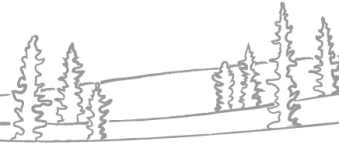




NWT Water Monitoring Bulletin

– May 04, 2023 at 14:00



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:

- On the Liard River and on the Mackenzie River at Fort Simpson, water levels are fluctuating under the ice and responding to upstream ice movement;
- Ice has yet to break on the Mackenzie River at Fort Simpson, or on the Liard River at the mouth (*i.e.* the confluence with the Mackenzie River);
 - There is an ice jam on the Mackenzie River just upstream of the confluence with the Liard River;
 - This jam has caused water levels to rise behind it (water levels are rising at the Mackenzie River at Strong Point gauge, near the mouth of the Rabbitskin River);
 - There is a large stretch of open water originating downstream of Jean Marie River and extending to the head of the ice jam;
 - Ice had yet to break in Jean Marie River as of early this morning.
 - Water levels in Fort Simpson at breakup will depend on the timing of when Mackenzie and Liard ice starts moving and how it clears downstream;
- 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 °C over the next couple of days and are forecast to exceed previously recorded highs on Saturday and approach 30°C. The sun and warm weather will continue to soften river ice.

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Liard River:

Current Status:

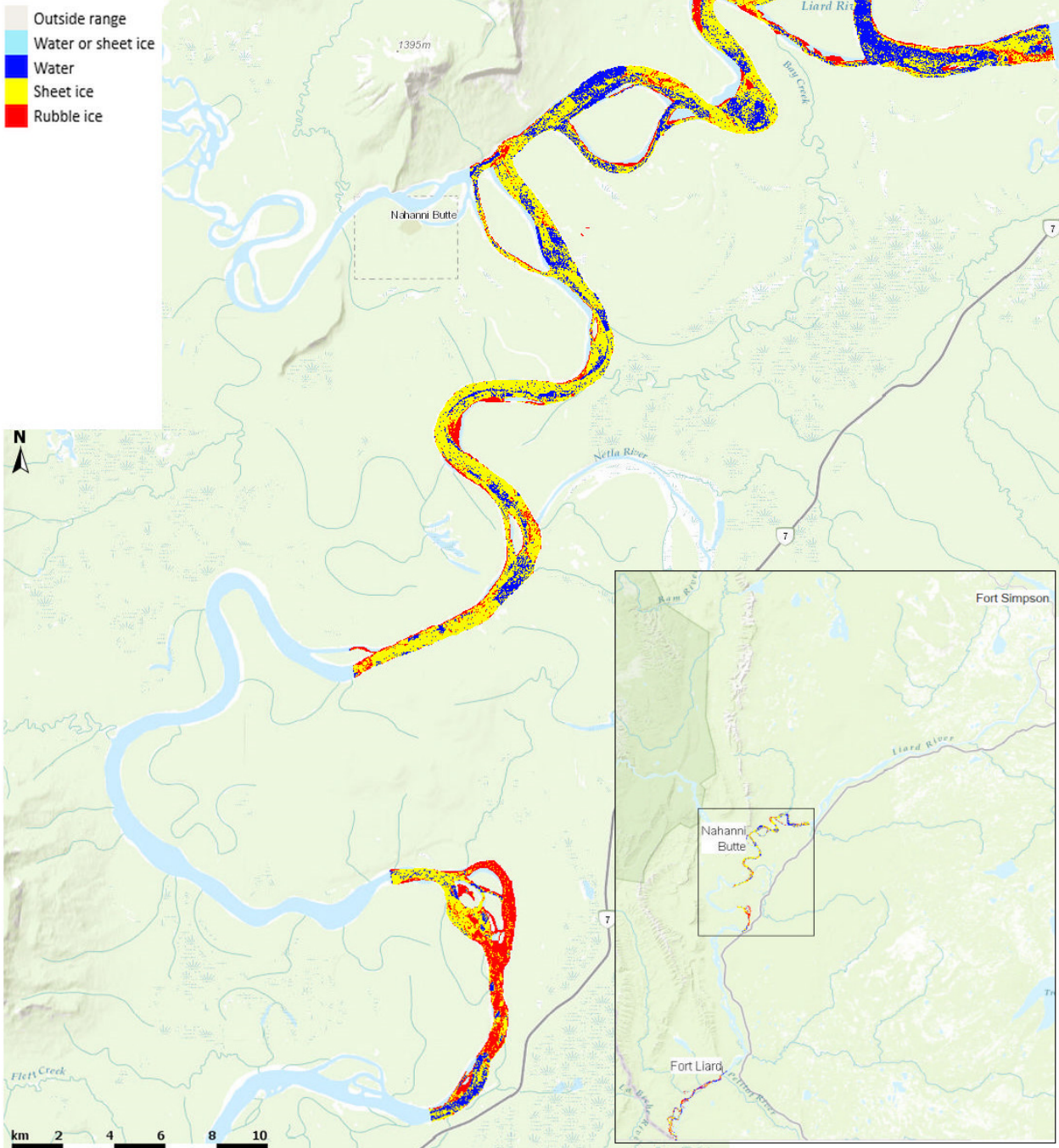
- Ice on the Liard River has moved past Fort Liard;
- Ice has not yet broken on the Liard River at Fort Simpson (as of 12:00);
- Most of the lower Liard River basin is snow-free;
- Water levels spiked at Fort Liard yesterday morning but have since receded as the ice moved downstream
 - Ice jams and runs are likely along the Liard River as ice continues to move;
 - Water levels remain within a normal range;
- The southern Dehcho region will continue to receive unseasonably warm weather through the weekend.



