Hydrologic Forecast Centre

Manitoba Transportation and Infrastructure

Winnipeg, Manitoba

FEBRUARY FLOOD OUTLOOK

February 28, 2023

Executive Summary

The February Outlook Report prepared by the Hydrologic Forecast Centre (HFC) of Manitoba Transportation and Infrastructure reports low to moderate risk of significant spring flooding in most southern Manitoba basins. Water levels are expected to remain below dikes and community or individual flood protection levels at all locations wherever there are dikes and community or individual flood protection works. The risk of flooding could change depending on weather conditions between now and the spring melt.

While the risk of spring flooding is generally low for several rivers including the Souris, Roseau, Rat and Pembina rivers, there is a moderate risk of flooding in the Interlake Region along the Fisher and Icelandic Rivers, and along the Red and Assiniboine Rivers. There is also a low risk of flooding for most other Manitoba basins including the Saskatchewan River, Whiteshell Lakes area, and northern Manitoba. With the exceptions of Dauphin Lake and Lake St Martin, most Manitoba lakes, including Lake Winnipeg and Lake Manitoba, are currently projected to remain within their operating ranges after the spring runoff.

Soil Moisture Conditions at Freeze up:

Soil moisture at freeze-up is one of the major factors that affects spring runoff potential and spring flood risk. Due to normal to below normal summer and fall precipitation, the soil moisture at freeze-up is normal to below normal for most Manitoba basins. Some localized areas in central Manitoba and in the Interlake region have above normal soil moisture. The soil moisture is normal to below normal for the Red and Souris River basins (including the U.S. portions of the basin), the Assiniboine River, Qu'Appelle River, Saskatchewan River, Winnipeg River and northern Manitoba basins.

Winter Precipitation:

Winter precipitation has been generally below normal in most central and southern Manitoba basins, with the exception of southeastern Manitoba that has received near normal precipitation. Winter precipitation has been normal to above normal throughout northern Manitoba basins, including the Saskatchewan and Churchill River basins. The United States portions of the Red River and Souris River basins also received normal to above normal precipitation since November 1st.

Snow Water Equivalent (SWE):

Snow Water Equivalent (SWE) is the measure of the amount of water content in the snow. Snow water equivalent (SWE) estimates obtained from January field measurements indicate SWE measurements range from 22 to 167 mm (0.9 to 6.6 inches). The average water content in the snowpack for most of the southern and central Manitoba basins is in the order of 30 to 80 mm (1.2 to 3.1 inches). The Shellmouth Reservoir basin has an average SWE value of approximately 70 mm (2.8 inches). Northern Manitoba, including the Saskatchewan River basin, has SWE of approximately 55 to 150 mm (2.2 to 5.9 inches). The Red River basin in the U.S. has an average SWE of approximately 65 mm with some localized areas with SWE measurements as high as 135 mm.

Base Flows and Levels:

Base flows and levels indicate the amount of water available in the system prior to the spring runoff. Higher base flows indicate higher soil saturation levels and higher spring runoff potentials. Base flows and levels in most rivers have been gradually declining since the fall of 2022. Base flows and levels are generally near normal to above normal in most Manitoba basins.

Soil Frost Depth:

Soil frost depth affects the amount of surface water that infiltrates into the soil. Generally, deeper than normal frost depth means the soil absorbs less water and contributes to increased surface runoff; whereas shallower than normal frost depth means the soil can absorb more melting surface water and can potentially decrease the amount of overland flooding. The frost depth is variable across the watersheds, but is generally considered to be normal to shallower than normal throughout most of the province due to warmer than normal winter temperatures.

Future Weather:

Most parts of southern Manitoba and the U.S. portion of the Red and Souris River basins are forecasted to receive less than 5 mm of precipitation in the next 7 days. Northern Manitoba could receive up to 15 mm of precipitation. In the longer range, climate outlook issued by the International Research Institute (IRI) at the Columbia Climate School indicate higher chance for near normal to above normal precipitation in southern and central Manitoba for March, April, May, and June and below normal to near normal precipitation in northern Manitoba during these times. Long range weather predictions are generally not reliable.

Flood Outlook:

The magnitude of the spring runoff on Manitoba's rivers is still very dependent on weather conditions from now until the spring melt and during the spring melt period. The runoff potential is significantly affected by the amount of additional snow and spring rains, frost depth at the time of runoff, and timing and rate of spring thaw; and the timing of peak flows in Manitoba, the United States, Saskatchewan and Ontario. A late thaw and spring rainstorms could result in a rapid snow melt that increases overland flooding and flows on tributary streams and larger rivers.

The province's practice is to plan and prepare for the unfavourable future weather condition scenario, which is a weather scenario that would have a 1-in-10 chance of occurring from now until the spring run-off. The preliminary spring flood outlook based on current basin conditions and future weather condition scenarios shows the risk of significant flooding is moderate for the Red River and the Assiniboine River. Similarly, the risk of significant spring flooding is moderate for the Interlake region including, the Fisher River and Icelandic River. However, as in most years, the risk of ice jam related flooding is high for the Icelandic and Fisher Rivers. The risk of significant spring flooding is low for most other Manitoba basins including the Pembina, Roseau, Souris, Rat, Saskatchewan and Carrot Rivers.

Water Control Structures Operations:

The Red River Floodway is expected to be operated under unfavourable weather conditions to reduce water levels within the City of Winnipeg. Limited operation of the Red River Floodway could be needed even for normal weather conditions. The Portage diversion is expected to be operated under unfavourable weather conditions. Also, minimal operation of the Portage Diversion may be necessary under normal and favourable weather conditions to prevent ice jamming on the Assiniboine River east of Portage la Prairie and to control river levels in the City of Winnipeg as well as areas along the Assiniboine River downstream

of Portage la Prairie. The Shellmouth Reservoir is being operated in consultation with the Shellmouth Liaison Committee members in order to reduce the risk of flooding downstream on the Assiniboine River, while at the same time providing sufficient storage for water supply and recreation.

Preparations:

The Manitoba government, local authorities and First Nation communities are continuing to prepare for spring flooding. This includes ice cutting and breaking this spring on the Red and Icelandic rivers, review of existing emergency response plans, information sharing, and preparation of resources used in flood response.

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Soil Moisture Conditions

In Manitoba, the most common method used to determine soil moisture at freeze-up is the MANAPI model, which is expressed by the API (Antecedent Precipitation Index). The API model indicates the amount of summer and fall rain (May to October) that remains in the top soil layer and has yet to contribute to the spring runoff. The API model results indicate that soil moisture is near normal to below normal for the majority of Manitoba basins (Figure 1). There are pockets of areas in southern and central Manitoba, including areas near Winnipeg, and the Interlake region that have above normal soil moisture. Western Manitoba and most of the U.S. portions of the Red River and Souris River basins have normal to below normal soil moisture. The soil moisture is normal to below normal in the Assiniboine River and Qu'Appelle River basins. The Winnipeg River system in Ontario has below normal soil moisture. Eastern Manitoba and the Whiteshell Lakes area have near normal soil moistures.

The soil moisture content modeled by the National Weather Service (NWS) in the U.S. indicates, soil moisture is normal to below normal for the Red, Souris, Pembina, and Roseau River basins in the U.S. (Figure 2).

