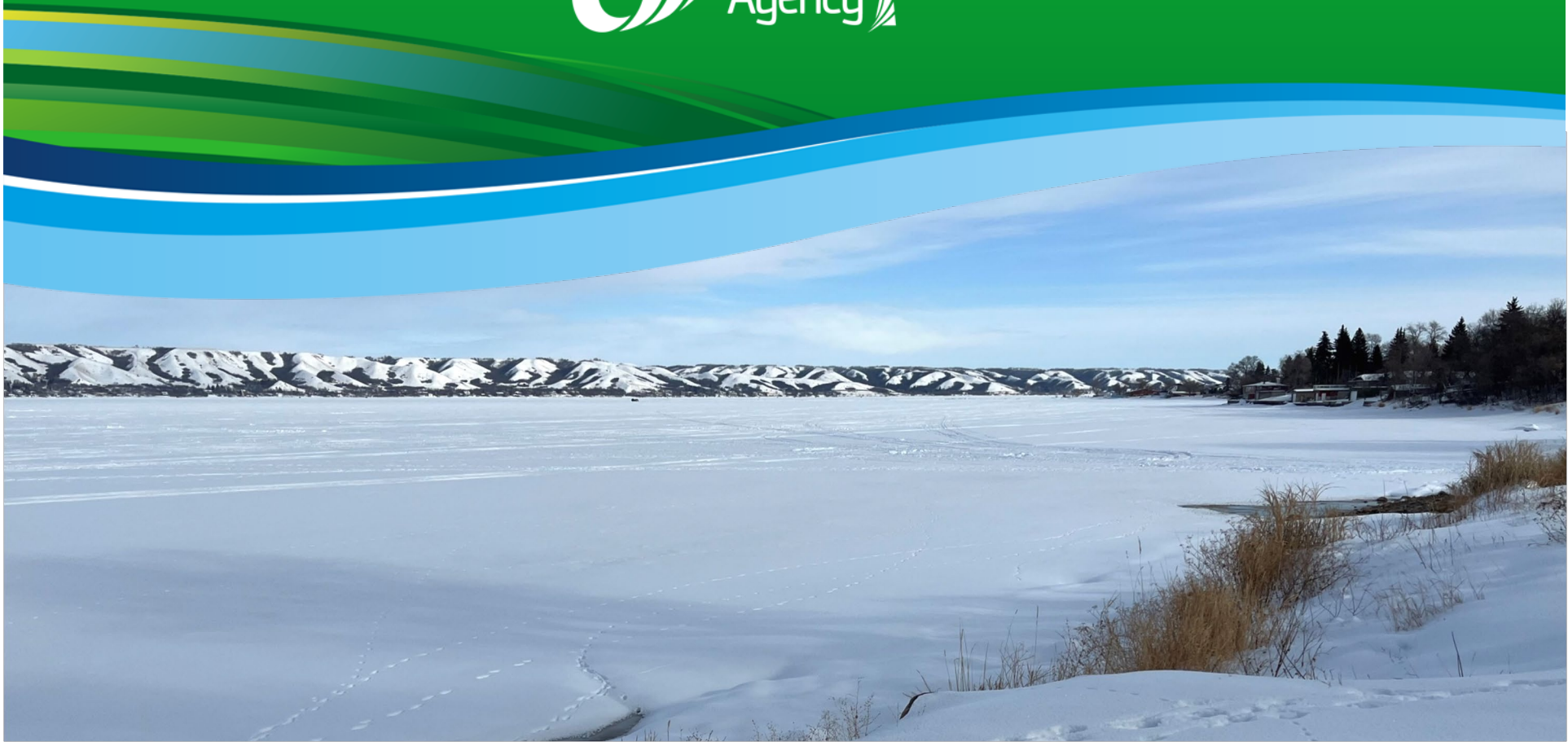


S A S K A T C H E W A N



Preliminary Runoff Outlook
February 1, 2023

Prepared by: Flow Forecasting and Operations Planning - Water Security Agency

Executive Summary

To facilitate preparations for spring runoff in 2023, the Water Security Agency (WSA) issues a preliminary runoff outlook. The projected snowmelt runoff potential for the province, based on conditions as of February 1, 2023, is shown in Figure 1. Average climatic conditions between February 1 and the spring melt were assumed when developing the spring runoff potential map. The runoff potential was determined based on the conditions at freeze-up (Figure 2) and the snowfall received to date this winter (Figure 3).