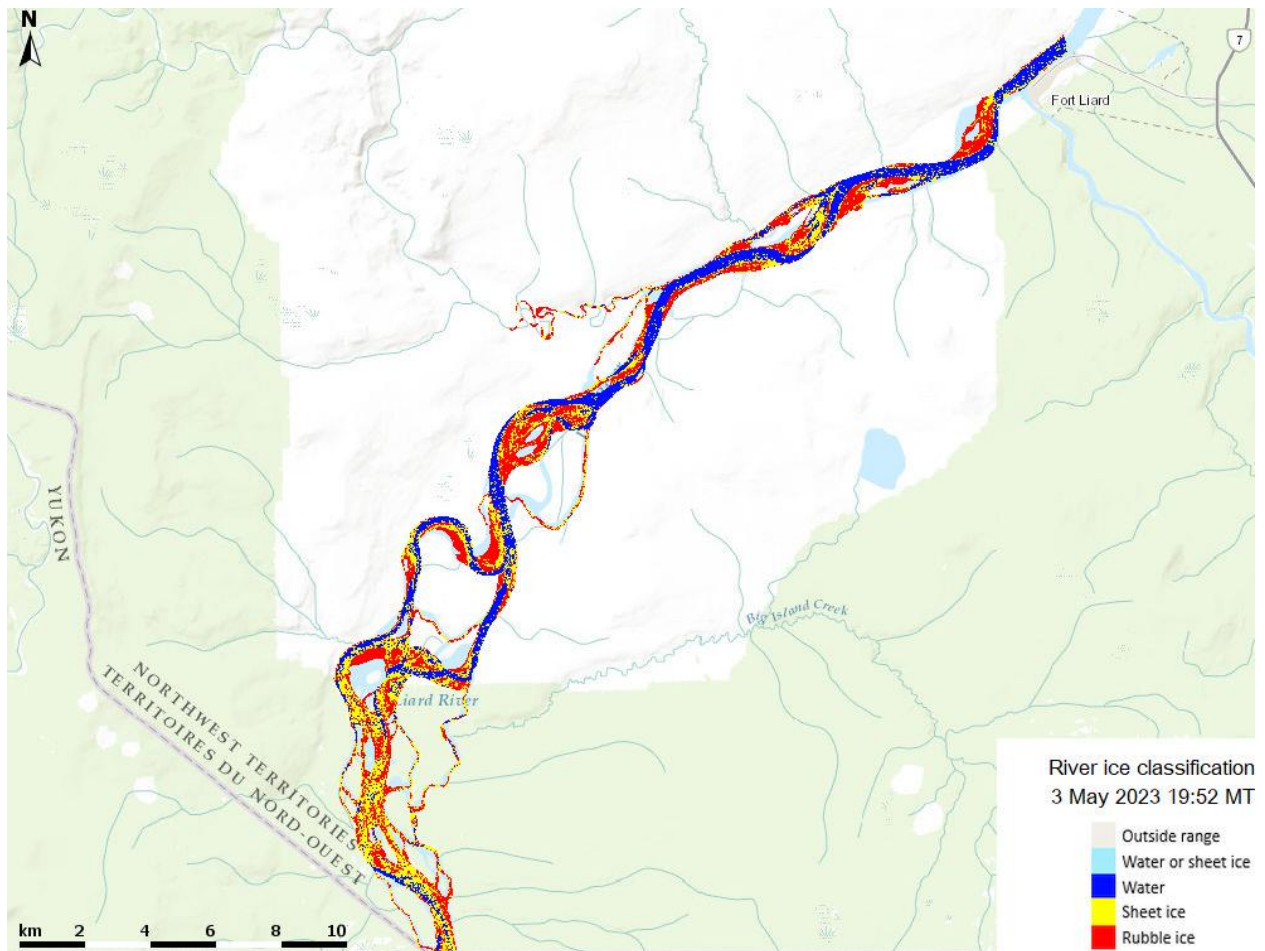
Above – Map of hydrometric stations in the Liard River basin. The station numbers are referenced in the water level plots below.

Satellite Data:

River ice classification
3 May 2023 19:53 MT



Above – Classified river ice imagery on the Liard River near Nahanni Butte. The image was acquired on May 3 at 19:53 MT. The image identifies consolidated ice along sections of the Liard with intermittent open water patches.

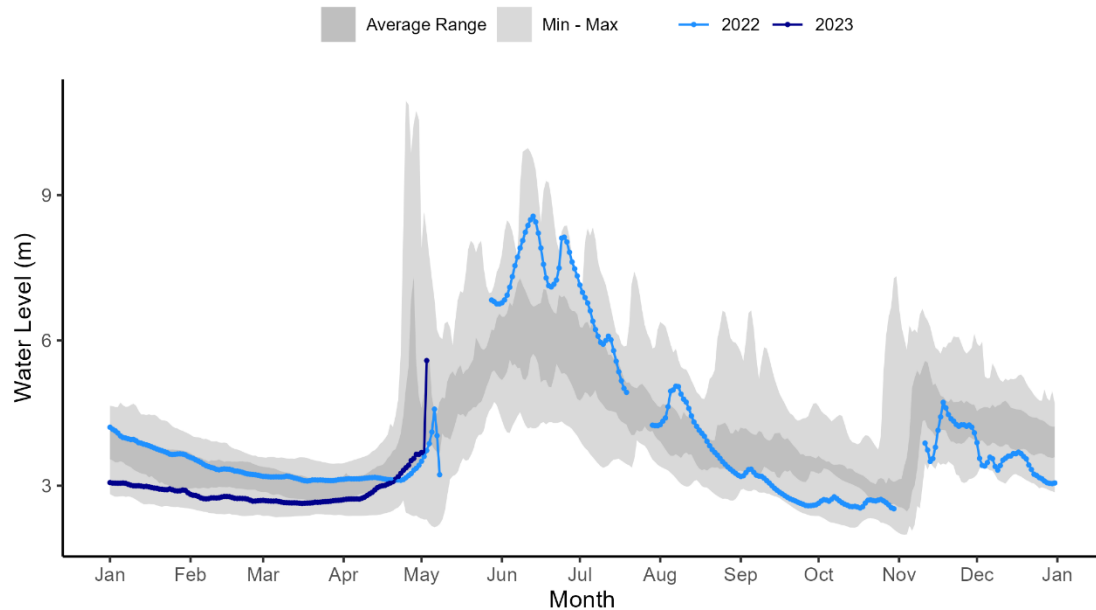


Above – Classified river ice imagery on the Liard River near Fort Liard. The image was acquired on May 3 at 19:52 MT. The image identifies large stretches of open water above Fort Liard with some ice chunks lodged on the banks of the river.

