Government of
Northwest Territories

NWT Water Monitoring Bulletin – May 02, 2023 at 13:00

NWT break up reports will be published routinely as break up unfolds. These reports will focus on regions with active snowmelt and ice break up. The geographic focus of the report will shift as conditions change. Additional information about basin conditions can be found in the ECC Snow Survey Bulletin and Spring Water Outlook, available here. If you have any photos or information about break up in your community, feel free to reach out to us: nwtwaters@gov.nt.ca.

Current Status:

- Water levels at the Hay River near Hay River hydrometric gauge reached their ice-induced peak on Apr. 30 and have been steadily declining since that point.
- On the Liard River and on the Mackenzie River at Fort Simpson, water levels are rising under the ice, but the rates of increase are still small;
    - Most of the snowpack has melted in the lower Liard River basin;
    - There are small patches of open water developing between Jean Marie River and Fort Simpson.
- Warmer than seasonal temperatures are forecast for the southern Dehcho region (lower Liard and upper Mackenzie basins) over the next week;
    - Daily highs will be in the low- to mid- 20s and will approach 30°C near Fort Providence. The warm weather and sun will rapidly melt any remaining snow and soften river ice.

Contents

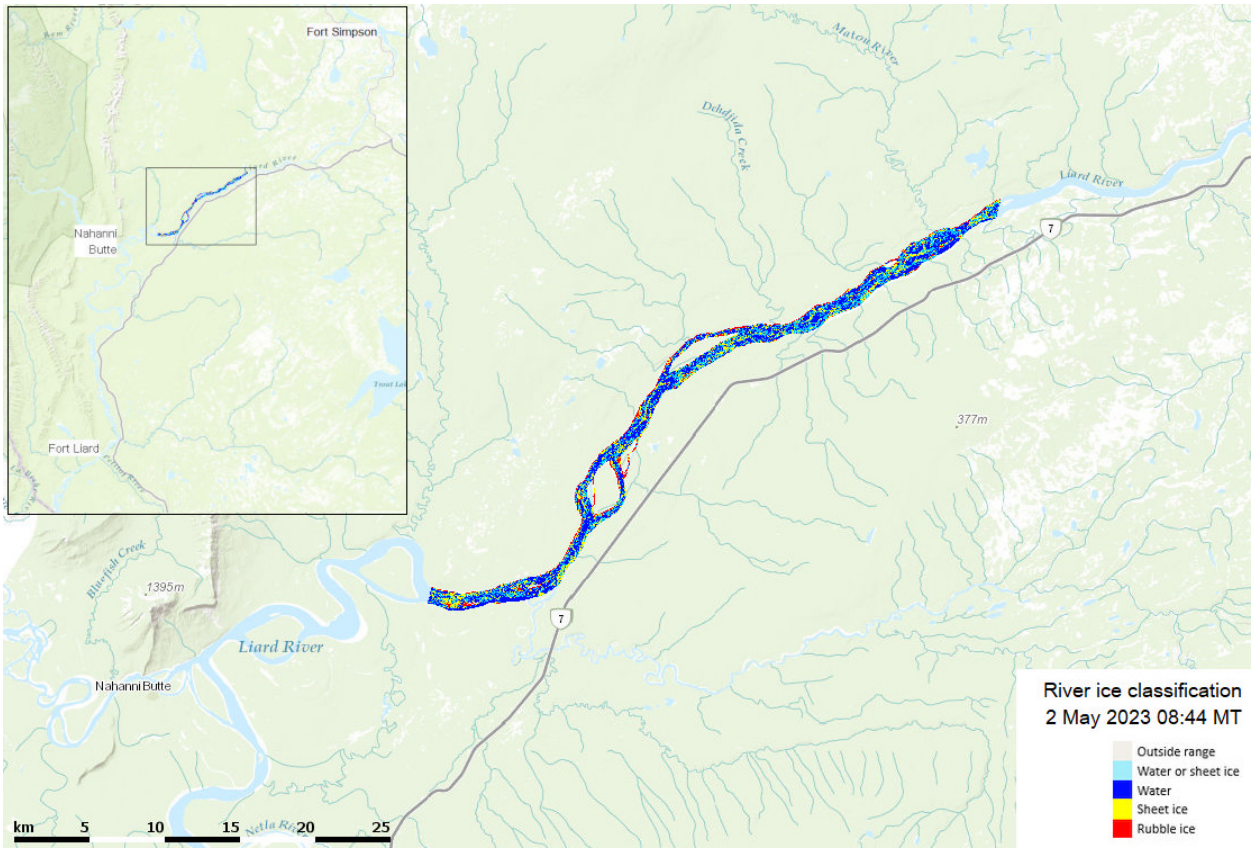
Liard River:

Current Status:

- Most of the lower Liard River basin is snow-free;
- Ice on the Liard River is softening in response to warm temperatures;
- Water levels are increasing underneath the ice on the Liard River at Fort Liard;
    - The rate of water level rise is normal for this stage of break up;
    - Lower water levels than normal on small tributaries to the Liard River are preventing ice from lifting and is also limiting the delivery of warmer water;
- The southern Dehcho region is forecast to receive warmer than normal temperatures throughout this week.

Above – Map of hydrometric stations in the Liard River basin. The station numbers are referenced in the water level plots below.