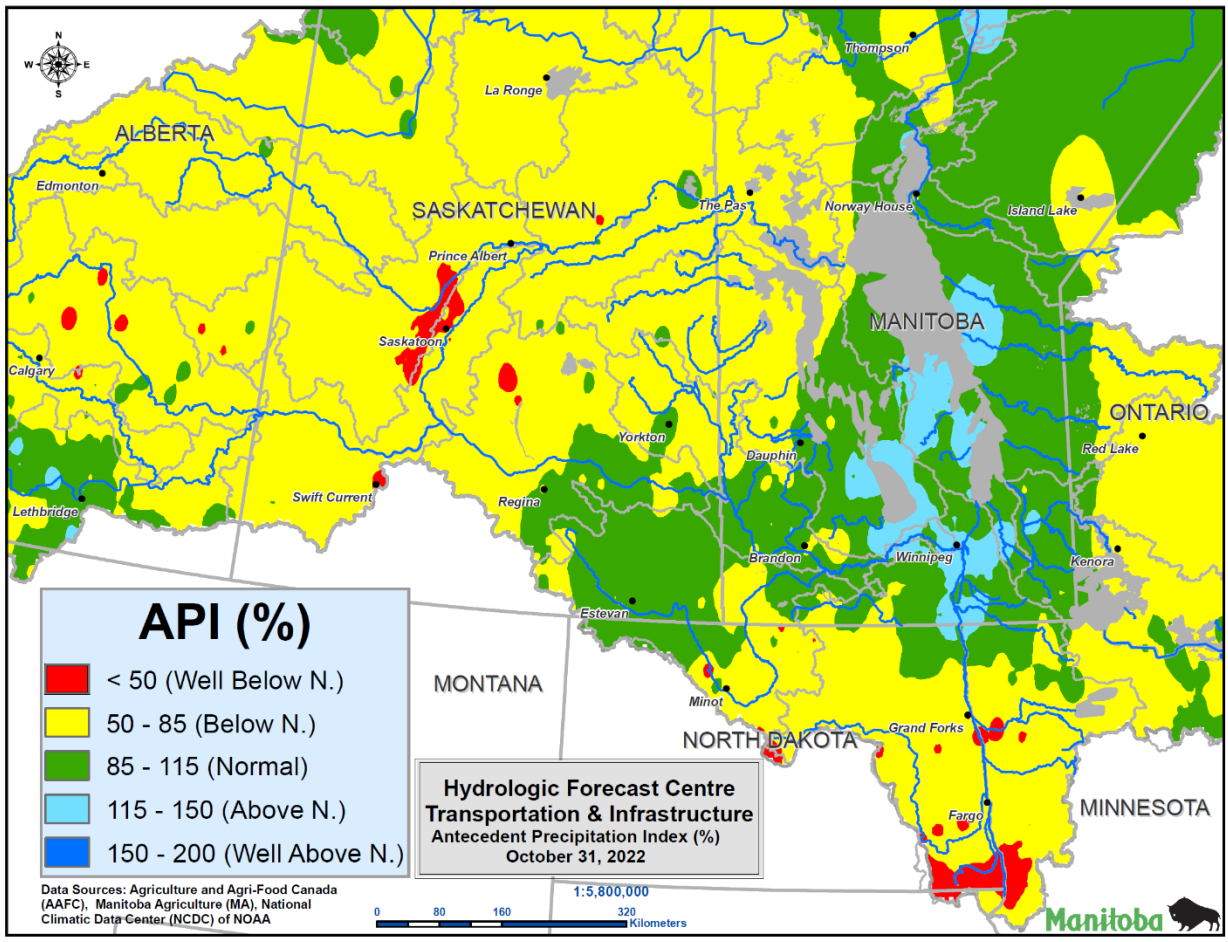

Figure 1 – Soil moisture expressed as Antecedent Precipitation Index (API) for the fall of 2022.

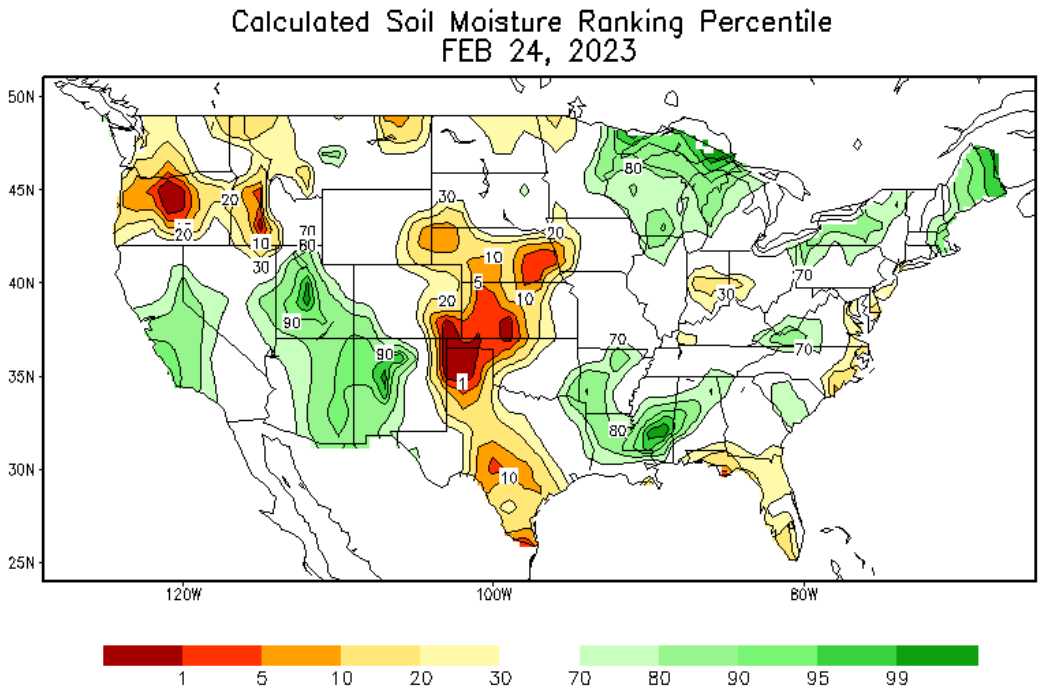

Figure 2 – Calculated soil moisture ranking percentile – NWS.

Winter Precipitation

November to February precipitation is generally below normal across much of southern and central Manitoba and southeastern Saskatchewan. The remainder of Saskatchewan is mostly near normal and northern Manitoba is normal to above normal. The U.S. portion of the Souris River basin and the southern portion of the Red River basin in the U.S. have received above normal winter precipitation. Southeastern Manitoba, including Whiteshell Lakes, has received near normal precipitation during this period (Figure 3).

Generally, the cumulative precipitation amounts across Manitoba, Saskatchewan and the United States portions of the Red and Souris River basins vary significantly. Southwestern Manitoba and southeastern Saskatchewan, including the upstream portion of the Souris River basin have received 35 to 65 mm (1.4 to 2.6 inches) of winter precipitation. Central Manitoba and the Interlake received a similar amount of precipitation since November 1st. Northern Manitoba has received approximately 65 to 95 mm (2.6 to 3.7 inches) of precipitation near The Pas to over 110 mm (4.3 inches) further north. Southeast Manitoba, including the Whiteshell Lakes area has received 65 to 95 mm (2.6 to 3.7 inches) and further upstream in the Winnipeg River basin there was over 110 mm (4.3 inches) of precipitation. The U.S. portion of the Souris River basin has received 35 to 80 mm (1.4 to 3.1 inches) while the U.S. portion of the Red River

basin has received from 35 mm (1.4 inches) in the northern part of the basin to near 110 mm (4.3 inches) of precipitation in the south. (Figure 4).

Most areas of southern and central Manitoba, including areas around the Fisher River and Icelandic Rivers in the Interlake region, and southeastern Saskatchewan have received below the 40th percentile winter precipitation. Put another way, historical precipitation records indicate that precipitation has been less than the current record for 40% of the time. Some areas in southwest Manitoba and the Interlake region received 5 to 20 percentile precipitation. The U.S. portions of the Red River and Souris River basins have received winter precipitation that ranges from the 40th percentile to the 95th percentile in the southern reaches of the basins. Northern Manitoba generally ranks above the 60th percentile with some areas that are near the 95th percentile for winter precipitation (Figure 5).

As can be seen in Figure 6, recorded precipitation as of February 21, 2022 indicates that southern and central Manitoba and southeastern Saskatchewan have precipitation accumulation that is approximately 10 to 50 mm (0.4 to 2.0 inches) less than normal. The U.S. portions of the Red and Souris Rivers have received approximately 10 mm less than normal to 50 mm more than normal further to the south. Northern Manitoba has precipitation accumulation that deviates from the normal by more than 30 mm (1.2 inches) in some areas. Areas near the Pas and the Saskatchewan River basin in Saskatchewan received winter precipitation that in line with historical average precipitation.

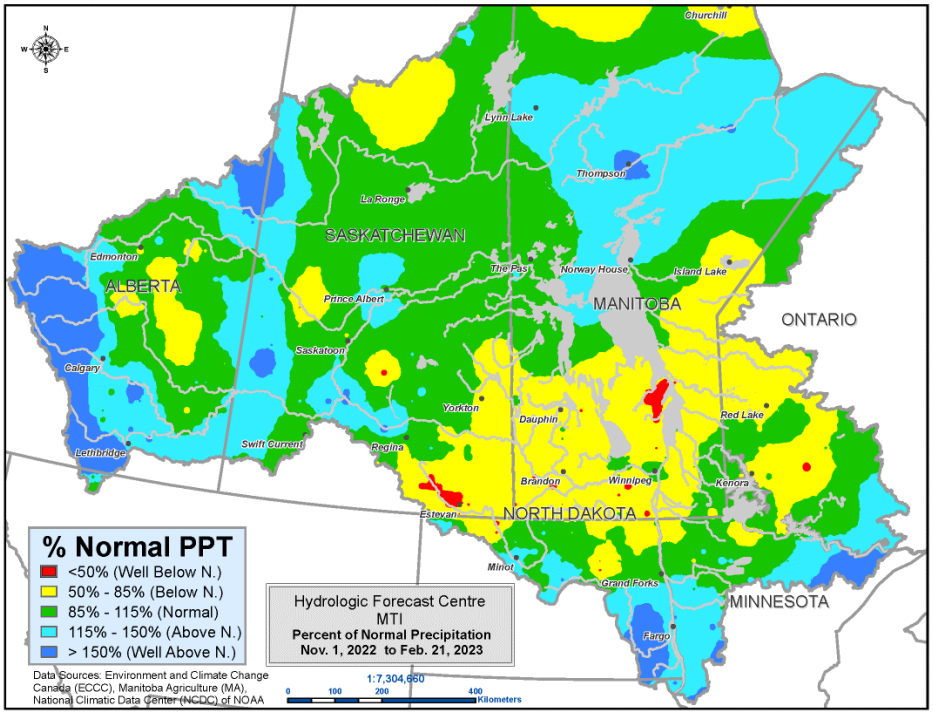

Figure 3 - Percent of normal precipitation from November 1, 2021 to February 21, 2023.

