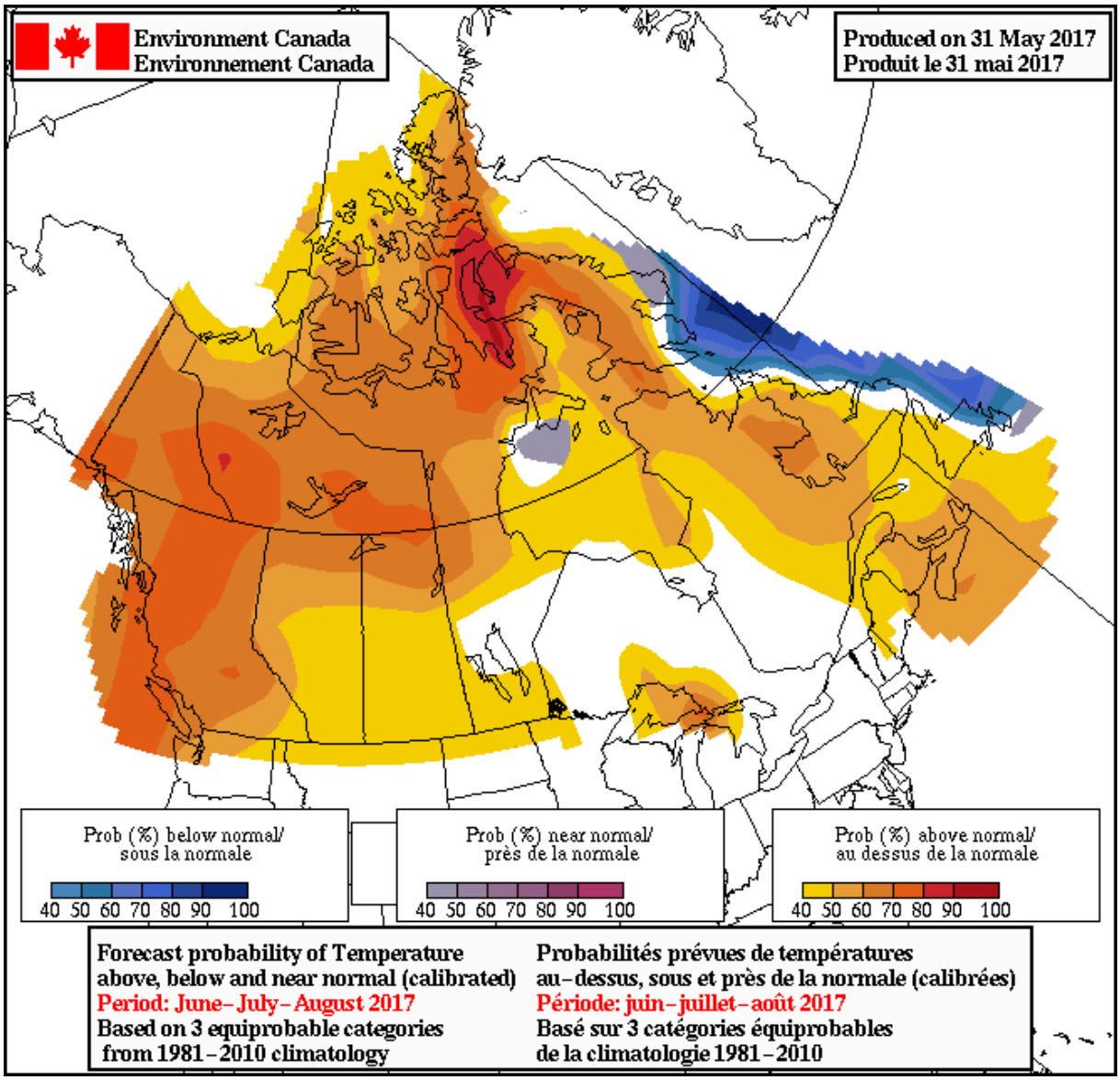


Figure 8: Environment and Climate Change Canada's seasonal (three month) temperature outlook for June-July-August.