With dry soil moisture conditions at freeze-up, many areas of Saskatchewan are expected to receive below normal snowmelt runoff. The exceptions are the northwest, central and southeast areas of the province, which are expected to receive a near normal runoff response. The area south of the Cypress Hills, including Val Marie and Eastend, currently has an above normal snowpack, leading to expectations of a near normal runoff response there.

An area in the southwest, which includes Maple Creek, is expected to see a runoff response that is well below normal. Periodic warm temperatures in this area have eliminated nearly all the snowpack. This, combined with dry fall soil moisture conditions prior to freeze-up, have increased the probability of minimal snowmelt runoff this spring.

In the western portion of the grain belt where subsoil moisture is depleted, the melt rate is expected to have a significant impact on runoff yields. A slow melt will result in most of the snowpack recharging the soil column. A rapid melt is likely needed to result in more runoff to replenish surface water supplies.

An updated runoff outlook report will be issued in early March.

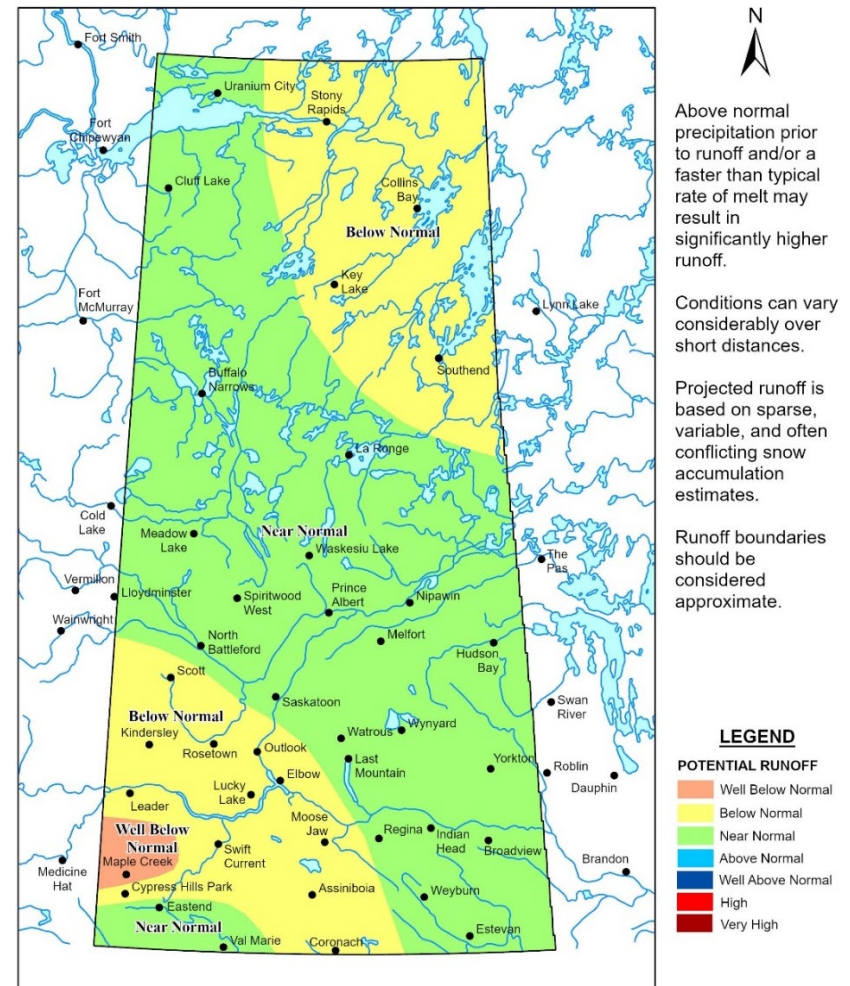


Figure 1: Spring Runoff Potential as of February 1, 2023

Cover Photo: Echo Lake January 20, 2023

Credit: Brett Watson, WSA

Fall Conditions

Across the western portion of the grain belt, precipitation accumulations in 2022 were well below normal. This resulted in dry conditions at freeze-up. Conditions at freeze-up were driest in the Saskatoon and Swift Current areas where extreme agricultural drought conditions existed throughout the 2022 growing season.