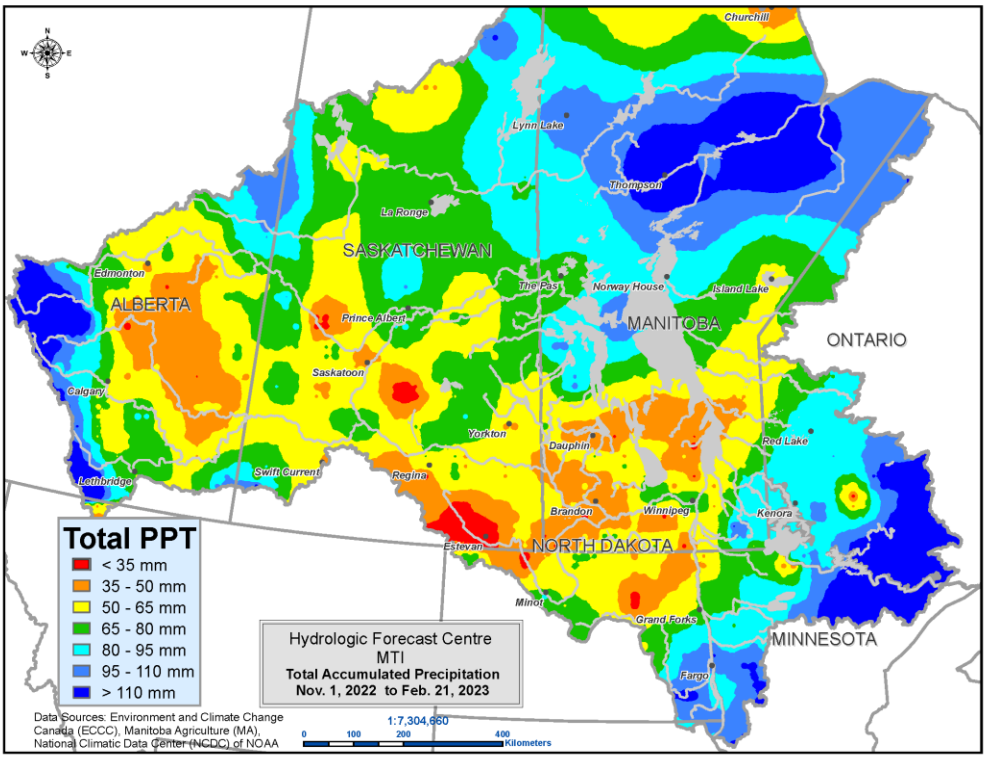

Figure 4 - Cumulative precipitation in mm from November 1, 2021 to February 21, 2023.

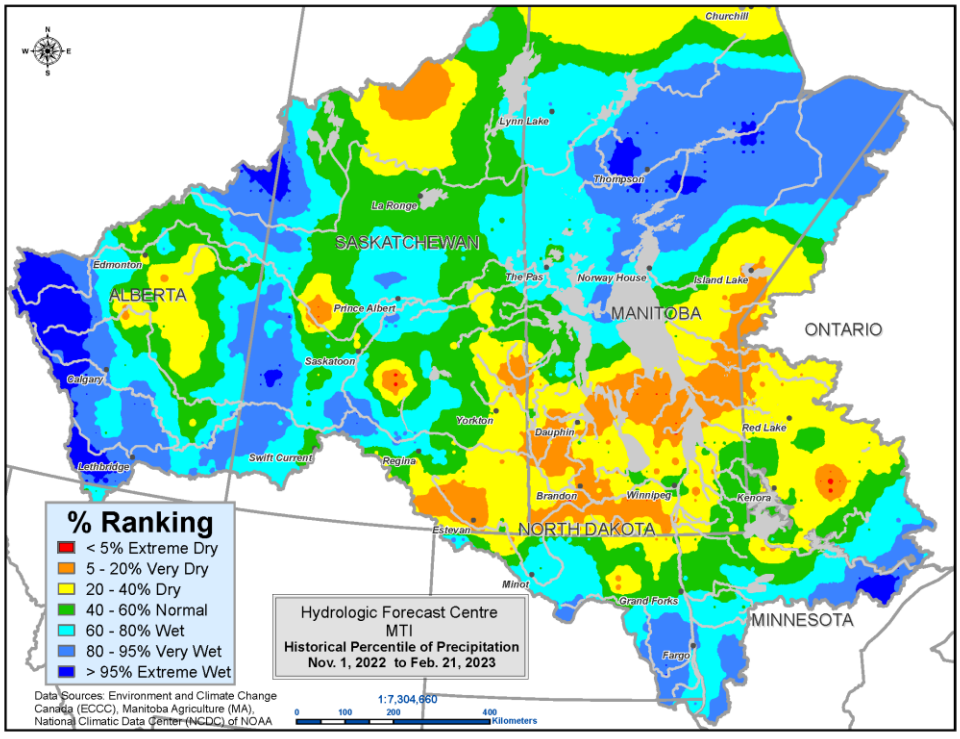

Figure 5 – Percent ranking precipitation from November 1, 2021 to February 21, 2023, compared to historic record.

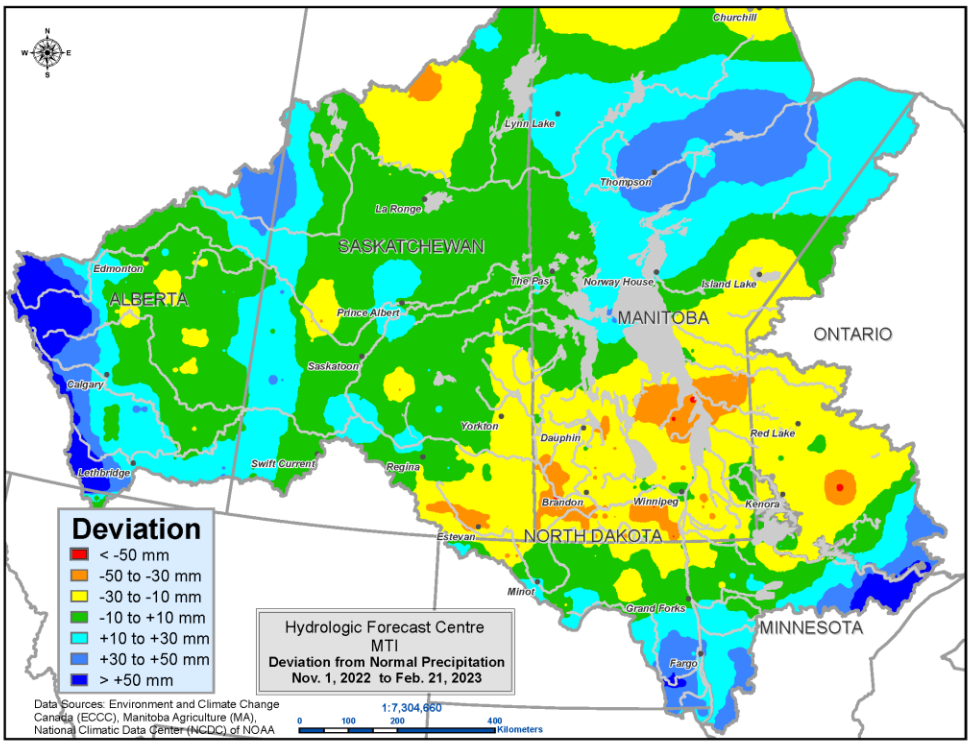

Figure 6 - Precipitation from November 1, 2021 to February 21, 2023, deviation from normal (mm).

Snow Water Content

Snow water equivalent (SWE) estimates obtained from end of January field measurements indicate that the average water content in the snowpack is in the order of 30 to 80 mm (1.2 to 3.1 inches) in most of the southern Manitoba basins with a few measurements just outside of this range (Figure 7). The Interlake region has SWE values of approximately 30 to 60 mm (1.2 to 2.4 inches). The Shellmouth Reservoir basin has an average SWE value of approximately 70 mm (2.8 inches). Northern Manitoba, including the Saskatchewan River basin, has snow accumulation with approximately 55 to 150 mm (2.2 to 5.9 inches) SWE. The highest measurements were taken at higher elevations, including Riding Mountain Provincial Park, Duck Mountain Provincial Park and the Porcupine Mountains. SWE in the Duck Mountains measured up to 167 mm (6.6 inches). A snow survey was also carried out in the U.S. portion of the Red River. The survey showed a heavier concentration of snow in the southwest part of the basin, with up to 135 mm SWE (Figure 8).

