

Water Availability and Drought Conditions Report

April 2016

Executive Summary

- This Water Availability and Drought Conditions Report provides an update on drought conditions throughout Manitoba for April 2016.
- Over the short term (one month) and medium term (three months), southern Manitoba experienced normal or above normal precipitation. Much of the central and eastern portions of northern Manitoba experienced moderately to extremely dry conditions over the past three month period. Over the long term, most of Manitoba experienced normal to above normal precipitation conditions.
- Most southern Manitoba rivers and tributaries experienced an earlier than normal spring freshet (mid-March) followed by a reasonably quick recession, and therefore experienced moderately dry conditions for the month of April when compared to historical medians for this time of the year. Widespread rain in mid-April generated a second streamflow peak later in the month along these southern rivers and tributaries which has increased some to within the normal range for this time of year. The Churchill River Basin is experiencing severely to extremely dry streamflow conditions throughout the month of April while all other basins are experiencing normal to above normal flows.
- There are currently no major concerns over water supply as supplies are generally adequate across the province. Even with below normal snowpack, most water supply reservoirs in southern and western Manitoba are close to or exceeding full supply levels, with the exception of the Elgin Reservoir which was intentionally de-watered in the fall of 2015 and is now at 36 per cent of full supply level. Manitoba Agriculture reported that dugout conditions are generally adequate across Agri-Manitoba except for the central region where supplies are 70 to 80 per cent of capacity.
- Warmer temperatures, low humidity and increasing winds have increased the risk of wildfires. The fire risk is considered to be high to extreme for much of southern and northwest Manitoba, and is generally moderate throughout the remainder of the province.
- Environment and Climate Change Canada's seasonal temperature forecast for May, June and July is projected to be above normal across Manitoba. The seasonal precipitation forecast for May, June and July is projected to be normal across the province.
- For more information on drought in Manitoba please visit the Manitoba Drought Monitor website: <http://www.gov.mb.ca/drought>.

Drought Indicators

Precipitation and streamflow drought indicators have been developed to assess drought conditions across Manitoba. Additionally, the Canadian Drought Monitor produces a blended drought indicator for Canada. 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) and medium term (three months), southern Manitoba experienced normal or above normal conditions. Much of the central and eastern portions of northern Manitoba experienced severely to extremely dry conditions during the month of April, and moderately to severely dry conditions over the past three months (February - April).

Over the long term (twelve months), most of Manitoba experienced normal to above normal conditions. Isolated areas centered over Dauphin, Fisher Branch, Cypress River 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. The streamflow indicator is summarized by basin in Table 1 and on Figure 4.

Most southern Manitoba rivers and tributaries experienced an earlier than normal spring freshet (mid-March) followed by a reasonably quick recession, and therefore experienced moderately dry conditions for the month of April when compared to historical medians for this time of the year. These include the Boyne River at Carman, Pembina River at Neche, Souris River at Wawanesa, and Qu'Appelle River at Welby. The April streamflow indicator for Red River at Emerson was extremely dry for April. Widespread rain in mid-April generated a second streamflow peak later in the month along these southern rivers and tributaries which has increased some, including the Red River at Emerson, to within the normal range for this time of year.

Within the Churchill River Basin, the Churchill River at Leaf Rapids is extremely dry and the Cochrane River is severely dry. All other basins are experiencing normal to above normal flows.

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 March map (Figure 5) indicates that an area in south-western Manitoba region and large areas in northern Manitoba are experiencing abnormally dry (D0) conditions. The Canadian Drought Monitor shows drought conditions dissipating as more area was classified as D0 and some areas were D1 at the end of March.

Table 1: Drought Indicators by Major River Basin

Basin (in Manitoba)	Drought Indicators			
	Precipitation Indicators			Monthly Flow Indicators April 2016
	Percent of 1 Month Median April 2016	Percent of 3 Month Median February - April 2016	Percent of 12 Month Median March 2015 – April 2016	
Red River	Above normal	Above normal	Normal to above normal	Roseau River is normal, Boyne and Pembina Rivers are moderately dry, and the Red River main stem is moderately to extremely dry
Winnipeg River	Above normal	Above normal	Above normal	Above normal
Assiniboine River- Souris River	Above normal conditions except for moderately dry conditions in the western portion of the upper Assiniboine River basin centered over Roblin	Normal to above normal	Normal with moderately dry conditions isolated over Cypress River	Qu'Appelle River is moderately dry, Souris River is moderately dry to normal, and Assiniboine River main stem is normal to above normal
Lake Manitoba	Normal to above normal	Normal to above normal	Normal except for moderately dry conditions isolated over Dauphin	Normal to above normal
Lake Winnipeg	Normal in the south and central portions of the basin, moderately to extremely dry conditions in the north	Normal to above normal in the south and central portions of the basin, moderately to severely dry conditions in the north	Normal to above normal except for moderately dry conditions isolated over Fisher Branch	Above normal
Saskatchewan River	Normal with moderately dry conditions centered over Flin Flon	Normal to above normal	Normal	Above normal
Nelson River	Extremely dry throughout the centre and eastern portions of the basin, with less severe conditions in the west.	Extremely dry conditions centered over Norway House, and severely dry throughout the centre and eastern portions of the basin, evolving to less severe conditions in the west.	Normal	Normal to above normal
Hayes River	Severely to extremely dry	Severely dry	Normal	Above normal
Churchill River	Normal to above normal in the western portion of the basin, moderately to extremely dry conditions in the east	Normal in the western portion of the basin, moderately to severely dry conditions in the east	Normal except for moderately dry conditions centered over Churchill	Extremely low flows for Churchill River at Leaf Rapids and severely low flows for Cochrane River
Seal River	Normal in the western portion of the basin, moderately to extremely dry conditions in the east	Normal to severely dry	Normal	Above normal

Water Availability

Reservoir Conditions

Water supply reservoirs are close to or at full supply level, with the exception of the Minnewasta and Elgin Reservoirs which are at 86 % and 36 % 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 south-western Manitoba (40 to 60 % of normal in the Elgin Reservoir catchment area) resulted in a lack of runoff in the region to refill the reservoir to full supply level. Spring and summer rainfall will help to replenish the reservoir; however, full supply level may not 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 their first report of the year, Crop Report: Issue 1 (May 2nd, 2016) are summarized in Table 2.