Hydrometric Data:

Liard River at Fort Liard [10ED001]:

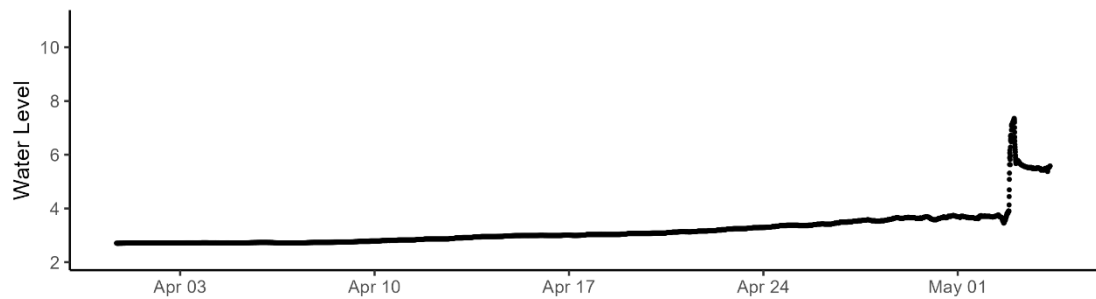
LIARD RIVER AT FORT LIARD (10ED001)



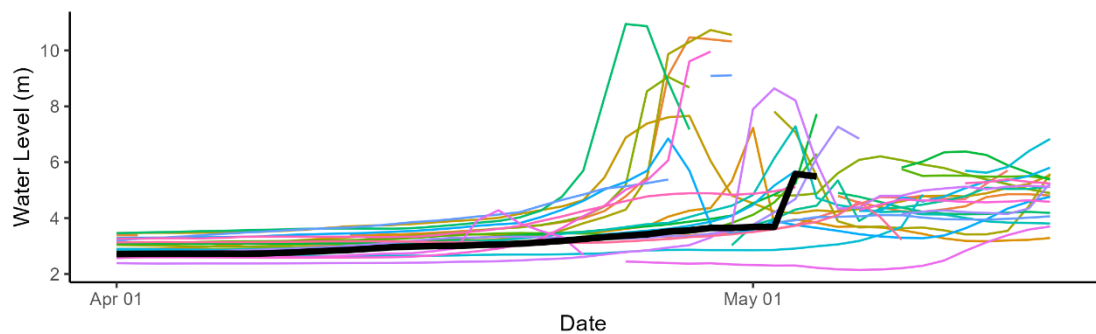
Above – Water level data for the Liard River at Fort Liard. Daily average levels for the previous year are shown here.

LIARD RIVER AT FORT LIARD (10ED001)

2023 Water Levels (5 minute resolution)



Historic Daily Water Levels

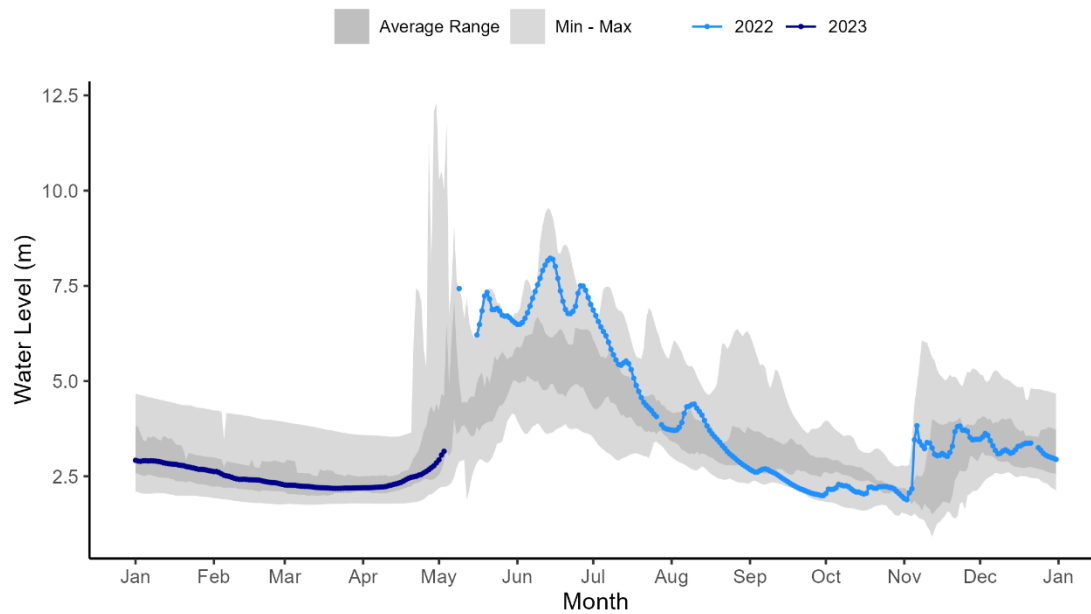


Above - The upper graph in the figure presents real time water level data at 5-minute resolution. The lower graph shows daily average levels relative to the previous 20 years.