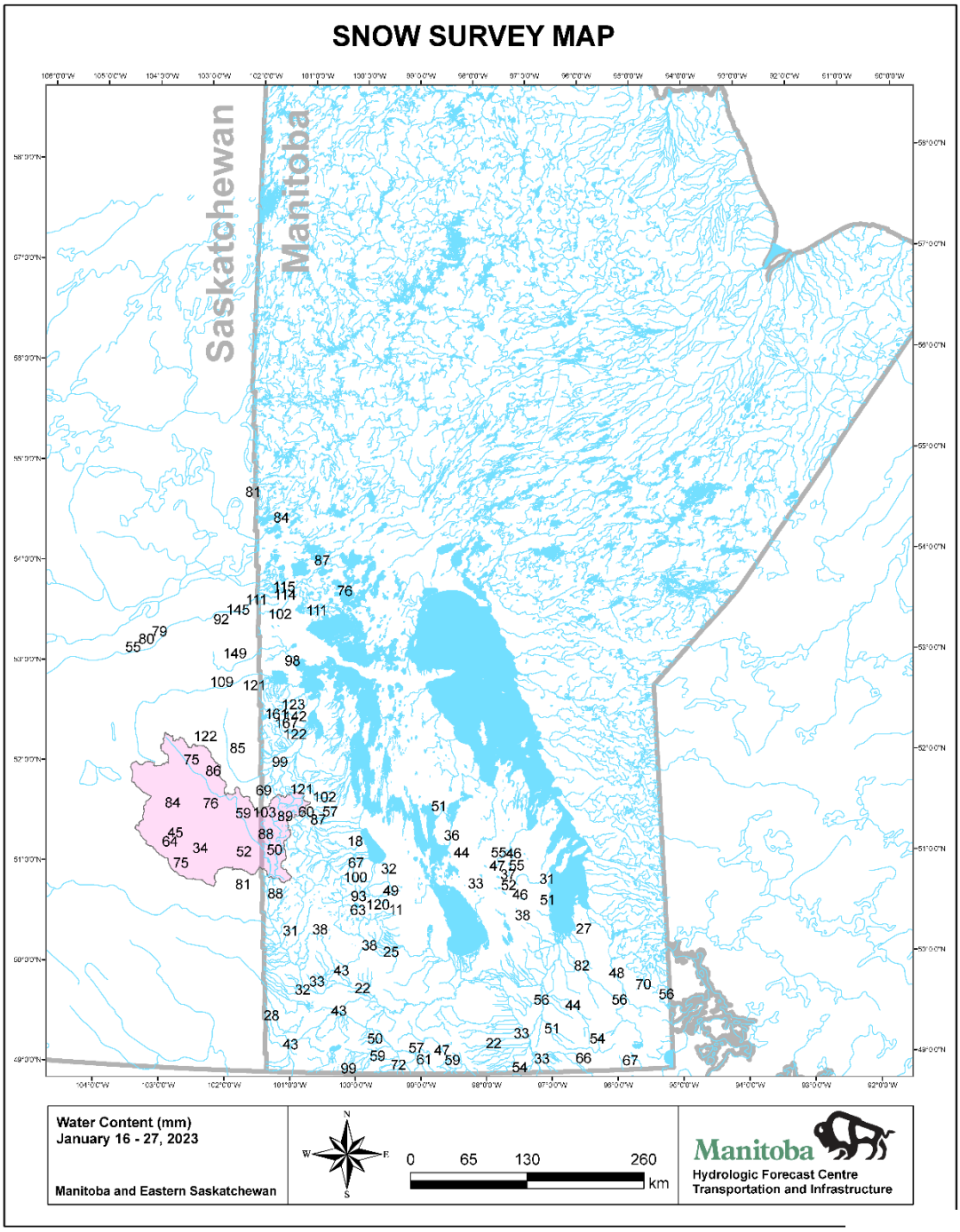

Figure 7– Snow Water Equivalent (SWE) in mm from field measurements conducted in January 2023.

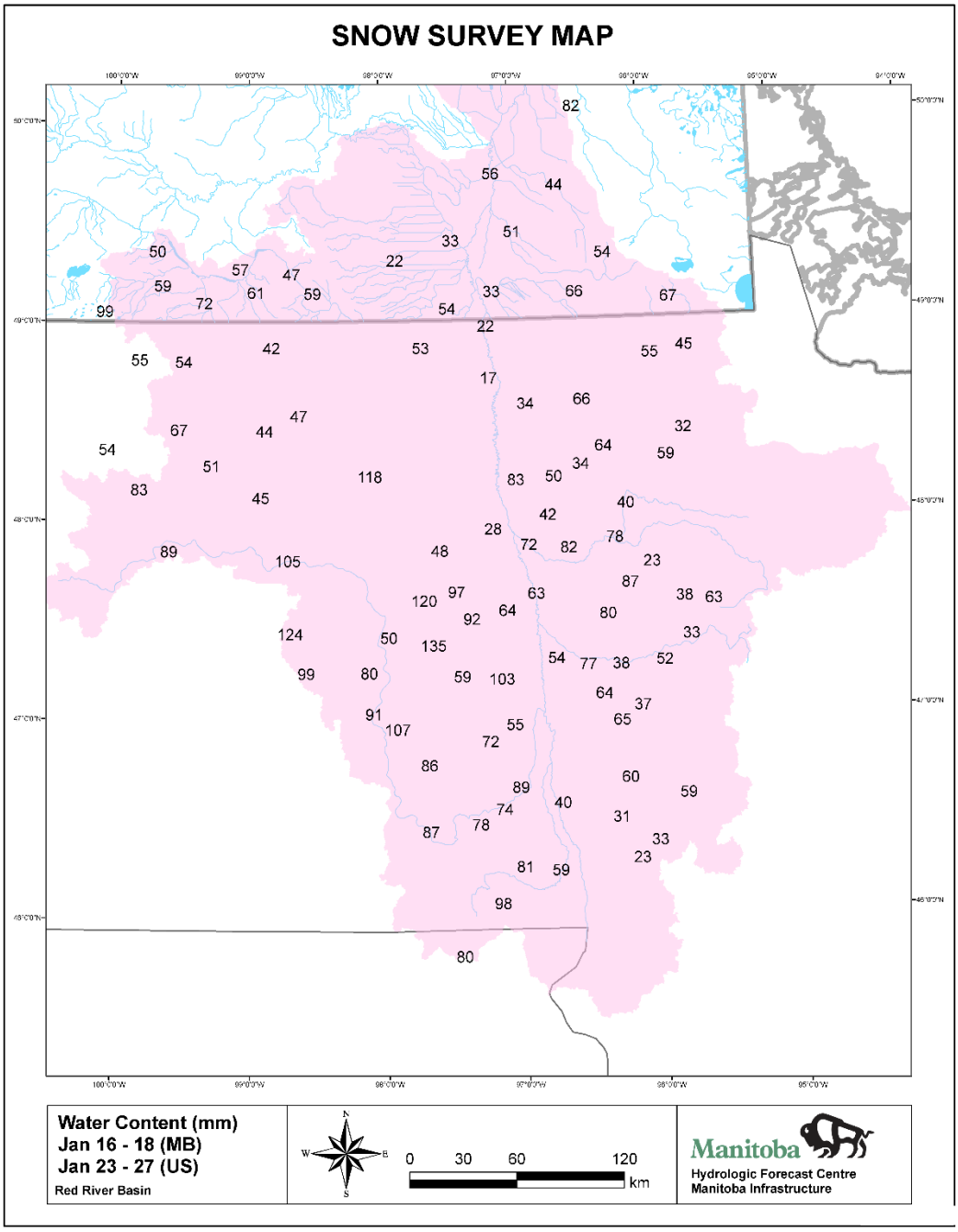

Figure 8 – Snow Water Equivalent (SWE) in mm from field measurements conducted in January 2023, Red River Basin.

Base Flows and Level Conditions

Base flows and levels indicate the amount of water available in the system prior to the spring runoff. Higher base flows indicate higher soil saturation levels and higher spring runoff potentials. Base flows and levels in most rivers have been gradually declining since the fall of 2022. Base flows and levels are generally normal to above normal in most Manitoba basins (Figure 9).