Table 2: On Farm Water Supply (Dugout) Conditions

Region	General Dugout Condition
Eastern	Adequate
Interlake	Not reported
Southwest	70-80 % capacity
Central	Adequate
Northwest	Adequate

Field staff indicated that irrigators along tributaries of the Morris River (Buffalo Creek, Hespeler and Rosenheim Drains) in central Manitoba have, for the most part, been successful in filling their irrigation reservoirs with runoff from the spring melt. Producers located along tributaries of the Whitemud River (Squirrel and Pine Creeks) have also indicated adequate runoff to fill irrigation reservoirs. Other areas of the province will be visited over the upcoming weeks to survey water supplies for irrigation.

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.

Drought Impacts

Overall, there have been minimal drought impacts during the month of April.

Manitoba Agriculture Food and Rural Development's most recent Crop Report indicates that as of May 2nd, due to favourable weather and field conditions seeding operations are underway in many areas of agro-Manitoba, with the greatest progress reported in the southwest and central regions of the province. Drier topsoil conditions have been noted in some areas.

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. Three municipalities in southwest Manitoba (Winchester, Argyle, and Clanwilliam) have registered minimal drought impacts on agricultural operations with the Impact Reporter during the month of April. Drought impacts in these municipalities were generally related to short-term dryness slowing crop/pasture growth and anticipated water shortages if conditions persist.

The Provincial Wildfire Program reported that as of May 5th, 2016, there have been 36 wildfires to date, 18 of which are still actively burning. Over 80 per cent of these fires occurred within the central and eastern regions of the province, with a total area of 1056 hectares burned overall. Warmer temperatures, low humidity and increasing winds have increased the risk of wildfires, as illustrated by the maps on Figure 6, where the fire risk is considered to be high to extreme for much of southern and northwest Manitoba, and is generally moderate throughout the remainder of the province. For these reasons, burning bans have been put in place for eastern and central Manitoba, as well as parts of western Manitoba. Any permits that had been issued have now been cancelled until conditions improve. Additionally, as of May 5th, travel restrictions are in place for areas in eastern and western Manitoba. More up to date wildfire conditions and restrictions, including burning bans, are available at the Wildfire Program's website (www.gov.mb.ca/wildfire).

Future Weather

Environment and Climate Change Canada's seasonal forecast for the next three months (May-June-July) projects temperatures to be above normal (Figure 7) and precipitation to be normal (Figure 8) for Manitoba. The National Oceanic and Atmospheric Administration predict a transition from El Niño conditions to ENSO-neutral conditions during late spring or early summer of 2016.

The ten day forecast for Manitoba from Environment and Climate Change Canada's Global Climate Model indicates some rain is expected over most of the province by mid-May, with estimates ranging from 20 to 50 mm in the southwest corner to 5 to 20 mm over most of northern Manitoba. The Interlake region eastward to the Ontario border and the southeast corner of the province are forecasted to have less than 5 mm of rainfall over the next ten days. Long range precipitation forecasts have considerable uncertainty and are likely to change in the upcoming days.

Table 3: Reservoir Status (Southern and Western)

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	1525.68	April 27, 2016	-6.32	520	189	36% **
Lake of the Prairies (Shellmouth)*	Brandon, Portage	1,402.50	1,404.88	May 1, 2016	2.38	300,000	333,749	111%
Lake Wahtopanah (Rivers)	Rivers	1,536.00	1,537.93	May 1, 2016	1.93	24,500	28,839	118%
Minnewasta (Morden)	Morden	1,082.00	1,079.26	May 1, 2016	-2.74	3,150	2,713	86%
Stephenfield	Carman	972.00	972.49	May 1, 2016	0.49	3,810	4,039	106%
Turtlehead (Deloraine)	Deloraine	1,772.00	1,772.07	May 1, 2016	0.07	1,400	1,408	101%
Vermilion	Dauphin	1,274.00	1,274.75	May 1, 2016	0.75	2,600	2,774	107%
Goudney (Pilot Mound)		1,482.00	1,482.22	April 30, 2016	0.22	450	461	102%
Jackson Lake		1,174.00	1,173.80	April 30, 2016	-0.20	2,990	2,940	98%
Kenton Reservoir		1,448.00	1,447.95	April 28, 2016	-0.05	600	597	99%
Killarney Lake		1,615.00	1,615.47	April 21, 2016	0.47	7,360	7,578	103%
Lake Irwin		1,178.00	1,178.06	May 2, 2016	0.06	3,800	3,842	101%
Manitou (Mary Jane)		1,537.00	1,536.52	April 30, 2016	-0.48	1,150	1,107	96%
Rapid City		1,573.50	1,573.54	April 28, 2016	0.04	200	203	101%
St. Malo		840.00	841.42	April 19, 2016	1.42	1,770	2,005	113%