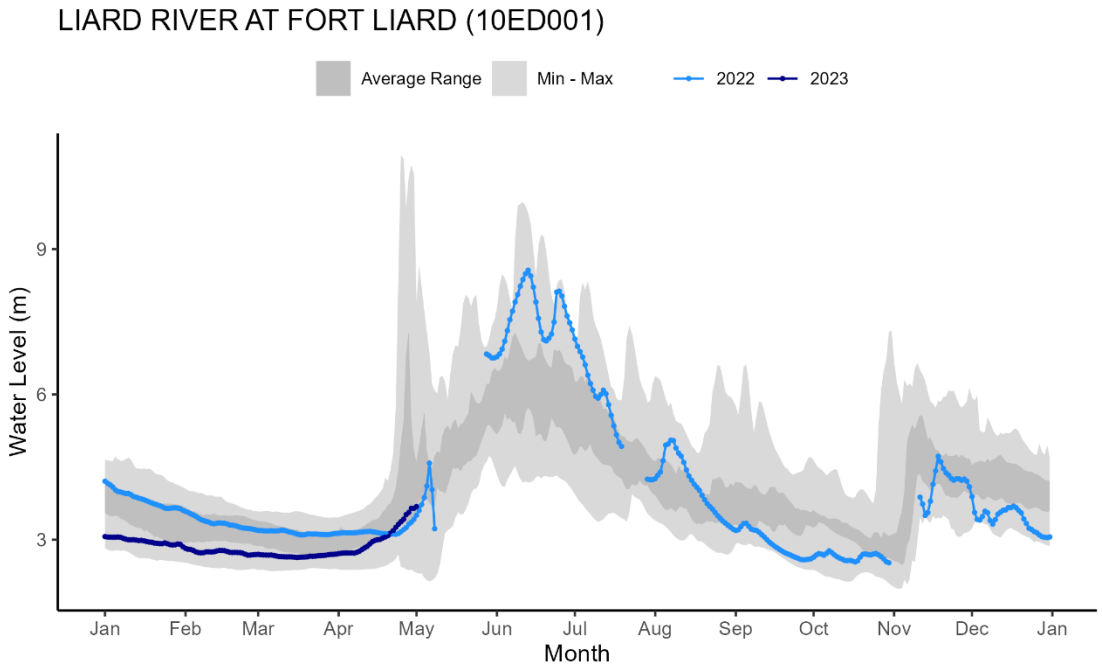
Satellite Data:



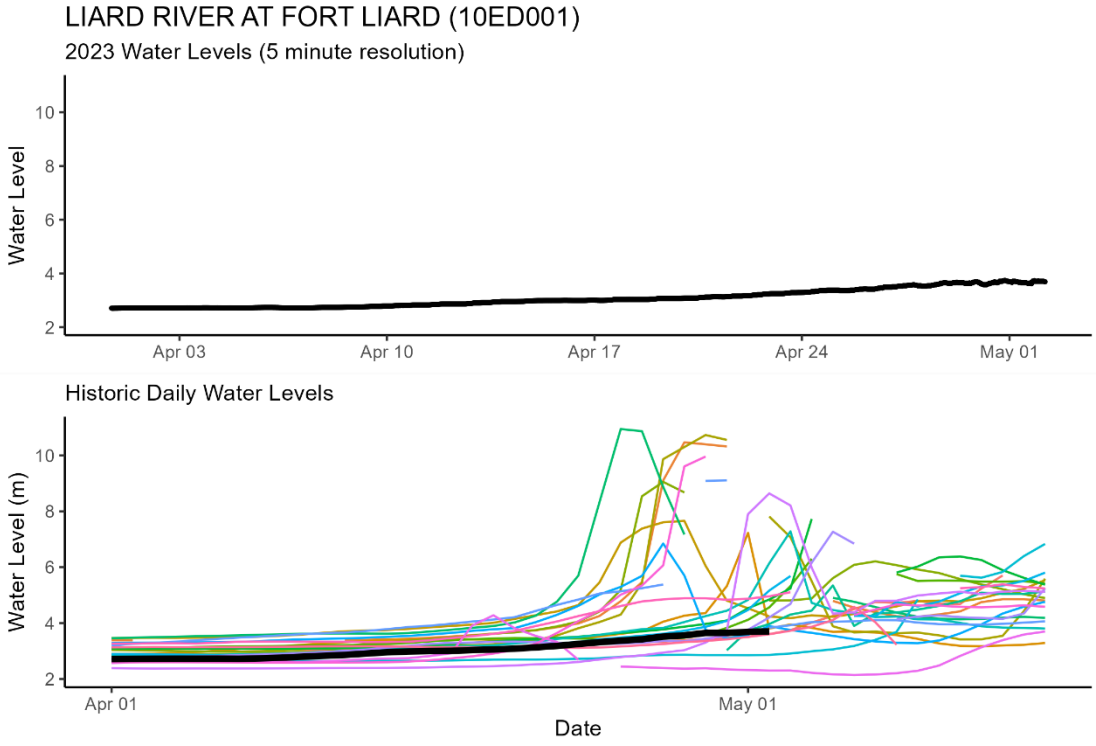
Above – River ice classification information for the Liard River, using radar imagery taken on the morning of May 02, 2023. The image shows meltwater on top of ice.