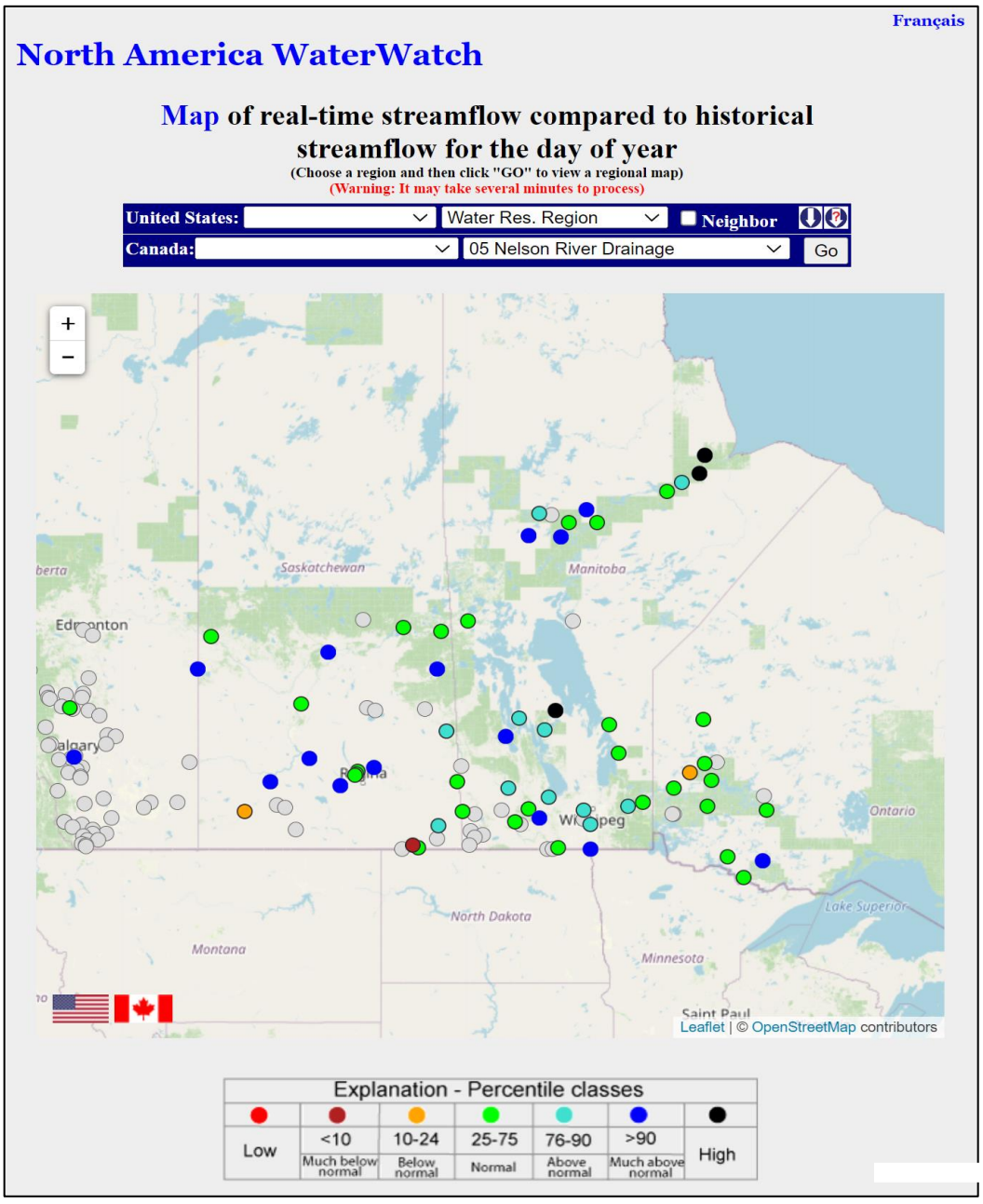

Figure 9 – Base flows and level conditions as of February 21, 2023 (Note: Flows and levels readings at some locations could be ice affected and may not show the actual flows and levels).

Soil Frost Depth

Soil frost depth is dependent on winter temperatures and the amount of snow cover insulation. The frost depth is variable across the watersheds, but is generally considered to be normal to shallower than normal throughout most of the province. Generally, deeper than normal frost depth takes longer to thaw which means the soil absorbs less water and contributes to increased surface runoff; whereas shallower than normal frost depth means the soil can absorb more melting surface water and can potentially decrease the amount of overland flooding. Figure 10 shows comparative measurements of frost depth at various locations across the province.

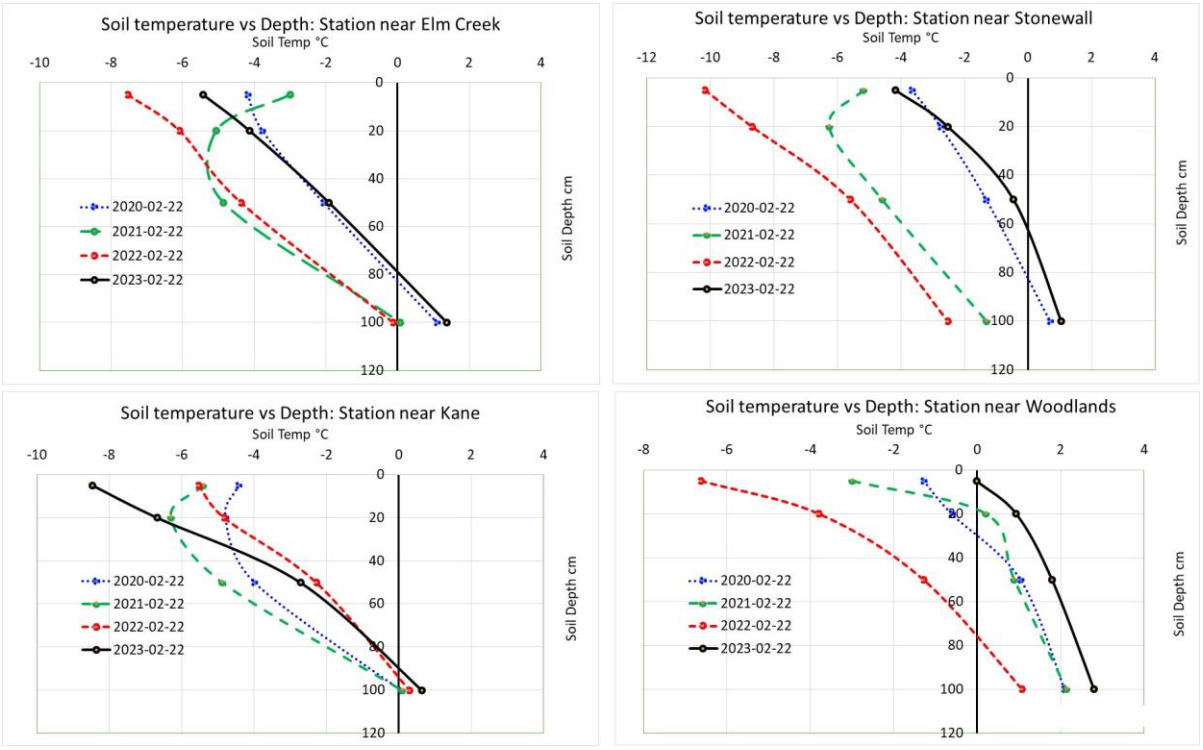

Figure 10 – Frost depth in centimeters at various locations across the province.

Future Weather Outlook

Most parts of southern Manitoba and the U.S. portions of the Red and Souris River basins are forecasted to receive less than 5 mm of precipitation between February 24 and March 2 (Figure 11). Parts of northern Manitoba could receive up to 15 mm precipitation. In the longer range, climate outlook issued by the International Research Institute (IRI) at the Columbia Climate School indicate a higher chance for near normal to above normal precipitation in southern and central Manitoba for March, April, May and

June and below normal to near normal precipitation in northern Manitoba (Figures 12 and 13). Long term weather predictions are generally not reliable.

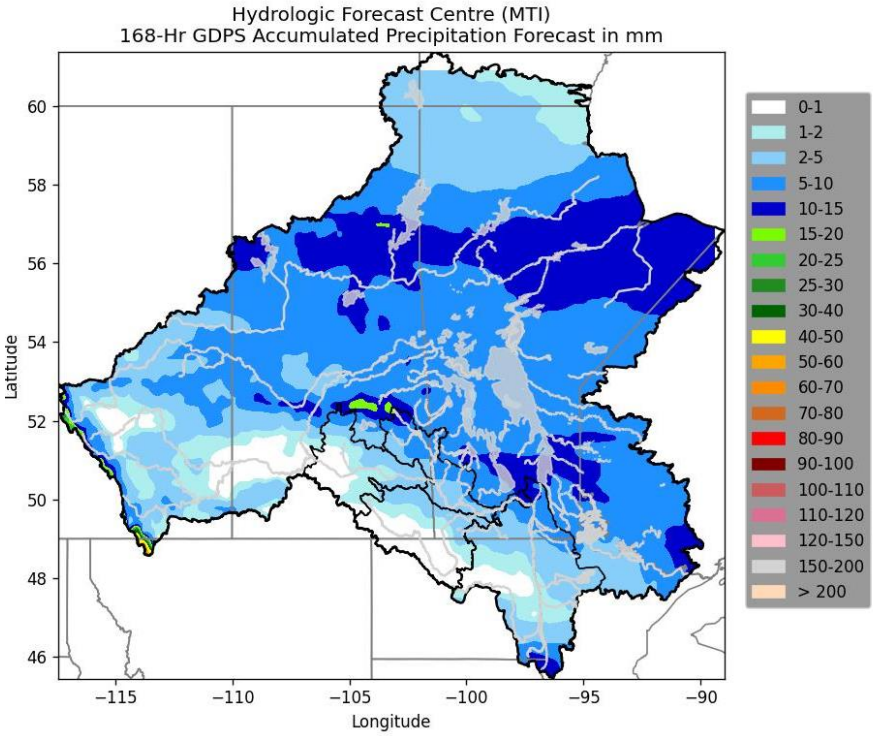

Figure 11 – Short term precipitation forecast between February 24th and March 2nd.