* 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>

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Past reports are available at:

www.gov.mb.ca/drought

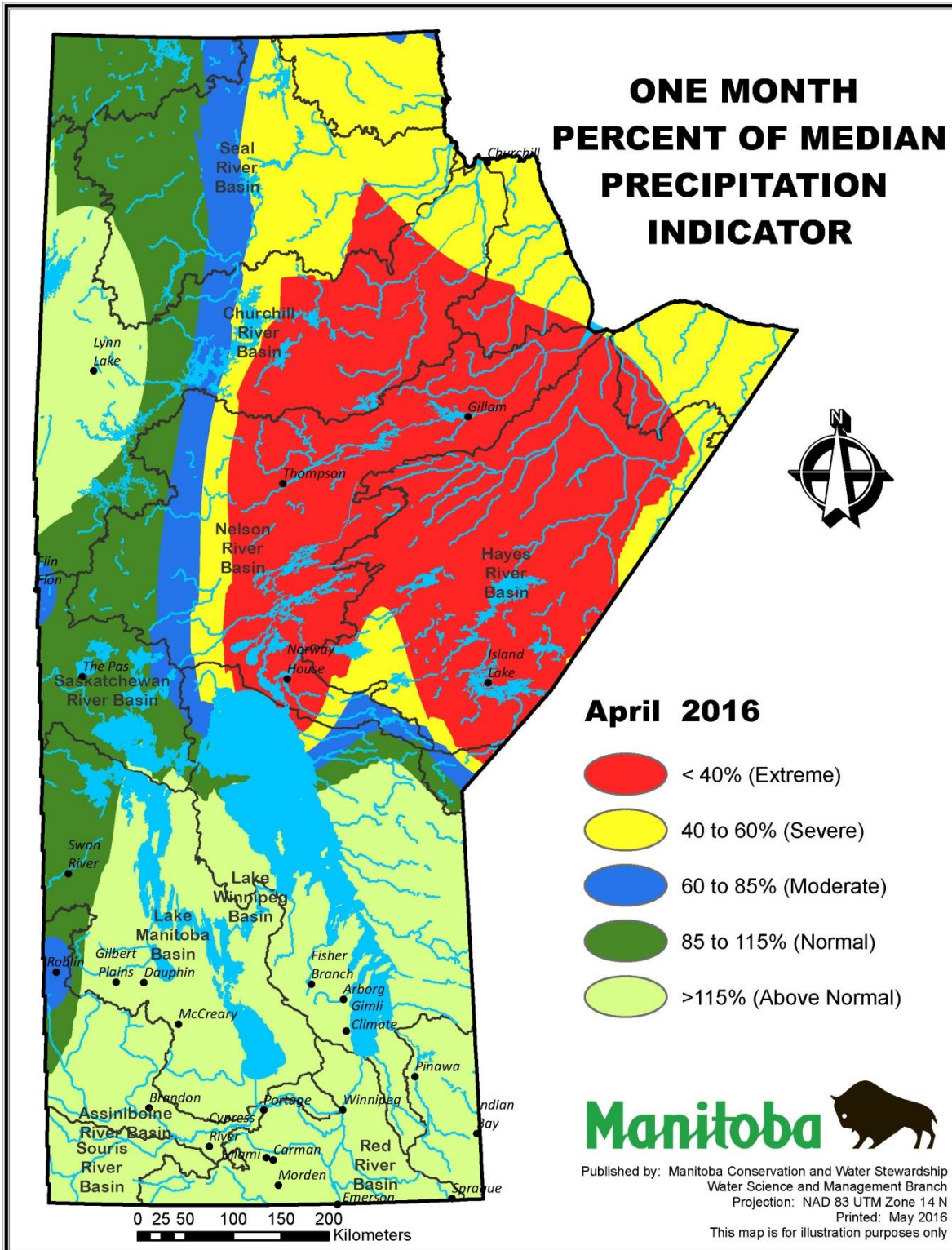


Figure 1: Precipitation Indicator (percent of one month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