In eastern and northern areas of the province, precipitation recorded in the spring and early summer was above normal with some areas recording higher than the 90th percentile accumulations. However, late summer and the fall were drier than normal, resulting in slightly drier than normal soil moisture conditions at freeze-up.

There were two significant early snowfall events late in the fall of 2022. The first event impacted areas across the southwest and the east-central portions of the province. This heavy snowfall was followed by warmer temperatures, which melted much of the snowpack and improved soil moisture near the surface. The second snowfall event occurred in early November and affected most of southern and central Saskatchewan.

The early snowfall that melted could result in two outcomes: 1) there is the potential that the increased soil moisture will reduce infiltration capacity this spring because the soil will be frozen, or 2) the heavy snow received in early November could insulate the soil and reduce frost penetration, which would result in more infiltration in the spring and therefore reduce the runoff in spring 2023. Snow surveys, which will be conducted in late February, will help to establish which scenario is most likely.

In fall 2022, WSA developed a map (Figure 2) which illustrates the risk that hydrological drought will occur in 2023. This map illustrates the moisture conditions present at freeze-up in 2022.

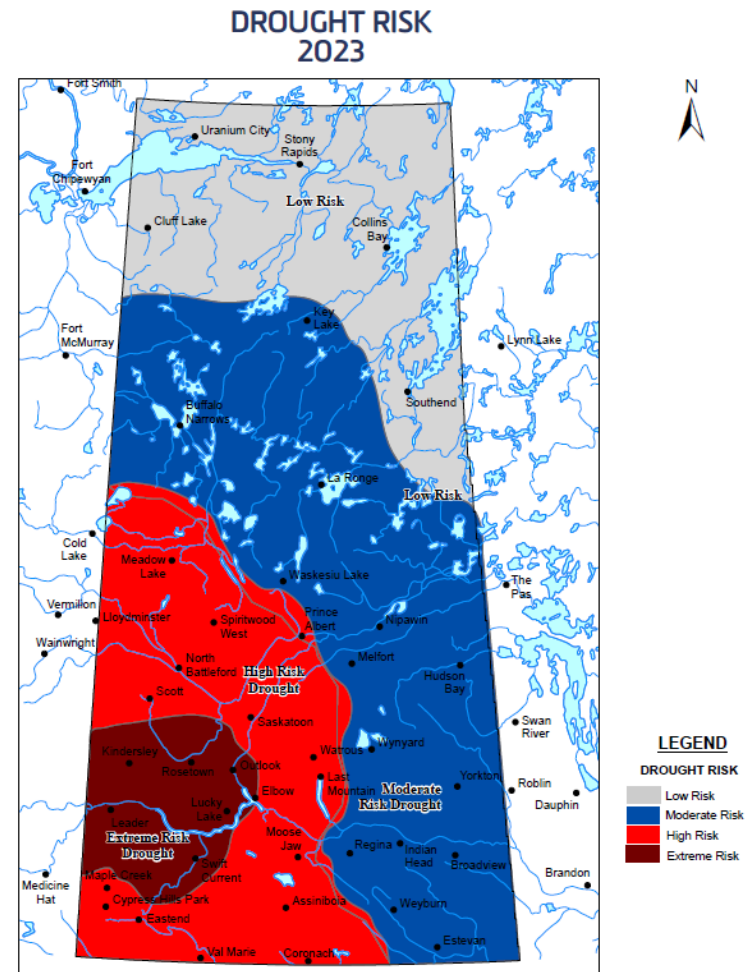


Figure 2: Hydrological Drought Risk as of October 2022

Early Winter Precipitation

Point snowfall data, mapped as a per cent of average, is provided in Figure 3. Based on this information, winter snowfall has been normal to above normal across most of southern Saskatchewan except for the southeast and south-central edges of the province, where snowfall has been below normal thus far. A small area around Watrous has also received well below normal snowfall amounts. Since many of this winter's snowfall events have been accompanied by strong winds, these observations may be underestimating winter precipitation.