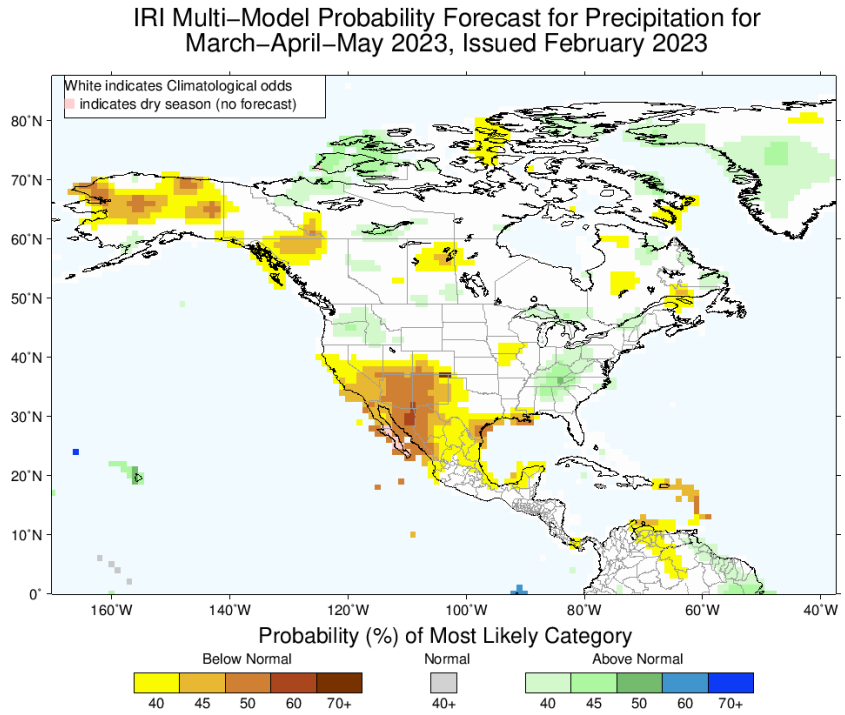

Figure 12 – IRI Multi-Model Probability Forecast for Precipitation for March-April-May 2023, issued February 2023.

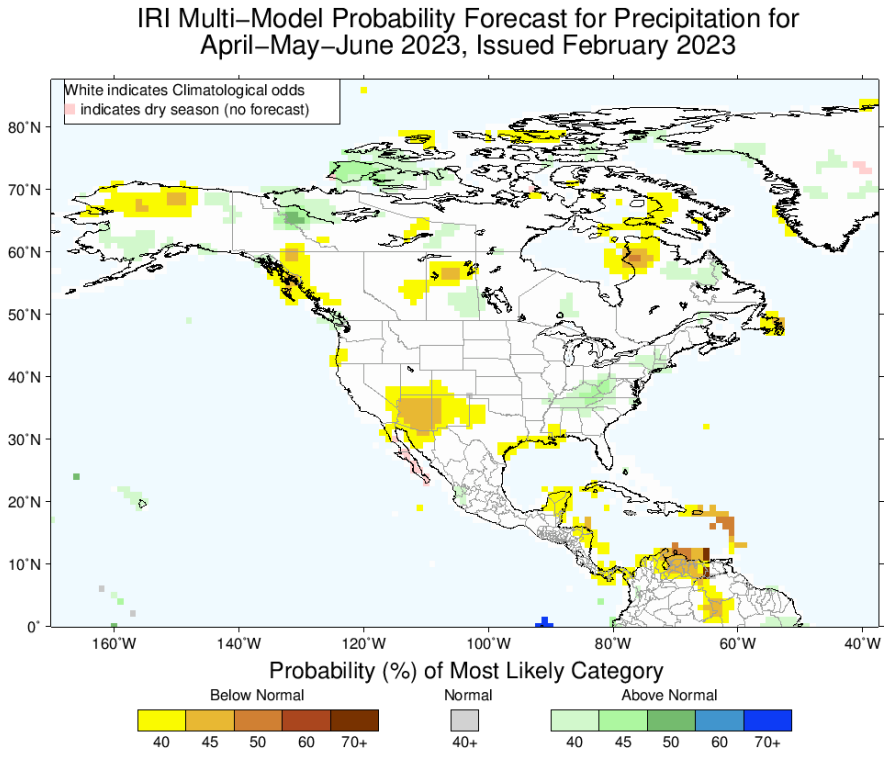

Figure 13 – IRI Multi-Model Probability Forecast for Precipitation for April-May-June 2023, issued February 2023.

Current Lake Level and River Flow Conditions

Current river flow conditions:

- The Dauphin and Fairford Rivers in the Interlake region: flows are above normal for this time of year.
- The Souris, Roseau and Pembina Rivers: near normal flows for this time of year.
- Due to releases from the Shellmouth Dam, Assiniboine River flows are above normal for this time of year.
- The Red, Carrot, Red Deer, Qu'Appelle, Saskatchewan and Churchill Rivers: flows are near normal to slightly above normal for this time of the year.
- There is no current flow/level data for the Fisher River and Icelandic River. Flow/level reporting will resume in spring. Historically, these rivers have very low flows throughout the winter season.

Table 1 summarizes flows at main rivers at selected locations as of February 23, 2023.

Current lake water levels:

- Water levels for major lakes in Manitoba are normal to above normal heading into the spring. With the exception of Dauphin Lake and Lake St. Martin, which are above their operating ranges, most Manitoba lakes including Lake Winnipeg and Lake Manitoba are within or close to their respective operating ranges heading into the spring runoff.

Table 2 summarizes levels at major lakes as of February 23, 2023.

Table 1. Flows for main rivers at selected locations as of February 23, 2023.

*****Note – The Assiniboine River flows and levels are regulated by the operation of Shellmouth Dam.*

*** Note – The Red River Level at James Avenue is measured in relative to the long term mean winter ice level at James avenue, which is 727.57 feet geodetic or 0 ft James.*

Rivers	Location	Most Recent Flow/Level (Feb. 23)	Minimum Flows/Levels	10th Percentile	Normal flows/Levels	90th Percentile	Maximum Flow/Level	Period of Record
Red River	Emerson	1,965 cfs	1 cfs (1937)	227 cfs	1,013 cfs	2,069 cfs	4,308 cfs (2017)	109 years
	Ste. Agathe	1,881 cfs	198 cfs (1977)	332 cfs	1,366 cfs	2,301 cfs	3,779 cfs (2011)	61 years
	*James Avenue Level **	1.65 ft	-1.65 ft (1991)	-1.1 ft	.97 ft	2.48 ft	5.42 ft (2011)	50 years
Assiniboine River*	Russell	700 cfs	27 cfs (1962)	47 cfs	295 cfs	668 cfs	1,511 cfs (2009)	109 years
	Brandon	870 cfs	12 cfs (1942)	61 cfs	401 cfs	909 cfs	2,182 cfs (2011)	109 years
	Holland	950 cfs	230 cfs (1989)	353 cfs	851 cfs	1,222 cfs	3,083 cfs (2011)	61 years
	Headingley	1,050 cfs	72 cfs (1963)	141 cfs	530 cfs	1,044 cfs	2,772 cfs (2011)	109 years
Shellmouth Dam Release	Shellmouth	700 cfs	29 cfs (1969)	113 cfs	495 cfs	1,052 cfs	1,790 cfs (2011)	53 years
Souris River	Wawanesa	8 cfs	0 cfs (1990)	0 cfs	48 cfs	147 cfs	484 cfs (2011)	109 years
Qu'Appelle River	Welby	141 cfs	10 cfs (1978)	23 cfs	135 cfs	286 cfs	509 cfs (2011)	79 years
Fairford River	Fairford	4,587 cfs	45 cfs (1965)	248 cfs	2,755 cfs	5,756 cfs	12,643 cfs (2012)	67 years
Waterhen River	Waterhen	1,501 cfs	0 cfs (1963)	12 cfs	1,184 cfs	3,080 cfs	5,827 cfs (2017)	71 years
Dauphin River	Dauphin	9,300 cfs	18 cfs (1982)	190 cfs	2,343 cfs	5,114 cfs	9,394 cfs (2012)	45 years
Saskatchewan River	The Pas	12,273 cfs	1,999 cfs (1930)	3,435 cfs	10,592 cfs	18,971 cfs	23,590 cfs (1975)	109years

Table 2: February 23 lake levels, forecasts and corresponding operation ranges.

**Levels on these lakes are managed by operation of dam structures.*

Lakes	Current level, Feb 23 (ft)	Operating range or long term avg. (ft)	Normal level for Feb 23 (ft)	Last time level was equal or higher than the current level	Expected Level by Mar 31, 2023 (ft)	Historical comparison
Lake Manitoba*	811.8	810.5 - 812.5	811.9	811.8 (2018)	≈ 812.0	*Historic water level for this time of year is above the current level 56% of the time*
Lake Winnipeg*	713.9	711 - 715	713.6	714.8 (2020)	≈ 714.0	*Historic water level for this time of year is above the current level 36% of the time*
Lake St. Martin*	800.9	797 - 800	799.2	802.0 (2018)	≈ 801.0	*Historic water level for this time of year is above the current level 20% of the time*
Lake Winnipegosis	831.0	830.4	830.4	831.8 (2019)	≈ 830.9	*Historic water level for this time of year is above the current level 32% of the time*
Dauphin Lake*	854.9	853.0 - 854.8	854.0	855.9 (2017)	854.8 – 855.2	*Historic water level for this time of year is above the current level 6% of the time*
Shellmouth Reservoir*	1396.1	1386 - 1400	1394.8	1397.1 (2021)	1386 – 1398	*Historic water level for this time of year is above the current level 39% of the time*
Lake Wahtopanah near Rivers*	1535.0	1535.5	1531.5	1535.7 (2020)	1532 – 1534	*Historic water level for this time of year is above the current level 22% of the time*
Lake Minnewasta	-	1078.1	1078.1	1081.4 (2020)	-	-

River Ice Conditions and Ice Jamming[1]

The province has started collecting ice thickness measurements on the Red River and will continue throughout February. Normal ice thickness for this time of the year varies according to air temperature since freeze up, the river flow velocity and the location of the river. Normal ice thickness for this time of the year typically ranges from 46 cm (18 inches) to 76 cm (30 inches). The completed measurements taken north of Netley Creek indicate an ice thickness of approximately 61 cm (24 inches). The ice is slightly thinner than it was last year at this time (Figure 14).