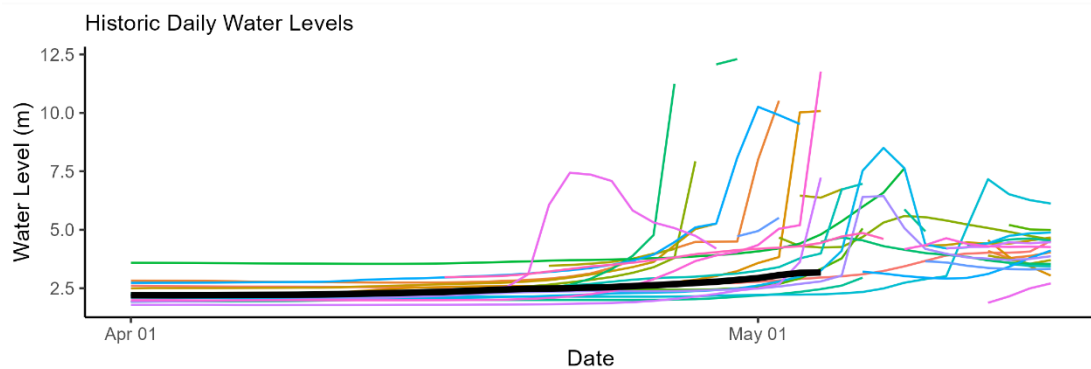
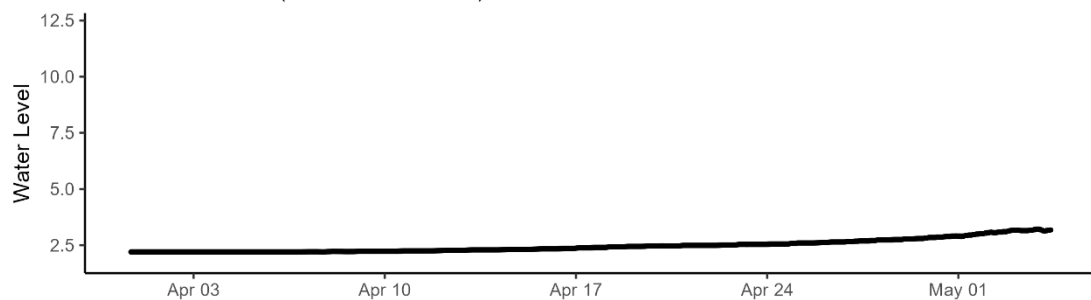
Above – Liard River at Fort Liard hydrometric gauge photo from May 04 at 13:00. Photo courtesy of Water Survey of Canada and GNWT.

Liard River near the mouth [10ED002]:
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.

LIARD RIVER NEAR THE MOUTH (10ED002)
2023 Water Levels (5 minute resolution)



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.

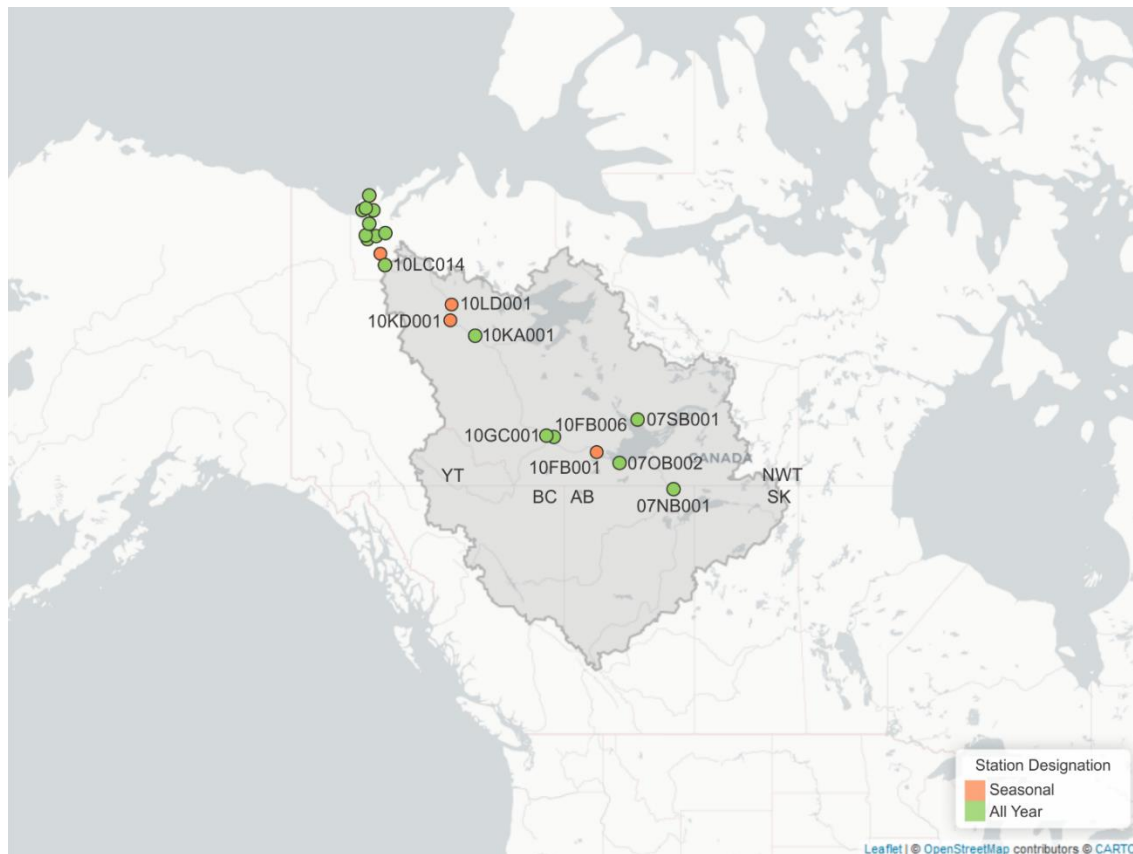


Above – Liard River near the mouth hydrometric gauge photo from May 04 at 13:00. Photo courtesy of Water Survey of Canada and GNWT.