The month of January was warmer than normal for the entire southern half of the province, with areas in the Boreal Transition Zone and the southwest experiencing temperatures as much as 5 degrees Celsius above normal. This has led to some mid-winter melt in the Maple Creek area. In addition, the map shown in Figure 3 is based on a relatively small number of sites across Saskatchewan.

In some areas, meltwater from higher January temperatures has wetted the soil surface and has reduced the infiltration capacity available to absorb late season snowmelt. This may direct more water to the province's storage reservoirs during spring runoff.

Manual snow surveys will be completed in late February to confirm snowpack conditions in advance of our early March Spring Runoff Forecast.

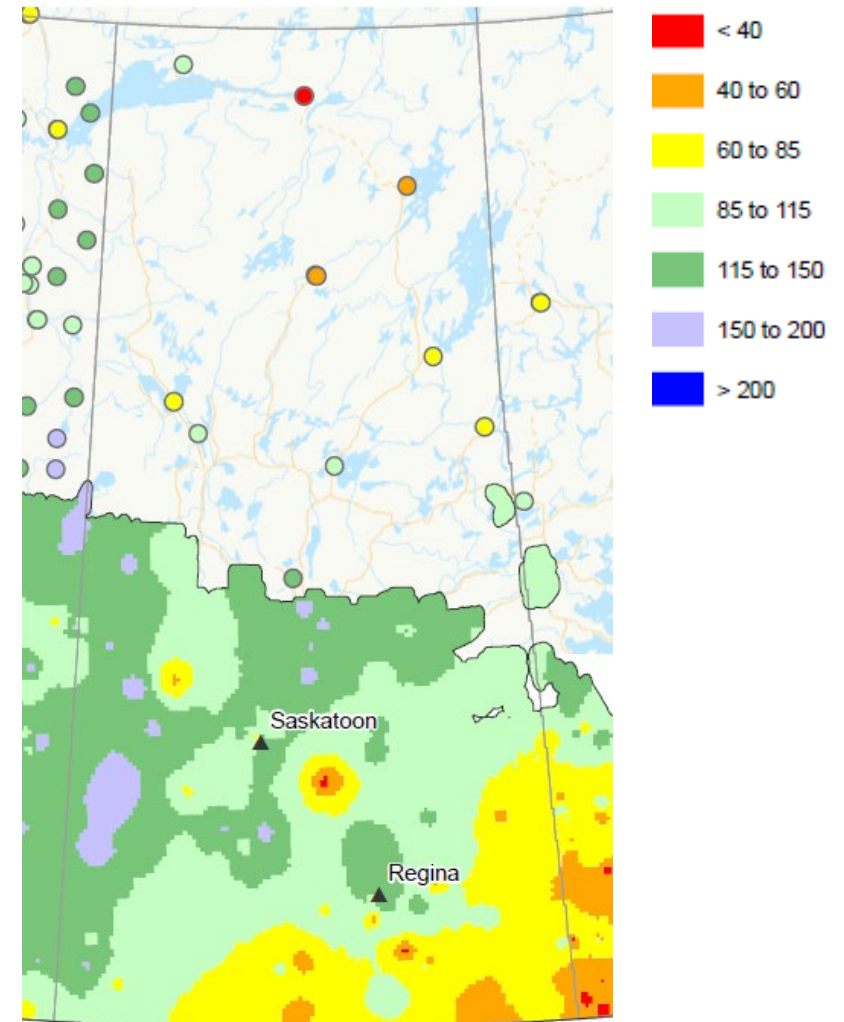


Figure 3: Per cent Normal Snowfall
(November 1, 2022 to January 31, 2023)
Map courtesy of Agriculture and Agri-food Canada

Long Range Forecasts

Most long-range precipitation forecasts are predicting a near normal precipitation accumulation across the province for February, March and April. All long-range models are predicting colder than normal temperatures over most of the province during this period. It is important to note that seasonal weather forecasts are statistically unreliable, and their skill is particularly poor for predicting precipitation. However, good agreement among various long-range products indicates a higher degree of confidence. Three-month spatial anomalies maps for precipitation (Figure 4) and temperature (Figure 5) covering the Feb. 1 to April 30 forecast period show the expected long-range precipitation and temperature trends in relation to climate normals.