Spring weather affects the timing and rate of the deterioration of the river ice, and will be a significant factor in determining ice strength at break-up. It is difficult to predict the time of occurrence and extent of ice jamming. However, with the ice cutting and breaking activities currently underway on the Red River, the chance of ice jamming and related flooding on the lower Red River should be reduced.

Localized flooding can occur when and where ice jams develop, even with below average river flows. The chances of localized flooding due to snow and ice blockages in drains, ditches and small streams during the early part of the run-off period will depend on the nature of the spring breakup and rate of melt.

[1] See Appendix A for 'Ice Jam' definition

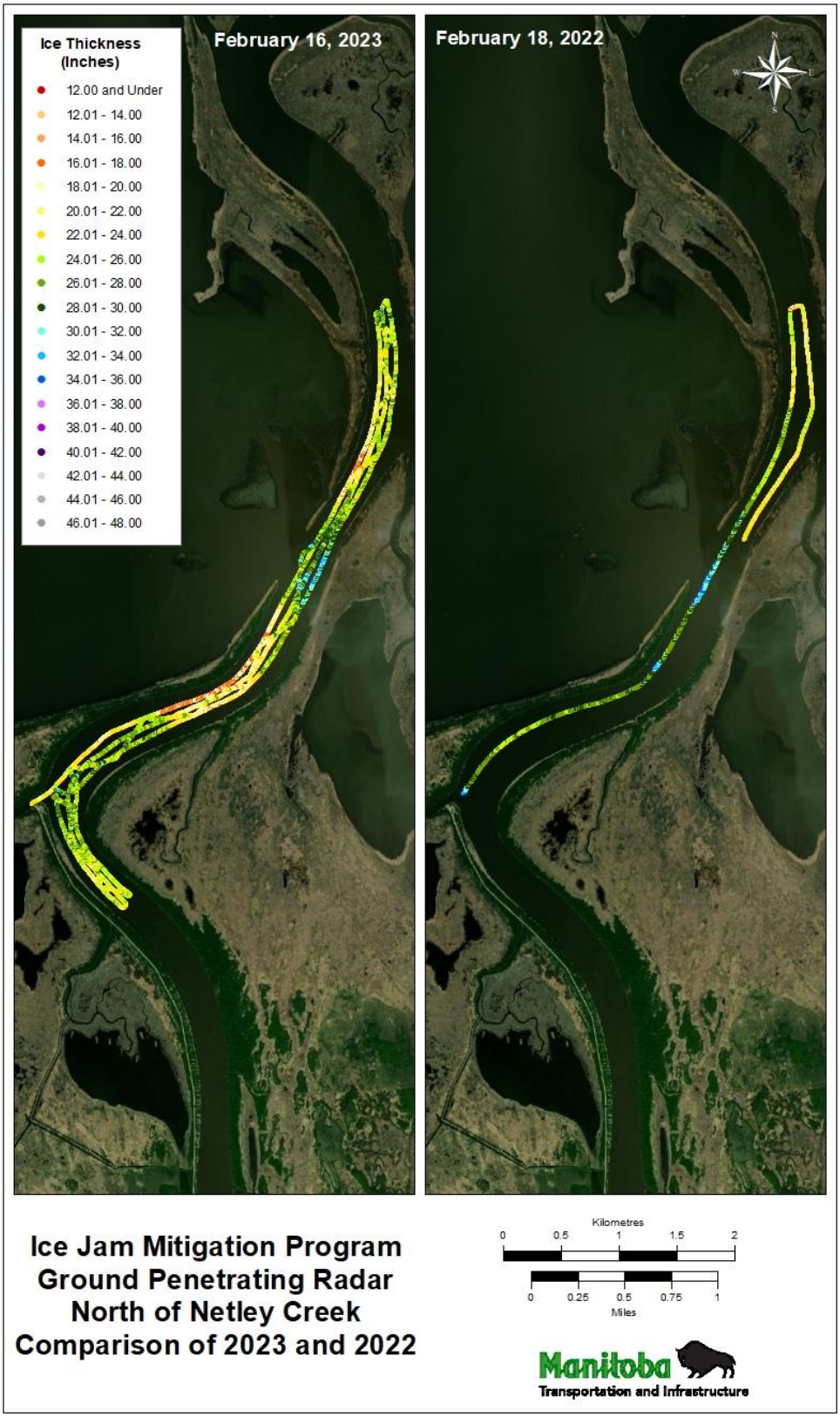

Figure 14 – Ice Thickness Measurements (inches) based on Ground Penetrating Radar: Red River (2022 vs. 2023).

Flood Outlook[2]

Spring flood outlooks provide estimates of peak river flows and lake water levels that are based on current basin conditions, and three possible future weather scenarios. These weather scenarios are: favourable, normal, and unfavourable. These scenarios correspond to three different probabilities of occurrence: lower decile, median, and upper decile. The province's practice is to plan and prepare for the unfavourable (upper decile) future weather conditions. For further information, see Appendix A: Definitions.

The risk of spring flooding is defined by three categories: major spring flooding risk, moderate spring flooding risk, and minor (low) spring flooding risk. Major spring flooding risk is associated with the probability that forecasted flows and levels exceed the bankfull capacity and cause flooding for near normal future weather conditions. Moderate spring flooding risk is associated with the probability that forecasted flows and levels exceed bankfull capacity for the unfavourable future weather conditions but forecasted flows and levels are below the bankfull capacity for normal future weather conditions. Minor (low) spring flooding risk is associated with the probability that forecasted flows and levels will remain below the bankfull capacity even for the unfavourable future weather conditions.

A number of uncertainties exist with respect to the flood outlook. These include, but are not limited to, the following:

- future weather uncertainties (snowfall and spring rainfall);
- winter snowpack, date of the onset of melt, and melt rate (i.e., timing and speed of snow melt);
- uncertainty in meteorological and hydrometric data collected to date;
- timing of the peak flows;
- frost depth at the time of spring melt; and
- hydrologic model prediction uncertainties.

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[2] See Appendix A for 'Flood Outlook', 'Weather Scenarios', 'Favourable Weather', 'Normal Weather', and 'Unfavourable Weather' definitions

[7] See Appendix A for 'Minor/Moderate/Major' Flood risk definitions

Red River

- There is a moderate risk of significant spring flooding along the Red River main stem. The current soil moisture is normal to below normal throughout U.S. portion of the basin and normal to above normal in Manitoba. Winter precipitation has been above normal in the U.S. portion of the basin and below normal in Manitoba portion of the basin.
- In favourable weather conditions, the risk of flooding is low
    - Levels would be similar to spring peak levels observed in 2018 from Emerson to the Red River Floodway Inlet.
- Normal weather: the risk of flooding is low to moderate
    - Levels would be near the spring peak levels observed in 2017 from Emerson to the Red River Floodway Inlet.
- Unfavourable weather: moderate risk of significant flooding
    - Levels on the Red River main stem would be similar to 2019/2020 from Emerson to Red River Floodway Inlet.
- The flood protection level of the community dikes and the individual flood protection works within the Red River basin are higher than the predicted peak levels, even in the unfavourable weather scenario.

Red River Floodway

- The Red River Floodway has been operated in 35 out of the 54 years since it has been constructed for the purpose of providing flood protection to the City of Winnipeg.
- Due to the forecasted flows on the Red River, the Floodway is expected to be operated under unfavourable weather conditions during the 2023 spring melt. Under normal weather conditions water is expected to flow into the floodway and minor operation is possible.
- Open water peak estimated levels at James Avenue are:
    - Favourable weather: 4.3 to 4.6 m (14.0 to 15.0 ft)
    - Normal weather: 5.2 to 5.5 m (17.0 to 18.0 ft)
    - Unfavourable weather: 5.6 to 5.9 m (18.5 to 19.5 ft)

Rat and Roseau Rivers

There is a low risk of significant spring flooding within the Rat and Roseau River basins.

Pembina River

There is a low risk of significant spring flooding within the Pembina River basin.

Assiniboine River and Its Tributaries

- There is a moderate risk of significant spring flooding along the Assiniboine River and most of its tributaries while the risk of significant flooding along the Souris River is low.
- The Assiniboine River and its tributaries are expected to remain within their banks for both favourable and normal future weather scenarios.
- Overbank flooding of agricultural land may occur on the Assiniboine River and Qu'Appelle River near St. Lazare under unfavourable future weather conditions.
- The flood protection level of the community dikes in the City of Brandon and in towns of Melita, Souris, Wawanesa, and St. Lazare are at elevations which are high enough to protect against expected spring water levels.