Hydrometric Data:

Liard River at Fort Liard [10ED001]:



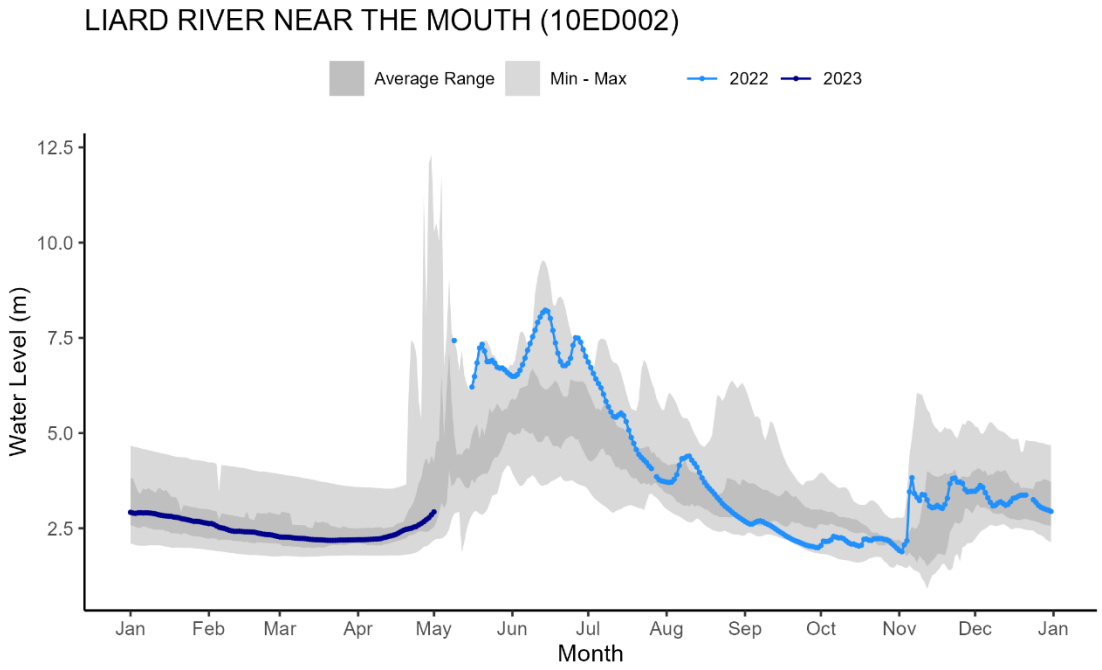
Above – Water level data for the Liard River at Fort Liard. Daily average levels for the previous year are shown here.



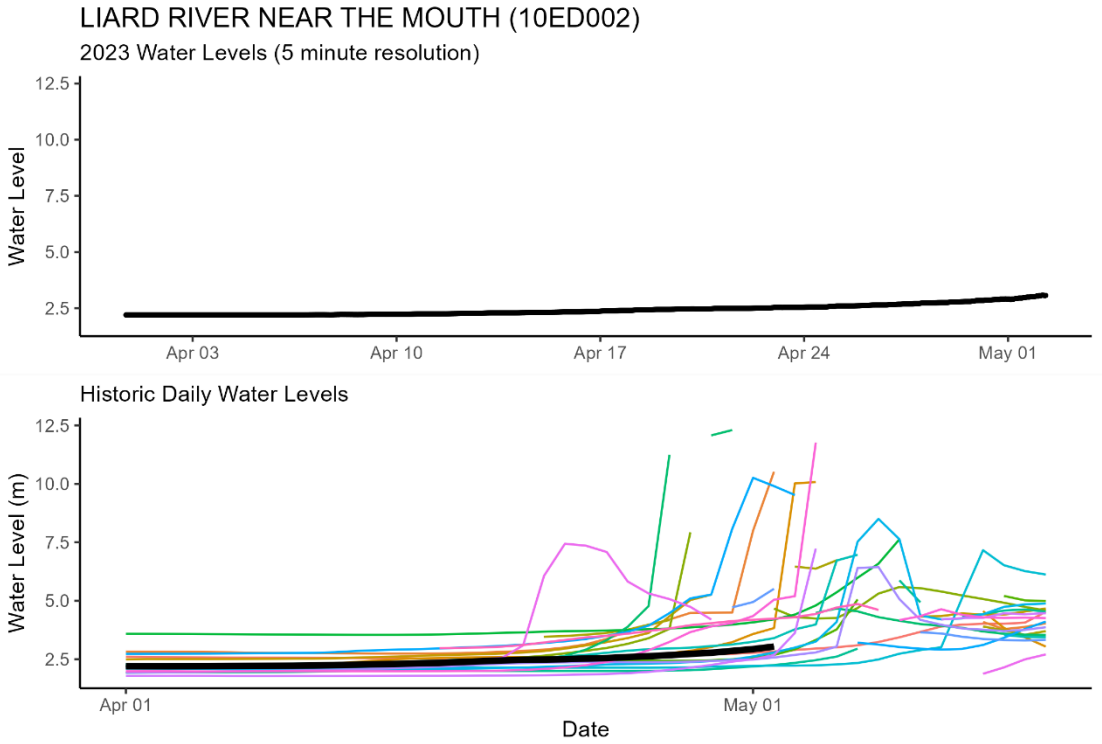
Above - The upper graph in the figure presents real time water level data at 5-minute resolution. The lower graph shows daily average levels relative to the previous 20 years.

Above – Liard River at Fort Liard hydrometric gauge photo from May 02 at 12:00. Photo courtesy of Water Survey of Canada and GNWT.