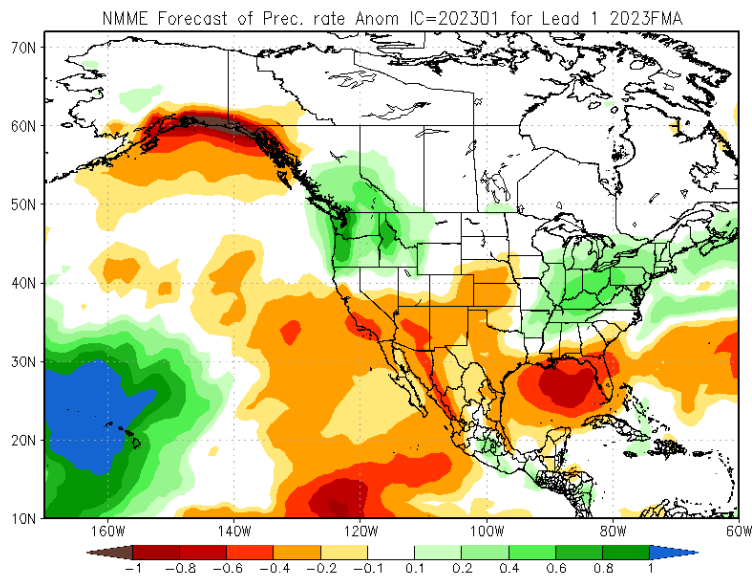


Figure 4: Multi Model Ensemble Precipitation Anomaly Forecast (Feb. 1, 2023 to April 30, 2023)
Map Courtesy of the US National Weather Service

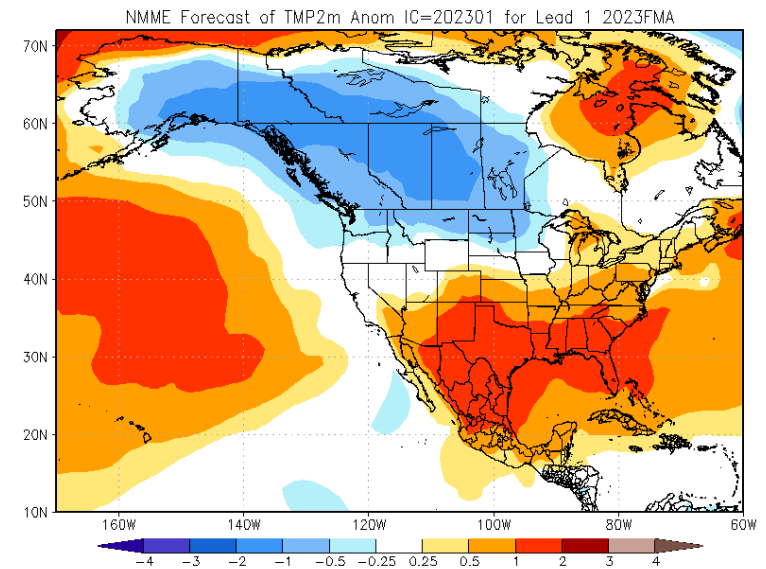


Figure 5: Multi Model Ensemble Temperature Anomaly Forecast (Feb. 1, 2023 to April 30, 2023)
Map Courtesy of the US National Weather Service

Water Supply Outlook

Souris Basin

Both Rafferty Reservoir and Grant Devine Lake are below their prescribed February 1 drawdown elevations. With drier than normal conditions at freeze-up in 2022 and what is estimated to be a near to slightly above normal snowpack, the snowmelt runoff response is expected to be near normal above the three reservoirs and above normal in the area below the reservoirs to Sherwood Crossing. Additional drawdown of the reservoirs is not expected, and it is anticipated that reservoir releases during the spring runoff period will be limited to amounts required to meet international apportionment obligations. At this time, Boundary Dam Reservoir and Grant Devine Lake are expected to fill during spring runoff. Any excess water from Boundary will be diverted to Rafferty. At this time, Rafferty Reservoir is not expected to fill from snowmelt inflows in 2023.