Portage Diversion

- The Portage Diversion has been operated 39 out of the 53 years since it has been constructed for the purpose of preventing ice jamming on the Assiniboine River east of Portage la Prairie and to provide flood protection for areas along the Assiniboine River downstream of Portage la Prairie including the City of Winnipeg. Based on the runoff potential in the Assiniboine and Souris basins, the Portage Diversion is expected to be operated under unfavourable weather conditions. Under favourable and normal weather conditions, the Portage Diversion may be operated to reduce ice jam related levels downstream of the diversion.

Shellmouth Dam

- The forecasted inflow volumes into the Shellmouth Reservoir for favourable, normal and unfavourable conditions as of February 23 are 123 million cubic meters (100,000 acre-feet), 253 million cubic meters (205,000 acre-feet) and 444 million cubic meters (360,000 acre-feet), respectively.
- The Shellmouth Dam is being operated to provide storage capacity for reservoir inflows in order to reduce flooding downstream as well as to ensure a sufficient reservoir level for recreation and water supply. The current reservoir level as of February 24th, 2023 is 425.52 m (1396.06 ft).

- The Shellmouth Liaison Committee provides regular input into the dam operations to meet the target level of 427.33 m to 427.94 m (1402 ft to 1404 ft) after the spring runoff. The outflow from the reservoir as of February 24th, 2023 is 19.7 cubic metres per second (697 cubic feet per second).

Interlake Region

- The risk of significant flooding within the Interlake region is moderate. Levels will remain below the bankfull levels for favourable and normal future weather conditions. Levels are projected to exceed bankfull capacities for unfavourable future weather conditions.
- As in most years, the risk of ice jam induced flooding is high for the Icelandic and Fisher Rivers.

Fairford River Water Control Structure

- The Fairford River Water Control Structure is currently set to 75% capacity in response to the high water levels experienced on Lake Manitoba through much of 2022 and will remain at the current setting until the lake level returns to the middle of its operating range at 247.35 m (811.5 ft). The current discharge at the Fairford River Water Control Structure is approximately 4,500 cfs.

Eastern Region

- The risk of significant spring flooding is low in the eastern region, including the Whiteshell Lakes area and the Winnipeg River basin.

Manitoba Lakes

- Currently, most major lakes are just above or within their operating ranges. Most lakes are expected to be within their normal operating range after the spring runoff. The risk of spring flooding in most Manitoba lakes is low.

Lake Manitoba

- Lake Manitoba's current level is 247.42 m (811.76 ft).
- The current level is 0.06 m (0.20 ft) below normal for this time of year, and is within the operating range of 247.04 m (810.5 ft) to 247.65 m (812.5 ft).
- After spring runoff, the lake level is expected to be within the operating range.

Lake St. Martin

- Lake St. Martin is currently at 244.11 m (800.88 ft).
- The current level is 0.53 m (1.74 ft) above normal for this time of year.
- After spring runoff, the lake level is expected to remain above normal levels.

Lake Winnipeg

- Lake Winnipeg's current level is 217.60 m (713.92 ft).
- The current level is 0.09 m (0.3 ft) above normal for this time of year and within the operating range of 216.71 m (711 ft) to 217.93 m (715 ft).
- After spring runoff, the lake level is expected to be within the operating range.

Lake Winnipegosis

- Lake Winnipegosis is currently at 253.28 m (830.96 ft).
- The current level is 0.16 m (0.52 ft) above normal for this time of year.
- After spring runoff, the lake level is expected to be near normal levels.

Dauphin Lake

- Dauphin Lake's current level is 260.57 m (854.90 ft).
- The current level is higher than normal for this time of year and just above the operating range of 260 m to 260.54 m (853 ft to 854.8 ft).
- After spring runoff, the lake level is expected to remain above the operating range but below the flood protection level.

Northern Manitoba and The Pas Regions

- The risk of spring flooding is low along the Saskatchewan and Carrot Rivers when considering all potential future weather scenarios.
- Levels along the Saskatchewan and Carrot Rivers at The Pas depend greatly on the outflows and the regulation of Saskatchewan's Tobin Lake. Considering the potential future Tobin Lake outflows and future weather conditions, the peak open water levels on the main stems of the Saskatchewan and Carrot Rivers are expected to be below bankfull levels. Manitoba continually consults with Saskatchewan regarding operation of the dams located in Saskatchewan including the release of flows into Manitoba rivers.

- The risk of major flooding is also low along Swan River under all future weather conditions.
- As in many other years, there is a risk of ice jam related flooding along the Saskatchewan, Carrot and Swan Rivers.

Emergency Management Flood Preparations

- The Manitoba government, local authorities and emergency management partners are continuing to prepare for spring flooding. Manitoba Emergency Measures Organization (EMO) continues to work with all local authorities and emergency management partners to provide guidance and support for preparedness and response activities in the upcoming hazard season. This includes:
    - review of existing emergency plans;
    - provide overall situational awareness by disseminating relevant up to date information;
    - provide training opportunities;
    - prepare resources for use in flood response;
    - host conference calls with local authorities and emergency management partners;
    - provide continuous coordination and collaboration with emergency management stakeholders;
    - work with Indigenous Services Canada (ISC) and Indigenous Reconciliation and Northern Relations (IRNR) on ISC and IRNR-led preparedness activities for First Nations and Northern Affairs Communities; and
    - issue emergency alerts as required.
- The ice-jam mitigation program north of Winnipeg has commenced, with ice cutters and ice breaking equipment working along the Red River to break the ice. Ice cutting and breaking work will start on the Icelandic River once the work is completed on the Red River north of Winnipeg.

Future Forecast Information

If the spring melt and runoff has not yet begun, a second flood outlook will be published with updated information in late March when further precipitation and other factors are available.

Appendix A: Definitions

[1] Ice Jam:

- A blockage of ice on a river/stream which restricts flow, resulting in increased water levels upstream.

- Jams may occur due to changing river channel geometry, bends in the river channel, depth and thickness of ice, rate of water level rise, or a solid section of ice downstream.

[2] Flood Outlook:

- Estimated spring peak water levels and flows provided before spring water flow begins.
- Estimates are based on diverse information, such as soil moisture, winter precipitation, snowpack, topography, current water level, channel capacity, and future weather condition scenarios (precipitation, temperatures, etc.).
- Estimates are provided for three weather scenarios (favourable, normal, and unfavourable) which correspond to three different probabilities of occurrence (lower decile, median and upper decile).

[3] Weather Scenarios:

- Used to account for future weather such as additional snow, melt rates and spring rainfall. These are determined by statistical analysis of the past 30 to 40 years of climate data.
- Three scenarios used:
    - Lower decile (favourable)
        - There is a 10% chance of the weather being ‘favourable’ or better. 90% of the time the weather will be worse than this ‘favourable’ condition.
    - Median (normal)
        - There is a 50% chance of the weather being ‘normal’ or better.
    - Upper decile (unfavourable)
        - There is a 10% chance of the weather being ‘unfavourable’ or worse. 90% of the time the weather will be better than this ‘unfavourable’ condition.
- The Province’s practice is to plan/prepare to the upper decile (i.e., unfavourable) condition.

[3] Favourable Weather:

- Characterized by little additional precipitation and a gradual snow melt.
- The lower decile weather condition.

[3] Normal Weather:

- Characterized by normal rainfall and temperature.
- Typically used to describe historic climate conditions.
- The median weather condition.

[3] Unfavourable Weather:

- Significant wide-spread precipitation with a rapid snowmelt.
- The upper decile weather condition.

[5]Flow/Discharge [expressed in cubic feet per second (cfs) or cubic metres per second (cms)]:

- The volume of water that passes a given location within a given period of time.

[6] FPL – Flood Protection Level:

- Is the water level of the greater of the flood of record or the 1-in-200-yr flood, plus a freeboard allowance for a particular waterway (typically 2 ft) or water body (i.e., the freeboard is site specific).
- It is provided by the Hydrologic Forecasting and Water Management (HFWM) branch of Manitoba Transportation and Infrastructure on a site-specific and structure-specific basis.
- This is formally set by the Water Resources Administration Act for the Red River Designated Flood Areas.
- In non Designated Flood Areas, the province uses the determined FPLs. For other works or developments, the FPL is recommended by the province, but ultimately regulated by the local planning districts and/or municipalities.

[7]Definition for minor/moderate/major risk of flooding:

- Minor Risk of Flooding:
    - Forecasted flows and levels will remain below bankfull capacity even for the unfavourable future weather conditions.

- Moderate Risk of Flooding:
    - Forecasted flows and levels exceed bankfull capacity for the unfavourable future weather conditions but forecasted flows and levels are below bankful capacity for normal or favourable future weather conditions.

- Major Risk of Flooding:
    - Forecasted flows and levels exceed bankfull capacity and cause flooding for near normal and unfavourable future weather conditions.

Operational Forecasts:

- Estimated future crest water level, flow and date of occurrence provided once active melt and river flow has begun.

- Estimates are modelled based on observed flow, existing conditions (including channel capacity, topography, and remaining snowpack) and normal future weather.

- Observed conditions are monitored throughout the flood and compared against the historic climate data used to generate the forecast.

- Forecasts are updated when weather conditions are outside the range of historical climate data used to generate the forecast.

- A range of forecasted values is provided further in advance of an upcoming forecasted crest because of unknowns in the basin conditions and river flows, and limitations in the modelling procedures.