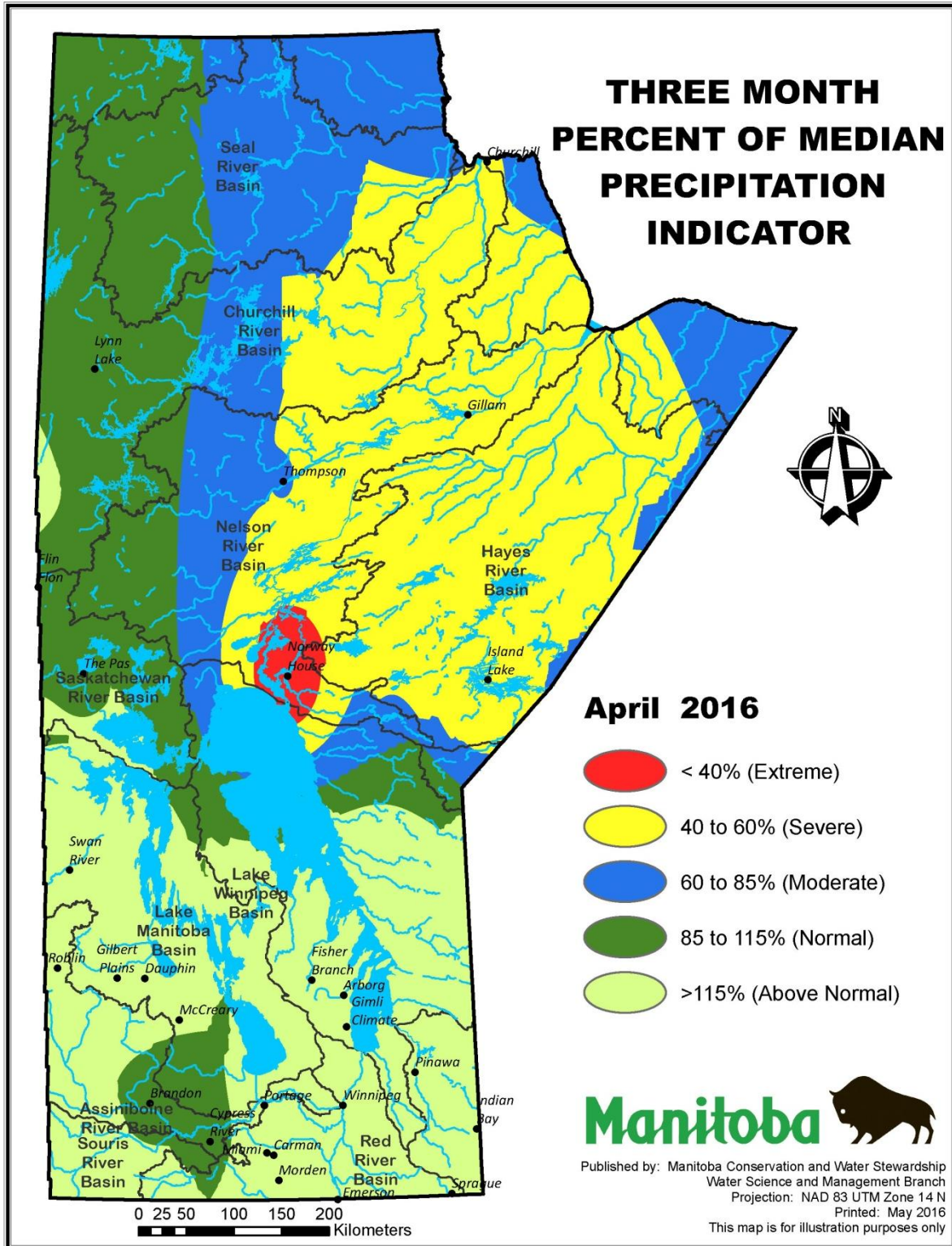


Figure 2: Precipitation Indicator (percent of three month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

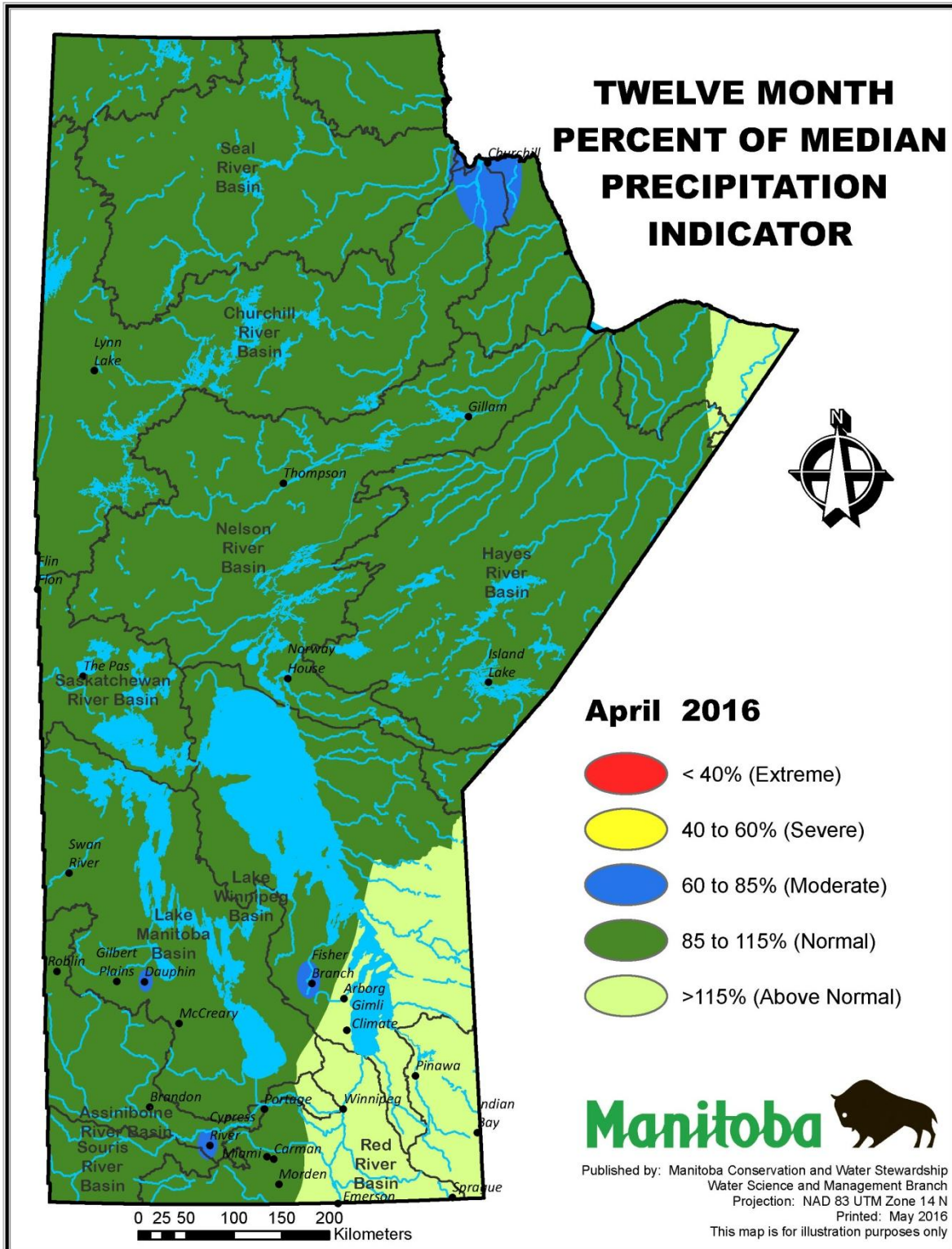


Figure 3: Precipitation Indicator (percent of twelve month median precipitation). Baseline medians are computed from 45 years of data (1971 – 2015).