Detailed forecasts for the Souris River Basin are developed on or near the first and fifteenth of each month, beginning in February, up until the snowmelt runoff event. These forecasts can be found on wsask.ca.

Saskatchewan River Basin

Winter inflows to Lake Diefenbaker have been close to the historical median. However, winter outflows from Gardiner Dam are slightly below normal due to Lake Diefenbaker being lower than normal going into the winter and a drawdown target for March that is near the upper end of the typical range. Flows on the North Saskatchewan River have been normal to above normal throughout the winter months.

The snowpack over the eastern slopes of the Rockies in the Saskatchewan River Basin's headwaters, which is responsible for much of the flow on the system in May and June, varies from above normal to much above normal in the Oldman River Basin and from below normal to above normal in the Bow River Basin.

Although the mountain snow measurements in the headwaters are only conducted at about half of the locations at this time and it is too early to make a reliable assessment of winter snowpack, the alpine snow accumulation seems to indicate the potential for flows into Saskatchewan in May and June that are sufficient to meet all user needs over the summer months. However, rainfall accumulations over southern Alberta in late spring and early summer, which cannot be predicted at this time, also play a large role in reservoir inflows. WSA is targeting a drawdown level of 551.5 metres at Lake Diefenbaker for March, which is the upper end of the typical range.

Qu'Appelle System

All lakes within the Qu'Appelle River Basin are at near normal levels for this time of year. While Buffalo Pound Lake is currently 0.09 m above the top of its winter operating range, a late January reduction in the Qu'Appelle River Dam outflow is expected to bring the lake down to the top of its operating range ahead of snowmelt runoff. With drier soil moisture conditions at freeze-up and less winter precipitation, areas upstream of Buffalo Pound Lake and lower portions of the Moose Jaw River are expected to experience a below normal snowmelt runoff response. With conditions in fall 2022 that were a little wetter and a snowpack that is thought to be near normal, lower areas of the basin (areas east of Lumsden) are expected to experience near normal snowmelt runoff in 2023. Currently, it appears that there is sufficient snowpack to bring all lakes within the system up to desirable summer operating levels in 2023.

Currently, the Echo Lake and Crooked Lake control structures are fully open. Stoplogs will be installed in these structures as needed to bring the lakes up to desirable levels for summer recreation. The Craven Control Structure will also be operated to manage upstream water levels and assist in bring Last Mountain Lake up to a desirable operating level for the summer months. At this time, we do not anticipate flooding within the system due to snowmelt runoff; however, that situation can change depending on the amount of late winter precipitation and the rate of melt. Localized flooding due to ice jamming is also possible. The March 1 Spring Runoff Forecast will contain a more detailed forecast and operating plan for the system.

Churchill System

Flows throughout the Churchill River Basin are between lower quartile and median levels for this time of year. With a near normal snowpack over southern portions of the basin, flows are expected to remain near or below normal into the summer months. Lac La Ronge is currently near the lower end of its operating range.

Quill Lakes

The Quill lakes are at an elevation of 519.6 m. This elevation is approximately the same as this time last year. The November and December snowfall recorded at Wynyard was above normal (52 mm, 157 per cent of normal), but the area received minimal snow in January bringing winter accumulations closer to normal. The runoff response to the Quill lakes will depend largely on the snow received over the next couple of months, the melt rate, and the conditions at the soil surface. Assuming near normal snow conditions, a near normal snowmelt inflow is expected.

A forecast for the post-snowmelt runoff peak water level will be provided in our March forecast.

Southwest

As of February 1, the snowpack across the southwest region of the province varies greatly. In the Maple Creek area, periodic warm temperatures have eliminated most of the snowpack. South of the Cypress Hills and in the Swift Current Creek Basin, a normal snowpack is present. The snowpack southeast of the Cypress Hills, especially in the Frenchman River Basin, appears to be above normal. Due to warm temperatures in January, the snowpack is hard and dense. Depending on weather conditions during spring runoff, this could result in a more prolonged runoff response.

Next Forecast

WSA will issue a Spring Snowmelt Forecast in early March.