Liard River near the mouth [10ED002]:



Above – Water level data for the Liard River near the mouth (at Fort Simpson). Daily average levels for the previous year are shown here.



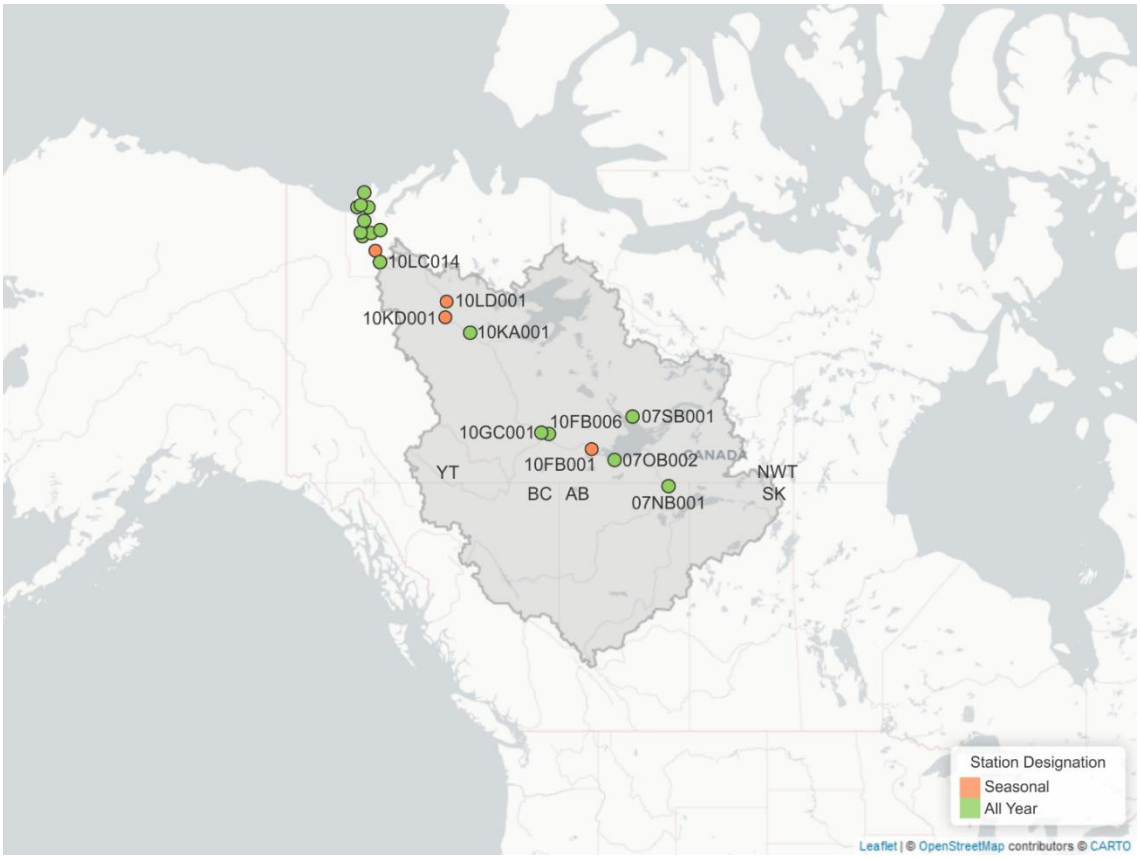
Above - The upper graph in the figure presents real time water level data at 5-minute resolution. The lower graph shows daily average levels relative to the previous 20 years.

Above – Liard River near the mouth hydrometric gauge photo from May 02 at 12:00. Photo courtesy of Water Survey of Canada and GNWT.

Mackenzie River

Current Status:

- Ice on the Mackenzie River is still largely intact
    - There are two small open water sections downstream of Jean Marie River (see satellite imagery);
- Water levels are rising underneath the ice at the Mackenzie River at Fort Simpson, but water levels remain average for this stage of break up;
- Warm temperatures in the region will soften river ice and expedite breakup.



Above – Map of hydrometric stations in the Dehcho (Mackenzie River) basin. The station numbers are referenced in the water level plots below.

Satellite Data:

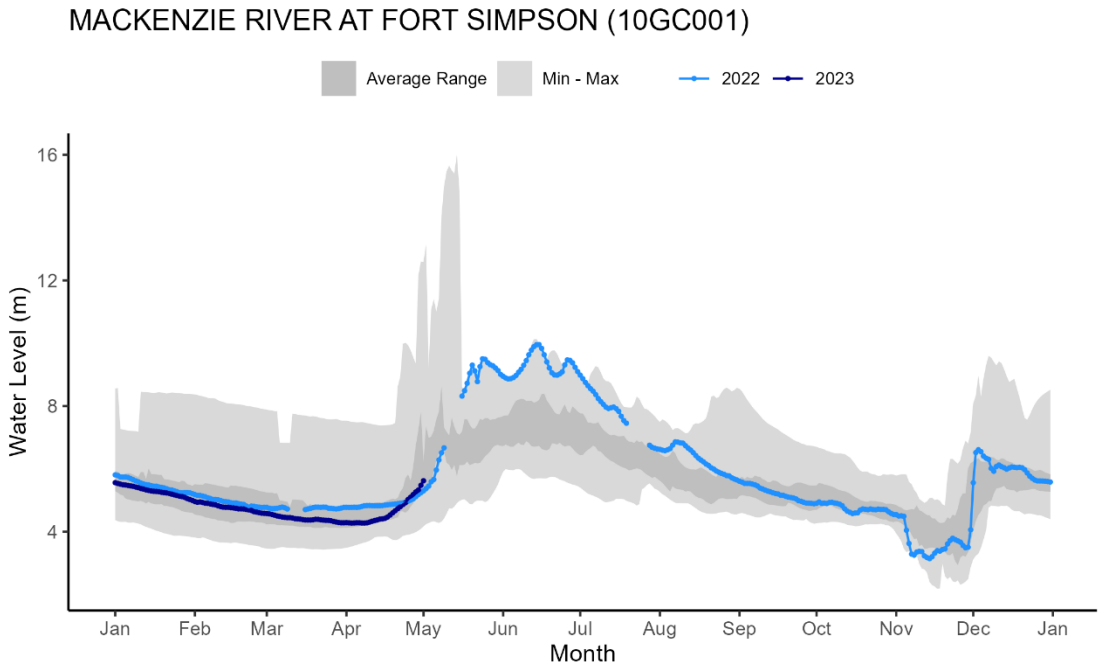
Above – Sentinel-2 imagery of the Liard and Mackenzie rivers acquired on May 01 at 13:00. The image shows intact ice along the Liard and Mackenzie rivers with some small open water sections downstream of Jean Marie River. There is also a section of open water upstream of Jean Marie River (not pictured here).

Hydrometric Data:
Mackenzie River at Strong Point [10FB006]:

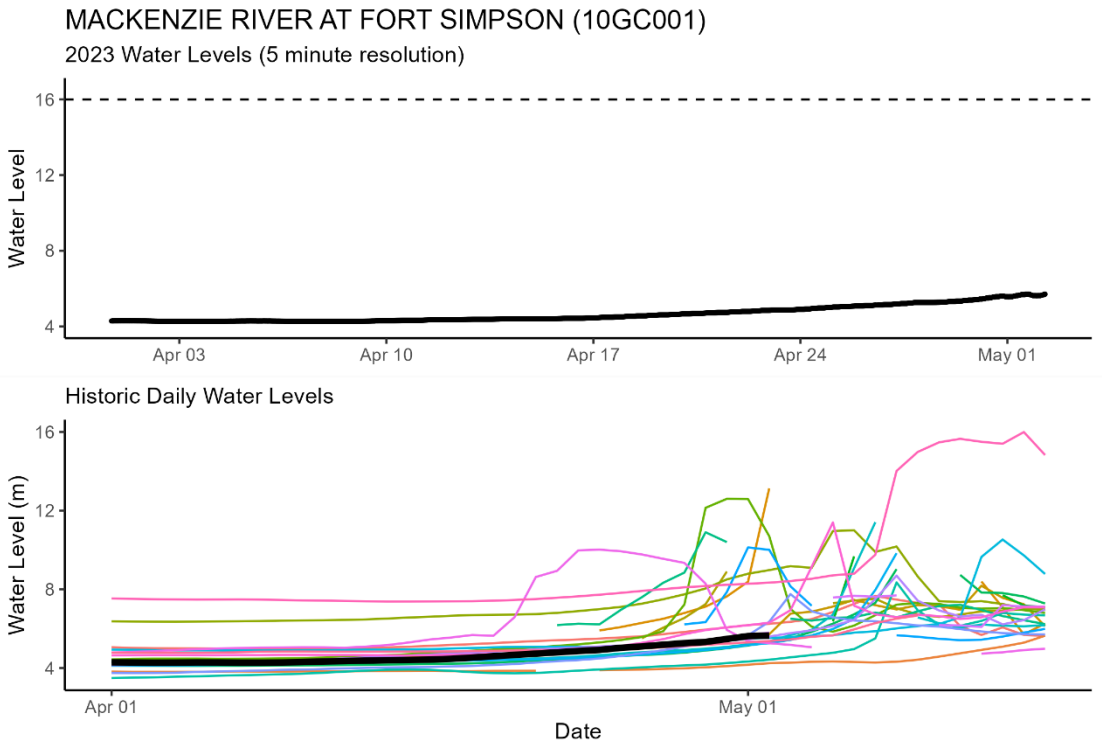
Note – The water level sensor at the Mackenzie River at Strong Point gauge appears to have been impacted by ice and is not producing reasonable values.

Above – Mackenzie River at Strong Point hydrometric gauge photo from May 02 at 12:00. Photo courtesy of Water Survey of Canada and GNWT.