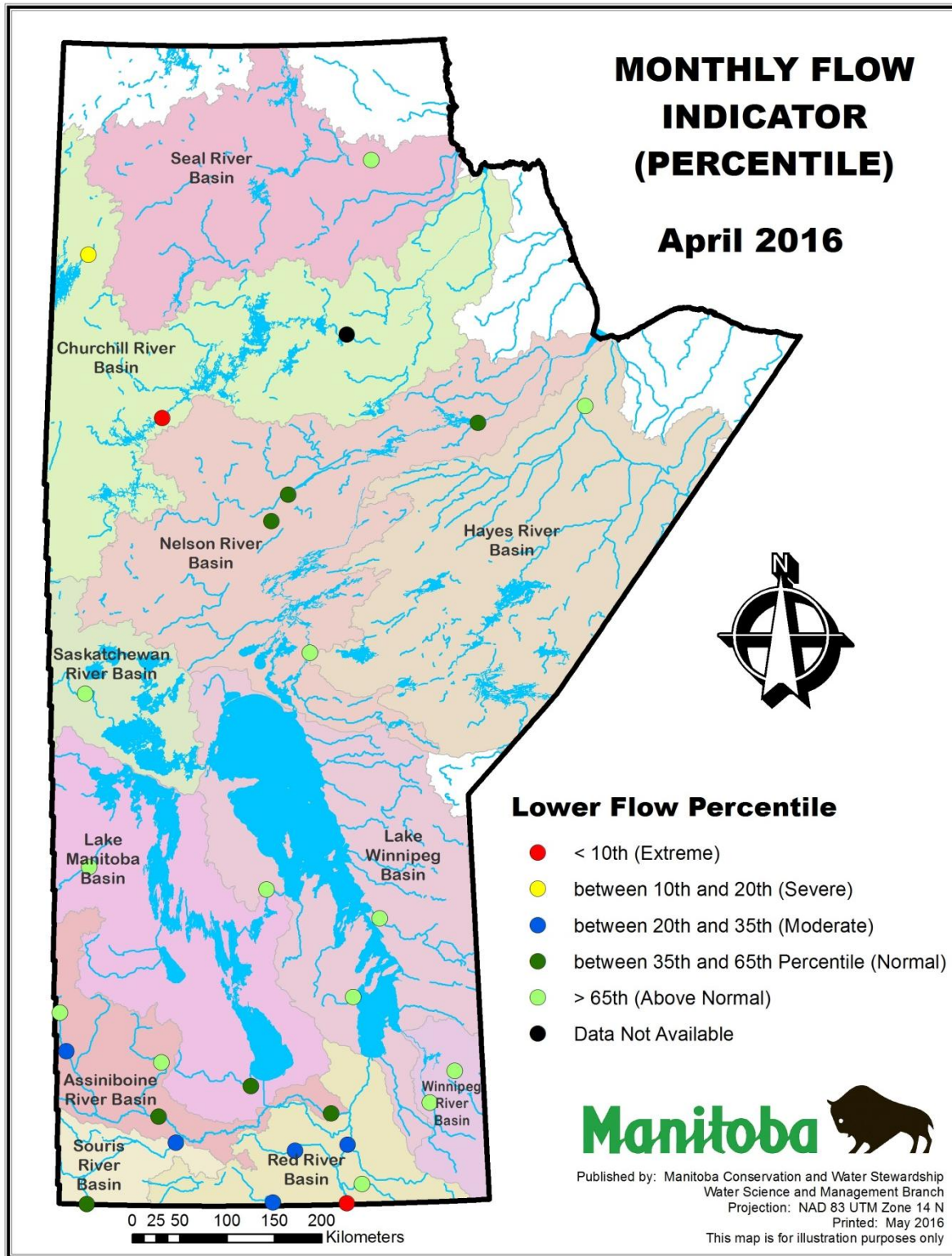


Figure 4: Monthly Flow Indicator for April, 2016.