Mackenzie River

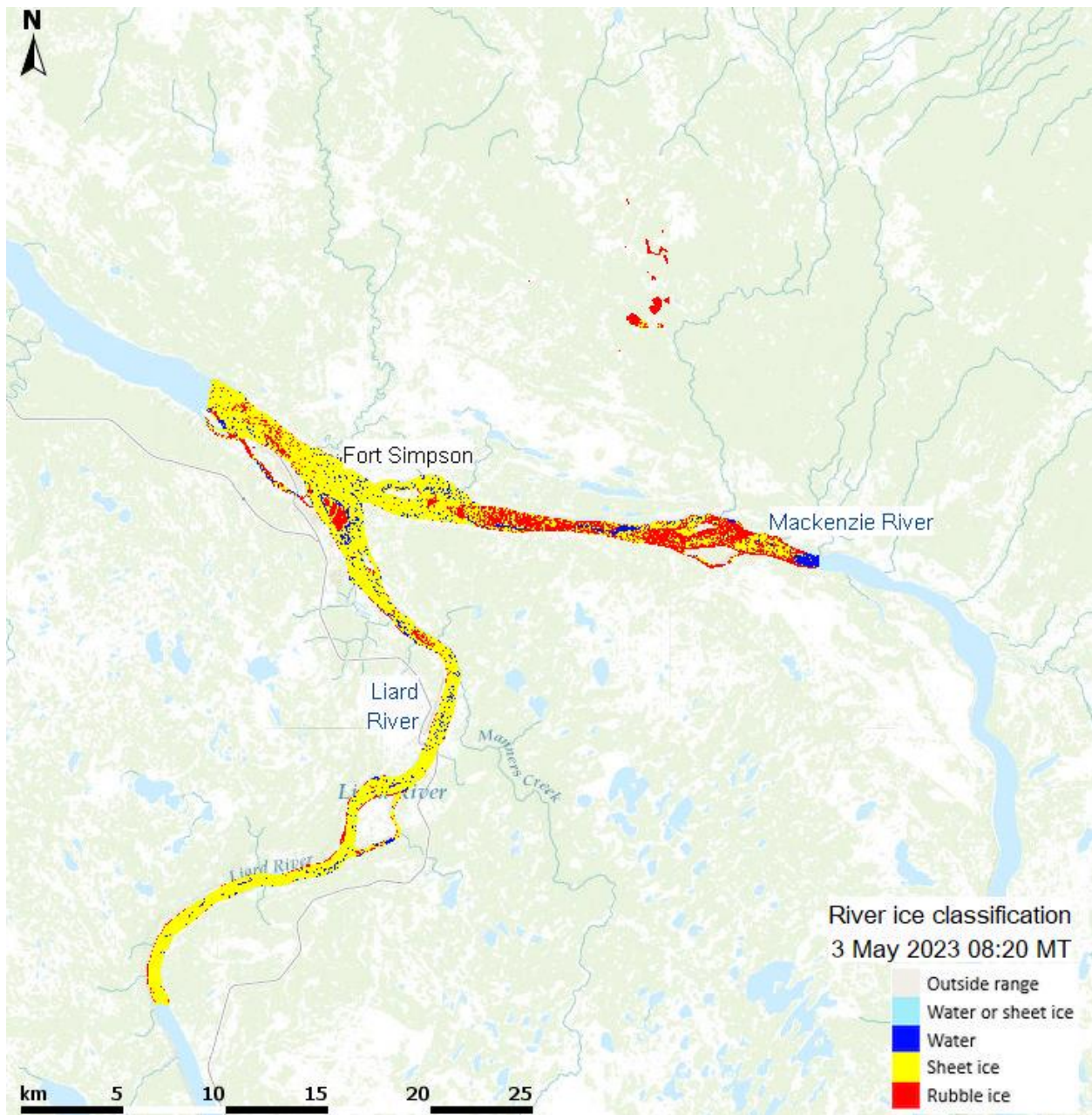
Current Status:

- An ice jam has developed on the Mackenzie River just upstream of the confluence of the Liard River near Fort Simpson;
 - The Mackenzie River at Strong Point gauge (near the mouth of the Rabbitskin River) has been steadily increasing over the last two days in response to the jam;
 - Ice has yet to break at Fort Simpson (as of 13:00);
 - There is a large stretch of open water between Jean Marie River and Fort Simpson;
 - High temperatures continue to soften the river ice.
- Water levels are rising underneath the ice at the Mackenzie River at Fort Simpson and remain within the normal range;
 - The water level in Fort Simpson will be dependent on the relative timing of when ice moves on the Mackenzie and Liard rivers and how it clears downstream of Fort Simpson.
- 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:

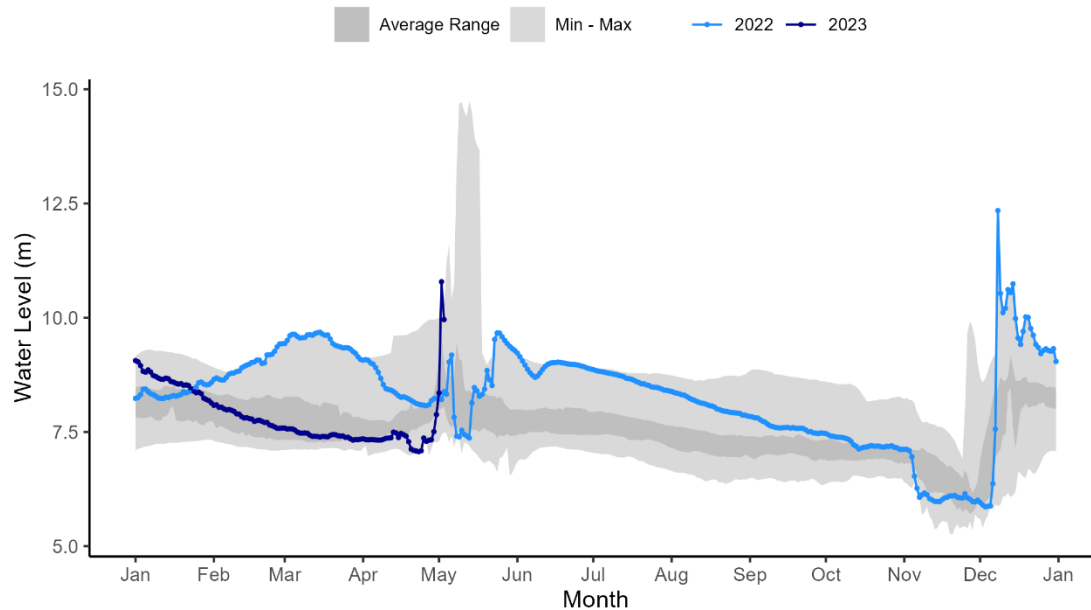


Above – Classified river ice imagery of the Mackenzie and Liard rivers above Fort Simpson. The image was acquired on May 3 at 08:20 MT. Although this image was acquired yesterday morning, it clearly delineates the ice jam (identified in red) on the Mackenzie River above Fort Simpson. The head of the ice jam is denoted by the small blue section (open water) at the eastern edge of the acquisition. The ice jam as pictured here is approximately 15 km long, and has likely grown since image acquisition.

Hydrometric Data:

Mackenzie River at Strong Point [10FB006]:

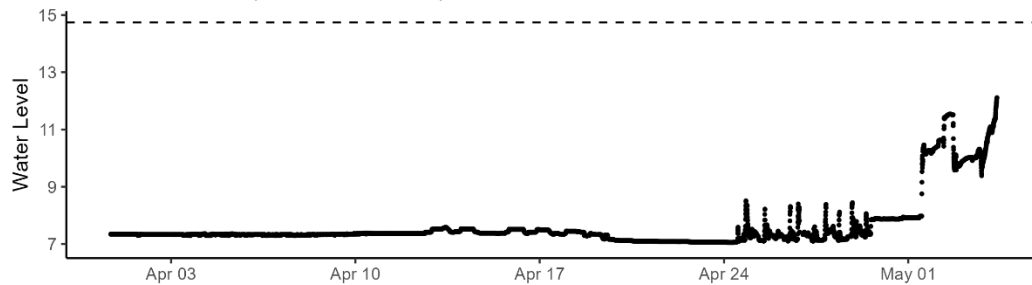
MACKENZIE RIVER AT STRONG POINT (10FB006)



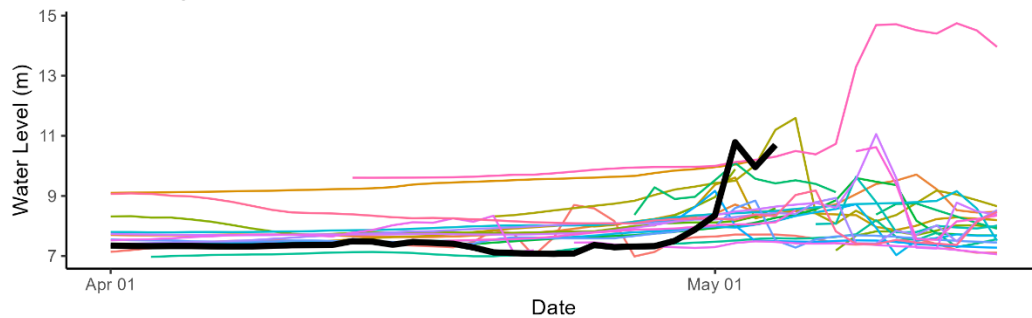
Above – Water level data for the Mackenzie River at Strong Point. Daily average levels for the previous year are shown here.

MACKENZIE RIVER AT STRONG POINT (10FB006)

2023 Water Levels (5 minute resolution)



Historic Daily Water Levels

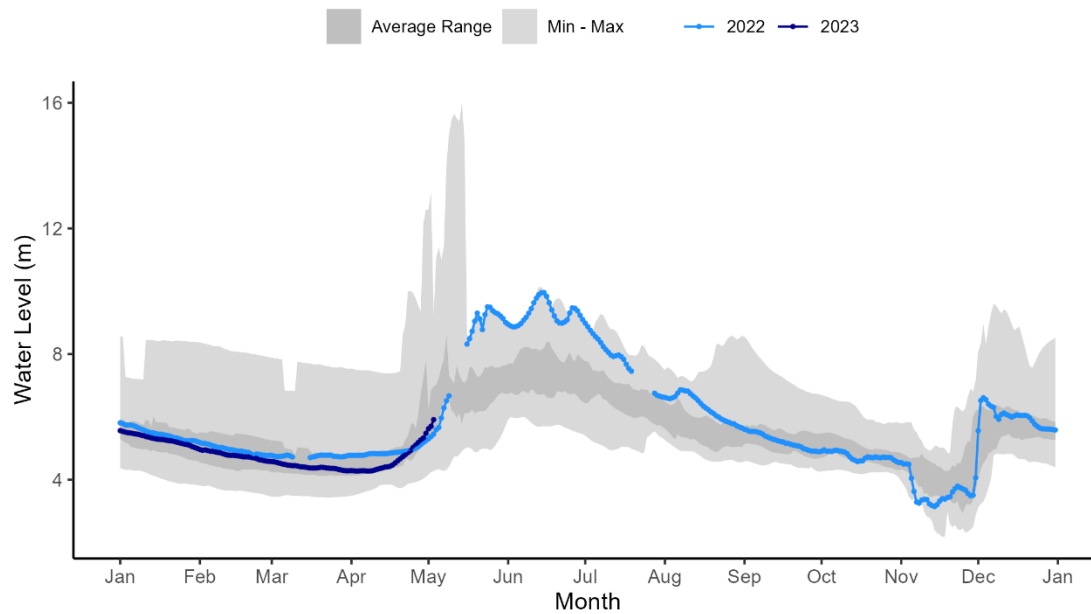


Above: The upper graph in the figure presents real time water level data at 5-minute resolution. The dashed horizontal line represents the highest levels on record (from 2021). The lower graph shows daily average levels relative to the previous 20 years.