Mackenzie River at Fort Simpson [10GC001]:



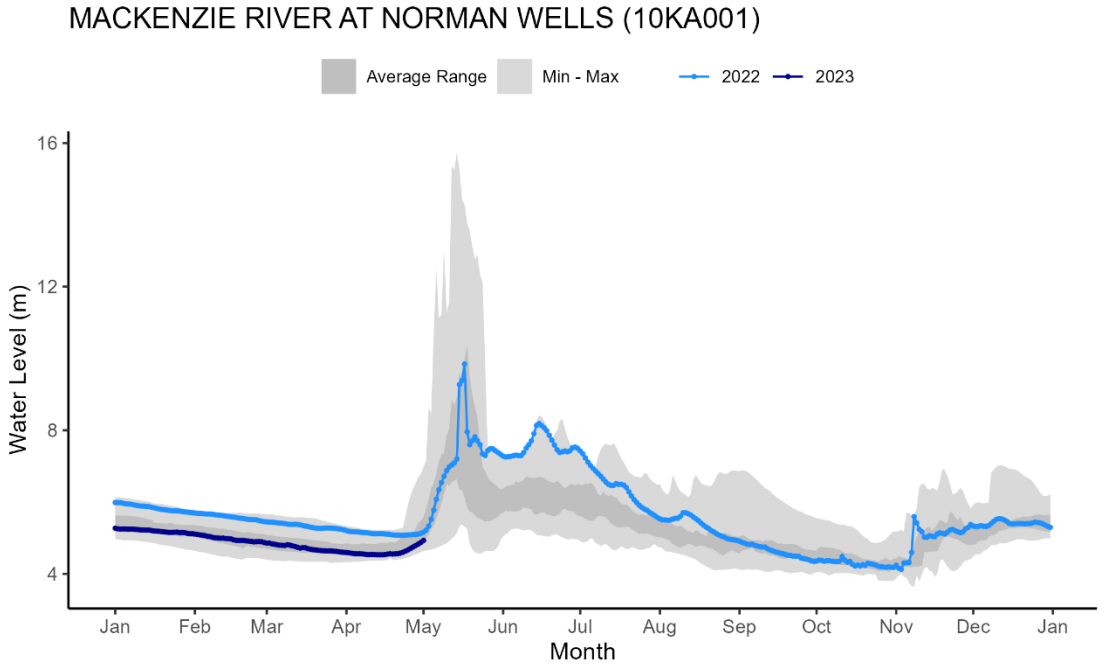
Above – Water level data for the Mackenzie River at Fort Simpson. Daily average levels for the previous year are shown here.



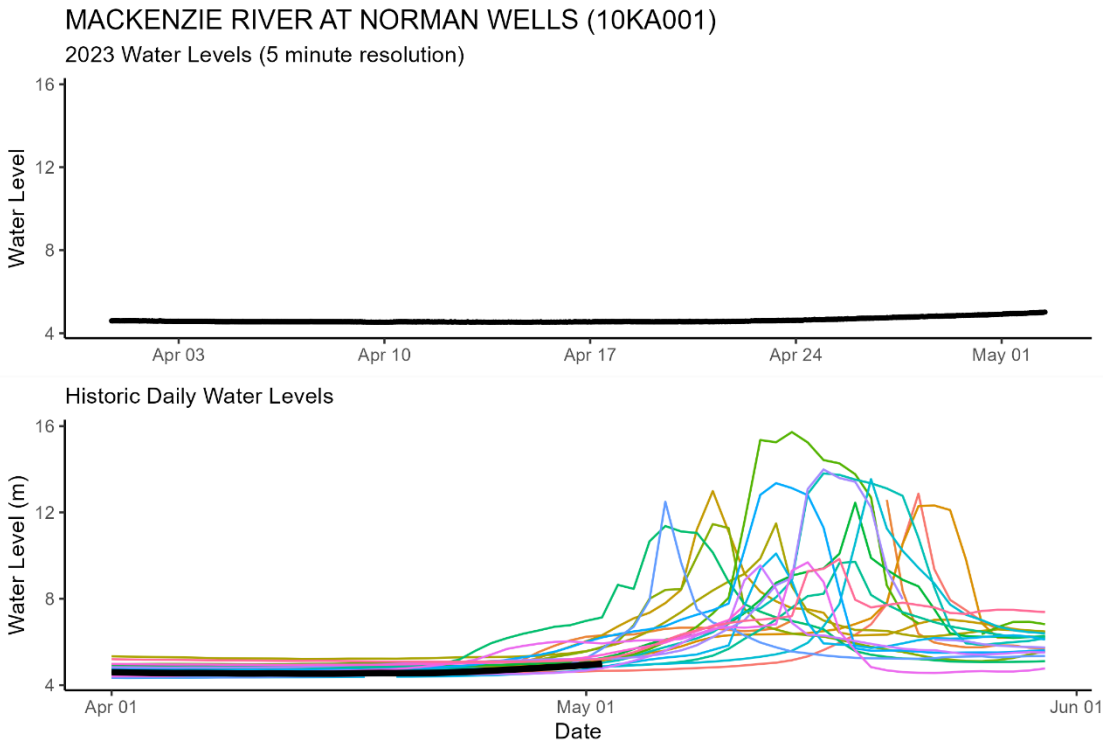
Above: The upper graph in the figure presents real time water level data at 5-minute resolution. The lower graph shows daily average levels relative to the previous 20 years.

Above – Mackenzie River at Fort Simpson hydrometric gauge photo from May 02 at 12:00. Photo courtesy of Water Survey of Canada and GNWT.

Mackenzie River at Norman Wells [10KA001]:



Above – Water level data for the Mackenzie River at Norman Wells. Daily average levels for the previous year are shown here.



Above: The upper graph in the figure presents real time water level data at 5-minute resolution. The lower graph shows daily average levels relative to the previous 20 years.

Weather Data:

Current status and forecast:

The southern Dehcho region is forecast to receive well above seasonal temperatures for the next week. Daytime high temperatures are forecast in the low- to mid-20s with areas near Fort Providence expected to reach the high-20s on Wednesday. Satellite imagery indicates that the snowpack has melted in almost all the lower Liard River basin and that snowmelt runoff delivery has likely ceased. Warm temperatures should soften river ice on the Liard and Mackenzie rivers.