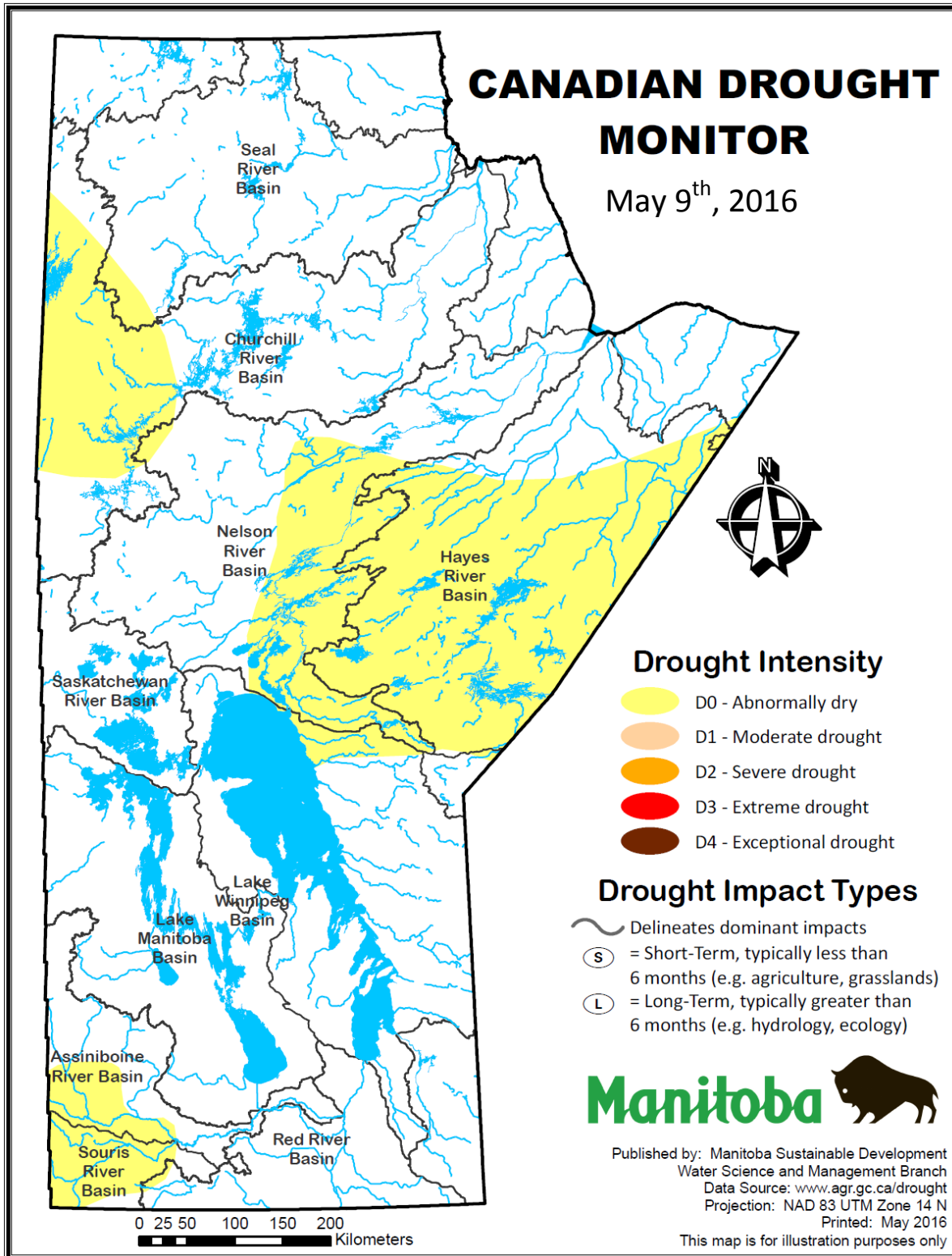
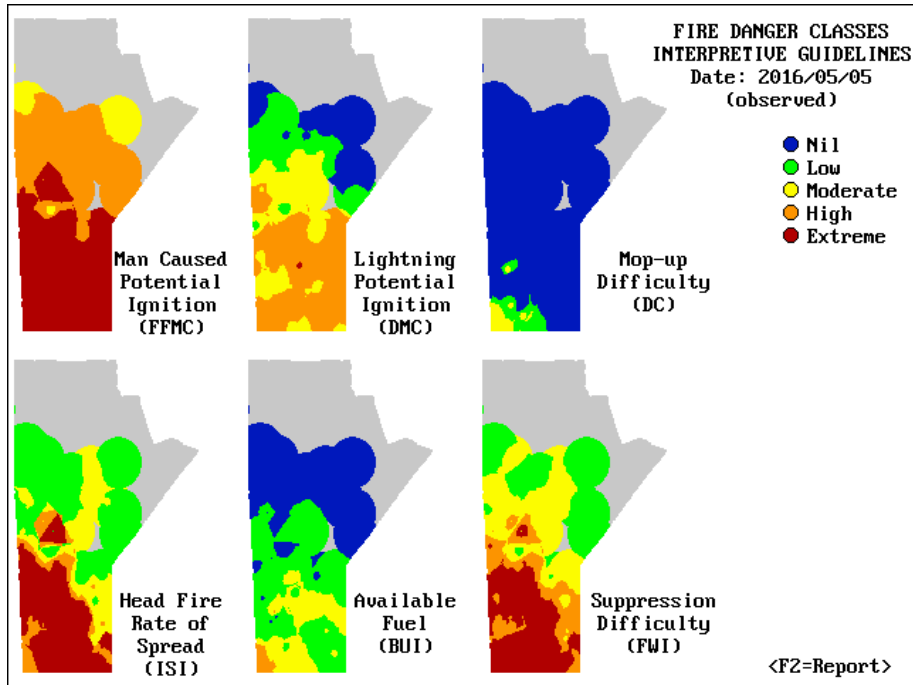
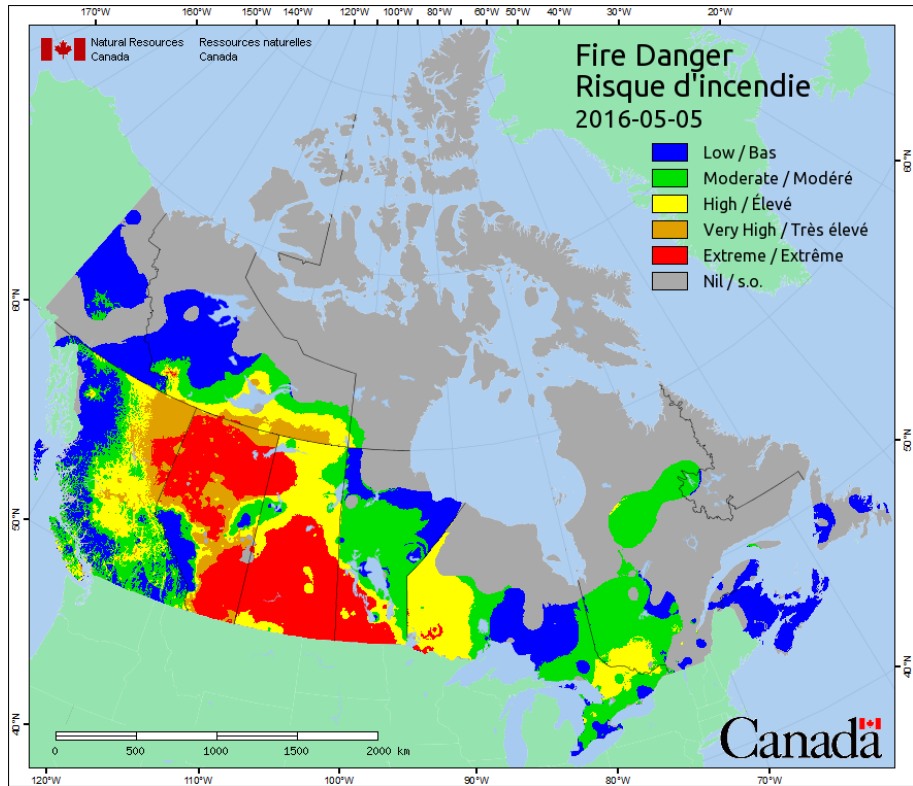


Figure 5: Agriculture and Agri-Food Canada’s Canadian Drought Monitor mapping of short-term (S) and long-term (L) drought conditions as of April 30th, 2016.



(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.