Above – Mackenzie River at Strong Point hydrometric gauge photo from May 04 at 12:00. Photo courtesy of Water Survey of Canada and GNWT.

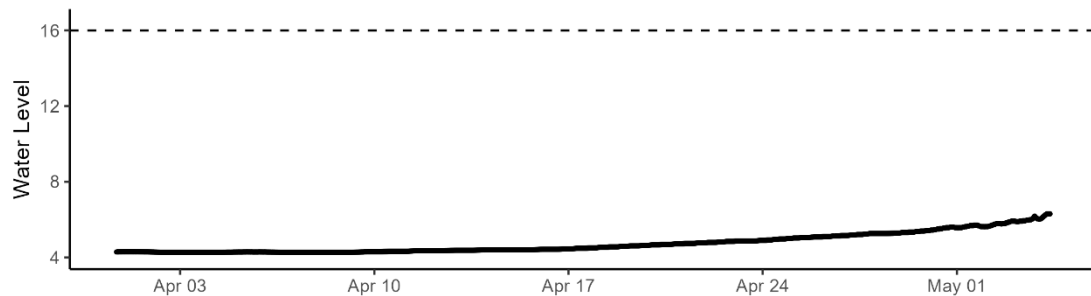
Mackenzie River at Fort Simpson [10GC001]: MACKENZIE RIVER AT FORT SIMPSON (10GC001)



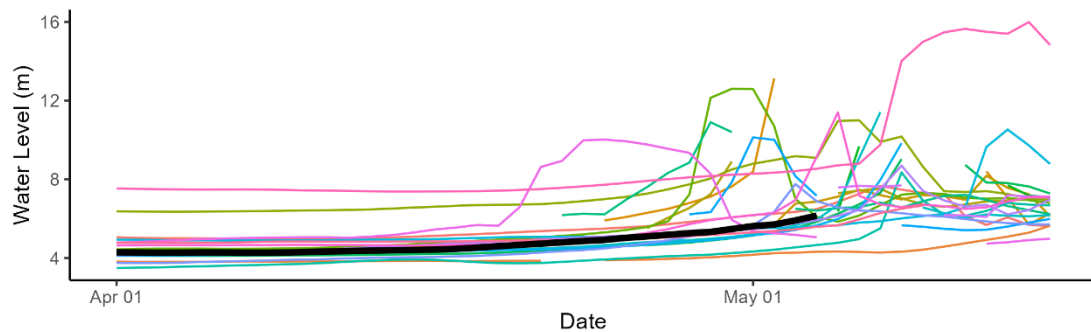
Above – Water level data for the Mackenzie River at Fort Simpson. Daily average levels for the previous year are shown here.

MACKENZIE RIVER AT FORT SIMPSON (10GC001)

2023 Water Levels (5 minute resolution)



Historic Daily Water Levels

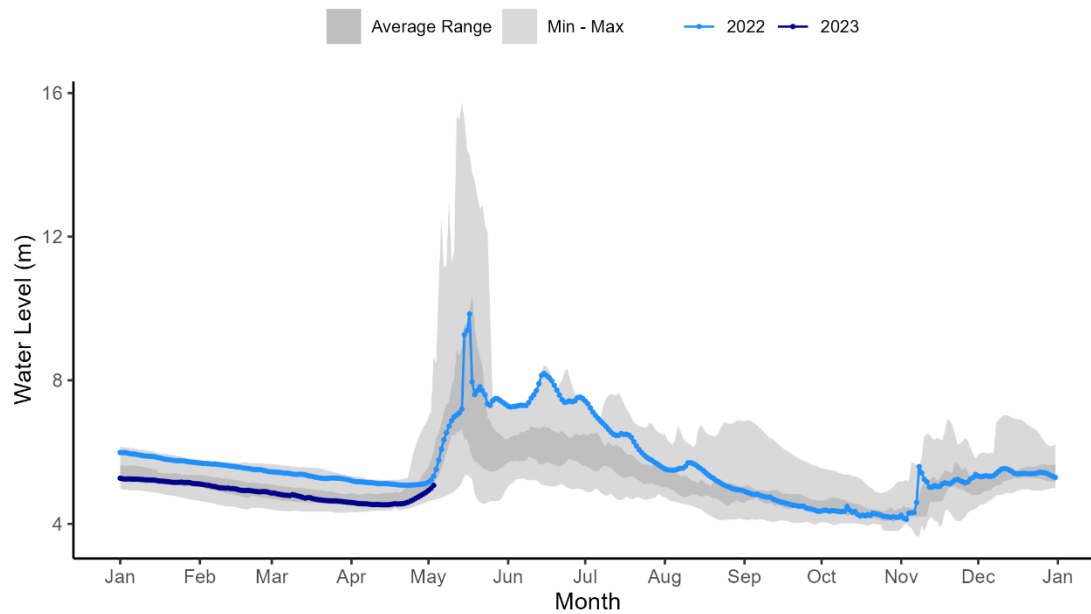


Above: The upper graph in the figure presents real time water level data at 5-minute resolution. The dashed horizontal line represents the highest levels on record (from 2021). The lower graph shows daily average levels relative to the previous 20 years.



Above – Mackenzie River at Fort Simpson hydrometric gauge photo from May 04 at 13:00. Photo courtesy of Water Survey of Canada and GNWT.