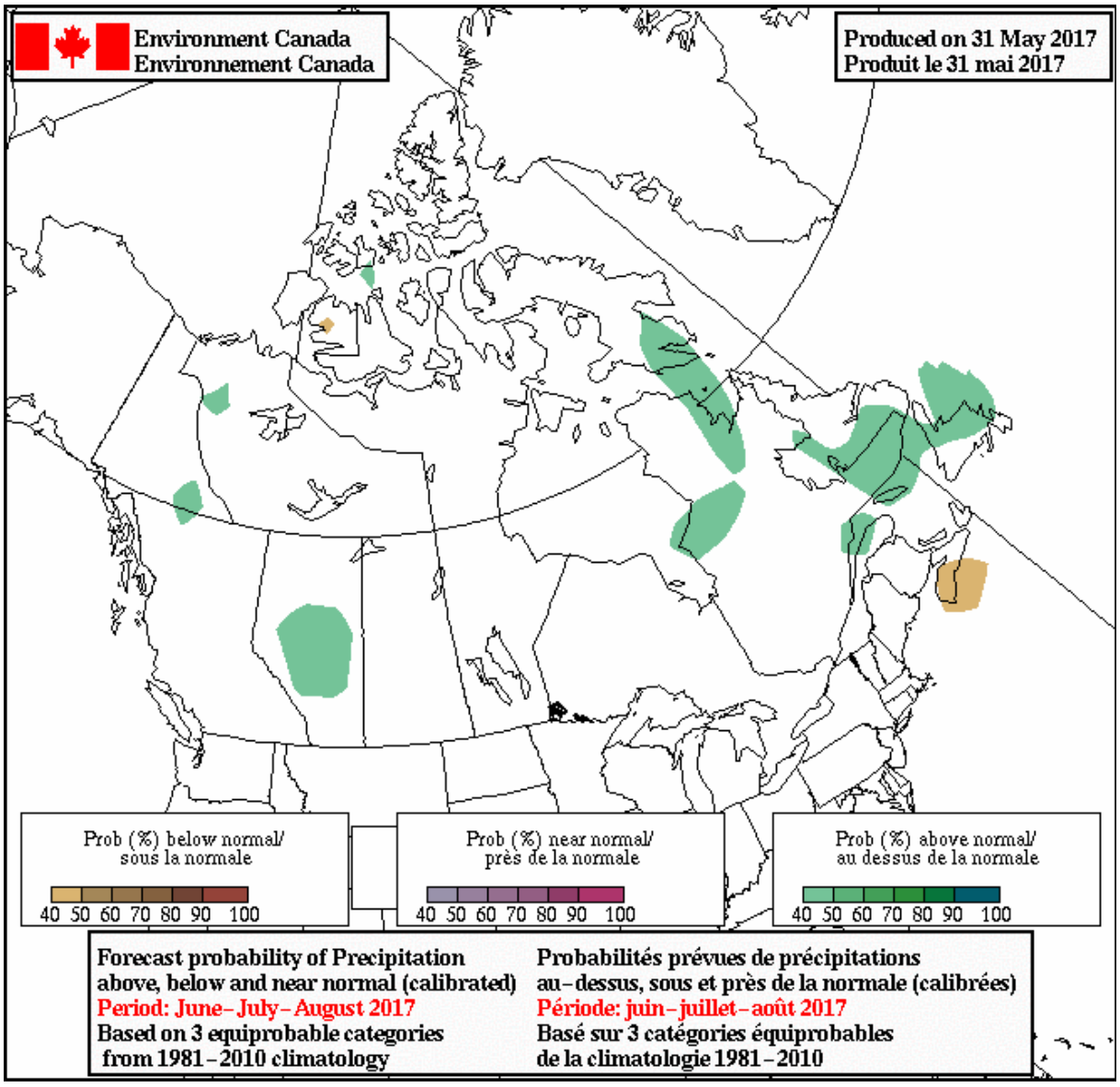


Figure 9: Environment and Climate Change Canada's seasonal (three month) precipitation outlook for June-July-August.