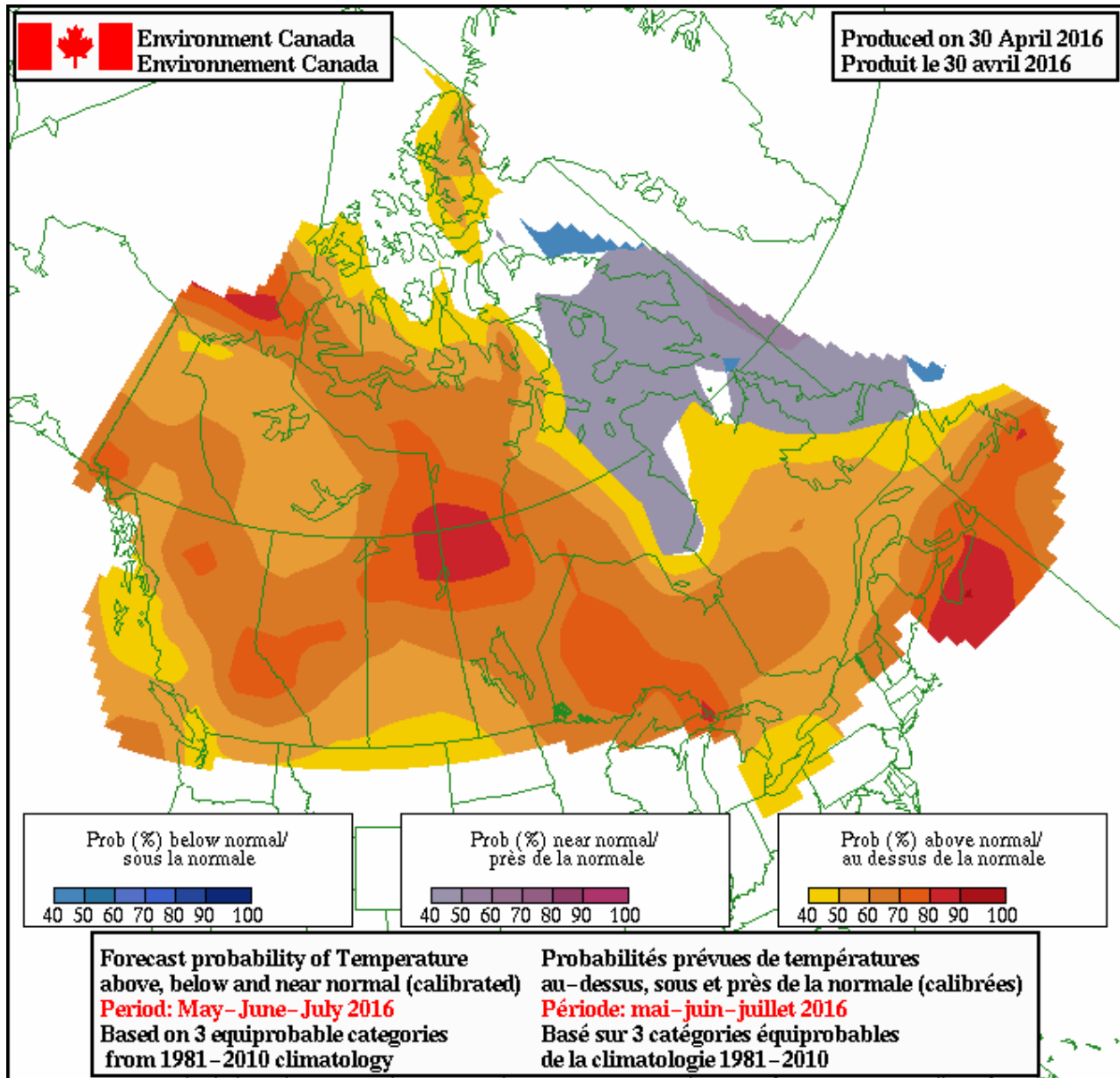


Figure 7: Environment and Climate Change Canada Seasonal (3 month) Temperature Outlook for May – June - July.