The spring has been warmer than normal throughout the southern NWT and northern AB and BC. Spring temperatures have been cooler in the Sahtu region suggesting that snowmelt timing will be closer to average further down the Mackenzie River.

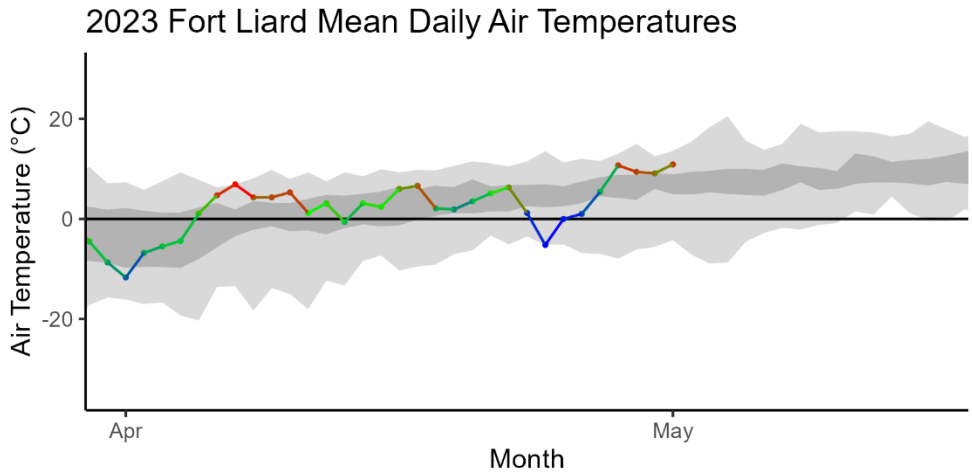
Background information and context:

Weather information informs how snow and ice will melt and provides information about how this spring is unfolding relative to previous springs. Warmer than normal conditions early in the spring allow for additional energy to melt the snowpack and soften river ice. Rain-on-snow events can cause rapid melt of snowpacks and facilitate quick delivery of snowmelt water to rivers. Locations included here cover basin areas that feed into NWT rivers that are currently undergoing break up.

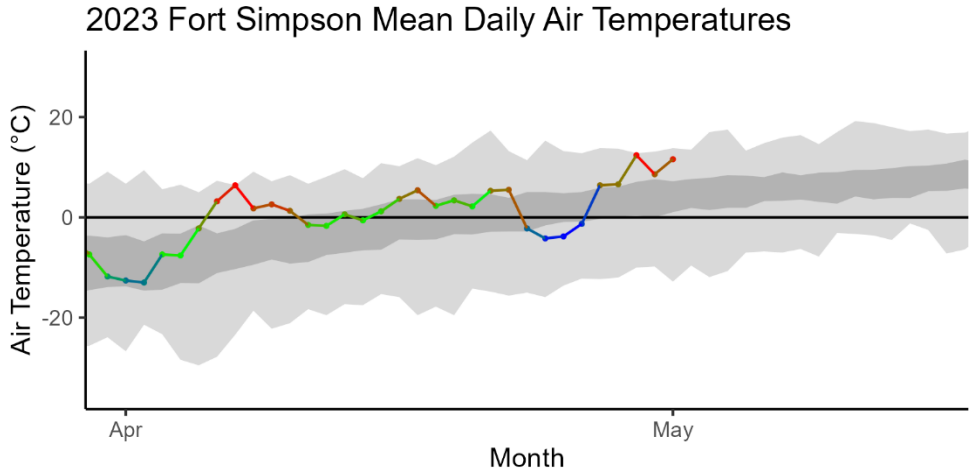
There are two sets of figures below. The first set of figures shows daily temperatures relative to normal for select locations in AB, BC, and the NWT. Weather information for High Level, AB and Fort Nelson, BC provide an idea of conditions in the upper (i.e., southern) part of the Hay River basin. The dark grey bands represent the average range of temperatures, while the light grey bands represent historic minimum and maximum daily mean temperatures. The second set of figures present a seven day weather forecast, provided by Environment and Climate Change Canada.

2023 spring temperatures to-date:

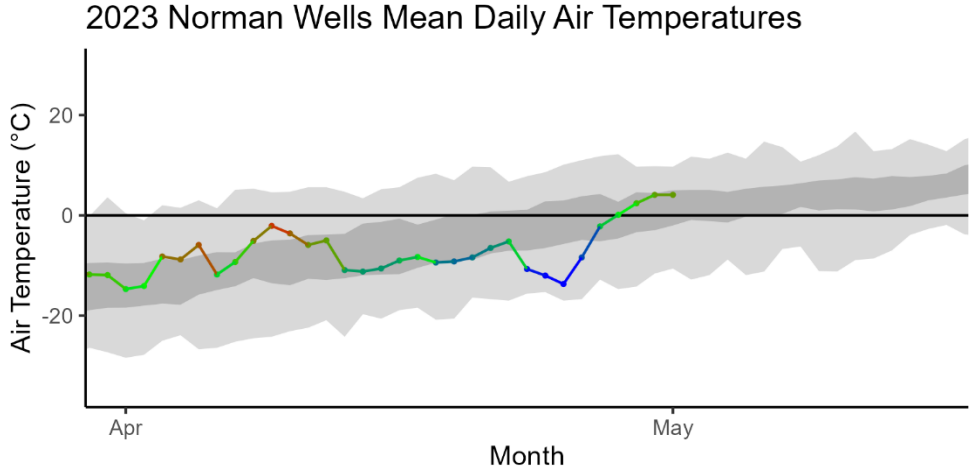
Fort Liard:



Fort Simpson:



Norman Wells:



Seven-day weather forecast:

Fort Liard:

Tue 2 May	Wed 3 May	Thu 4 May	Fri 5 May	Sat 6 May	Sun 7 May	Mon 8 May
24°C	24°C	20°C	21°C	25°C	18°C	15°C
A mix of sun and cloud	Mainly sunny	Sunny	A mix of sun and cloud	Sunny	A mix of sun and cloud	A mix of sun and cloud
Tonight	**Night**	**Night**	**Night**	**Night**	**Night**	
8°C	6°C	10°C	12°C	5°C	4°C	
A few clouds	Clear	Cloudy periods	Clear	Cloudy periods	Cloudy periods	

Fort Simpson:

Tue 2 May	Wed 3 May	Thu 4 May	Fri 5 May	Sat 6 May	Sun 7 May	Mon 8 May
24°C	25°C	19°C	21°C	25°C	19°C	16°C
A mix of sun and cloud	A mix of sun and cloud	Sunny	A mix of sun and cloud	Sunny	A mix of sun and cloud	A mix of sun and cloud
Tonight	**Night**	**Night**	**Night**	**Night**	**Night**	
14°C	6°C	7°C 30%	9°C	6°C	4°C	
Partly cloudy	Clear	Chance of showers	Clear	Cloudy periods	Cloudy periods	

Norman Wells:

Tue 2 May	Wed 3 May	Thu 4 May	Fri 5 May	Sat 6 May	Sun 7 May	Mon 8 May
8°C	3°C 60%	8°C	7°C	15°C	9°C	7°C
A mix of sun and cloud	Chance of showers	Sunny	Sunny	Sunny	A mix of sun and cloud	A mix of sun and cloud
Tonight	**Night**	**Night**	**Night**	**Night**	**Night**	
-3°C	-5°C	-2°C	0°C	1°C	-1°C	
Partly cloudy	Clear	Clear	Clear	Cloudy periods	Cloudy periods	

Factors to Watch:

It is important to note that much of the water contributing to flooding of NWT communities originates from outside of the NWT, which is why we also rely on information from the Yukon, British Columbia, Alberta and Saskatchewan.

The potential and severity of flooding will depend in large part on the weather over the upcoming weeks and how this interacts with existing ice conditions, water levels and snow pack amounts.

The primary factors that influence water levels in the spring are:

- Ice jams (can result in out-of-bank flows, even if there are below normal flows)
- Rate of melt of ice and snow:
    - Gradual vs quick melt
    - Rain on snow or ice events (rain brings a lot of energy to help melt happen more quickly)
- Current water levels
- How wet the ground was in the fall
- Snowpack

Spring Break up on NWT Rivers: Mechanical vs Thermal

In any given year, spring flooding can occur in a number of NWT communities, including Hay River, Jean Marie River, Fort Simpson, Fort Liard, Nahanni Butte, Tulita, Fort Good Hope, Fort McPherson and Aklavik. Spring flooding is caused by ice jam-induced flooding and can occur irrespective of existing water levels. However, if existing water levels are high, the impact of an ice jam flood can be much worse.

Ice jams typically form when on north-flowing rivers, where warm weather and snowmelt cause ice to break up on the southern reaches of a river. As this ice flows north (downstream), it meets a more solid ice cover. When this happens, the pieces of floating ice jam on the solid ice and can form a dam, which causes water levels to rise rapidly. This is called a **mechanical break up**, whereby the ice downstream is broken up by the force of ice moving into it.

If there is warm and sunny weather throughout early spring, the ice will thermally erode and weaken. This provides less of a resisting force for ice and water moving down the river and will have less of a chance of causing water levels to rise. This is called a **thermal break up**.

The causes of mechanical and thermal break ups are usually dependent on the weather during early spring. Warm weather, sunshine, and rain on snow events are usually a good way to bring extra energy into the system to help melt the ice. Warm temperatures in the upstream part of a basin could also cause a rapid snowmelt and move water to the river very quickly. This could lead to ice-jam conditions downstream if the ice has not yet received enough energy to degrade. Another important factor is the thickness of the ice. Thicker ice takes longer to melt and can increase the chances of ice jams. If an ice jam occurs, the location of the ice jam is also very

important. Each river reach has different locations that are prone to ice jams. The location of the ice jam can be an important factor as to whether or not a community floods. Furthermore, ice will jam and then move again at multiple locations along a river as break up progresses downstream. The timing and location of each jam can also influence if a community will flood.

Technical Note:

- The figures in this report plot water levels. The values on the y-axis are (in most cases) relative to an arbitrary datum. This means that the values on each gauge can be compared to different years but should not be used to compare water levels from one location to the next.

For example, the Hay River near the border gauge (07OB008) records a level of about 288 m. The Hay River near Hay River gauge (07OB001) usually records a level of about 4 m. This **does not mean** that the water level at the Hay River at the border site is 284 m higher than the water level at the Hay River near Hay River site.