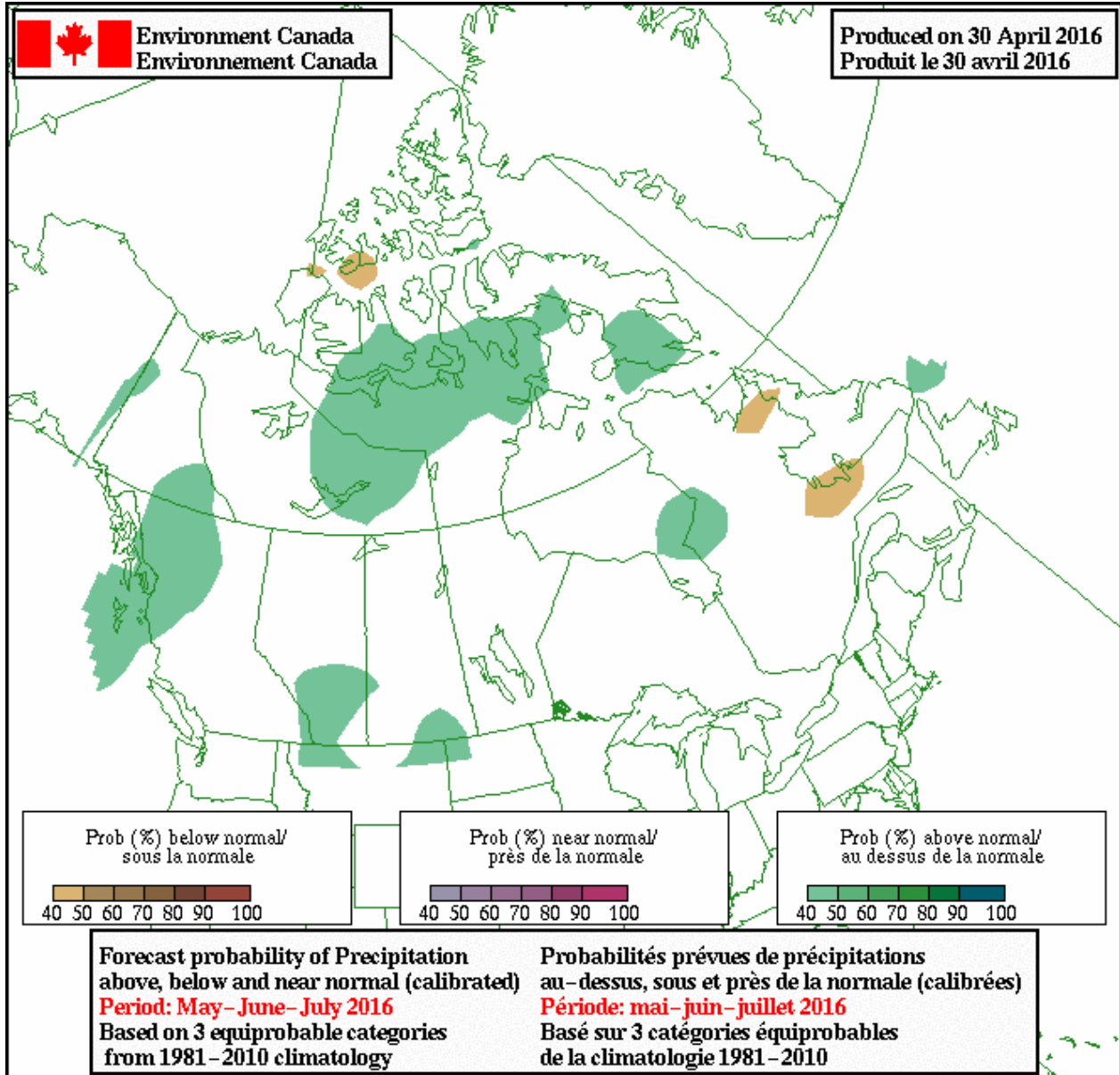


Figure 8: Environment and Climate Change Canada Seasonal (3 month) Precipitation Outlook for May – June - July.

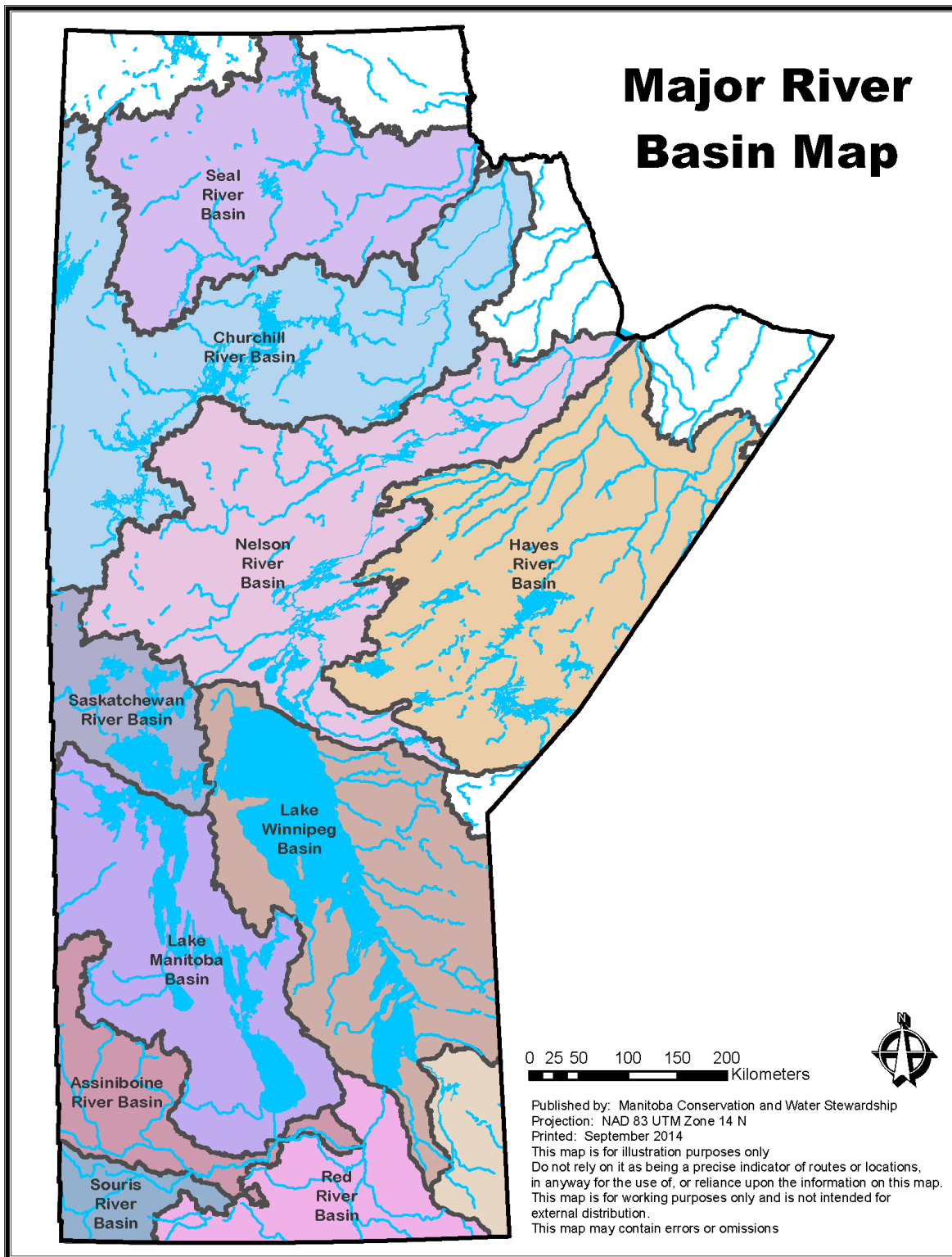


Figure 9: Major Manitoba river basins.