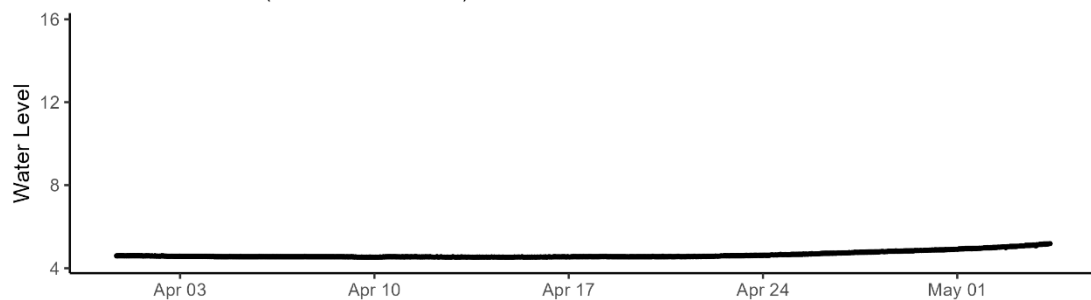
Mackenzie River at Norman Wells [10KA001]: MACKENZIE RIVER AT NORMAN WELLS (10KA001)



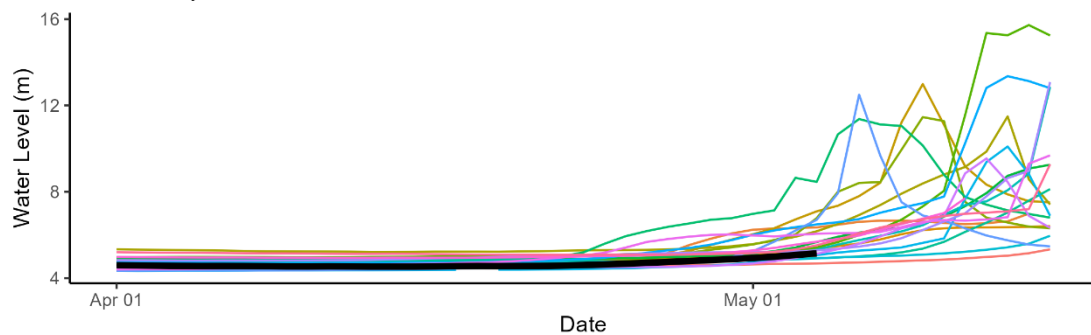
Above – Water level data for the Mackenzie River at Norman Wells. Daily average levels for the previous year are shown here.

MACKENZIE RIVER AT NORMAN WELLS (10KA001)

2023 Water Levels (5 minute resolution)



Historic Daily Water Levels



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 today and tomorrow, and are set to receive record high temperatures nearing 30°C on Saturday. Satellite imagery indicates that the snowpack has melted in the lower Liard River basin and that snowmelt runoff delivery has likely ceased. High temperatures will continue to 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:

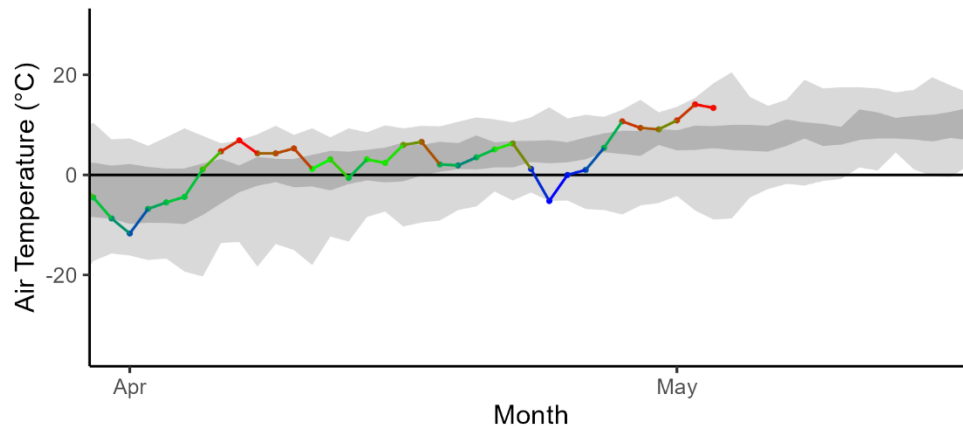
Weather information informs how snow and ice will melt and provides information about how this spring is unfolding relative to previous springs. Warmer than normal conditions early in the spring allow for additional energy to melt the snowpack and soften river ice. Rain-on-snow events can cause rapid 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:

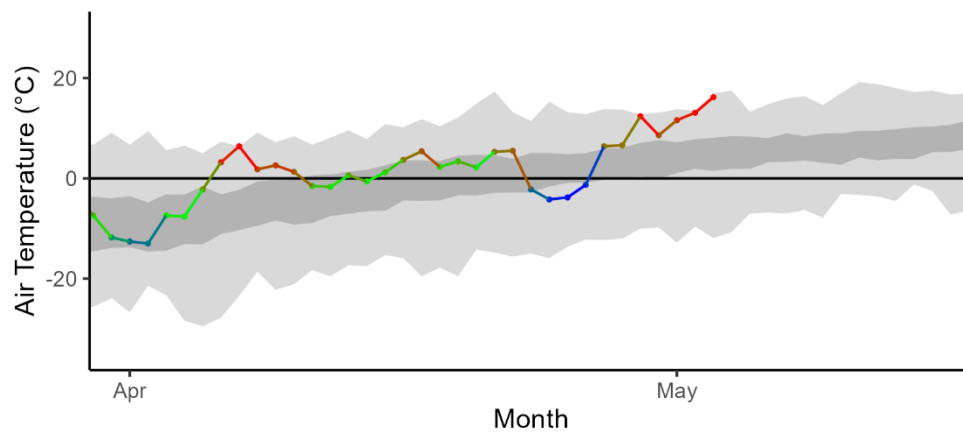
Fort Liard:

2023 Fort Liard Mean Daily Air Temperatures



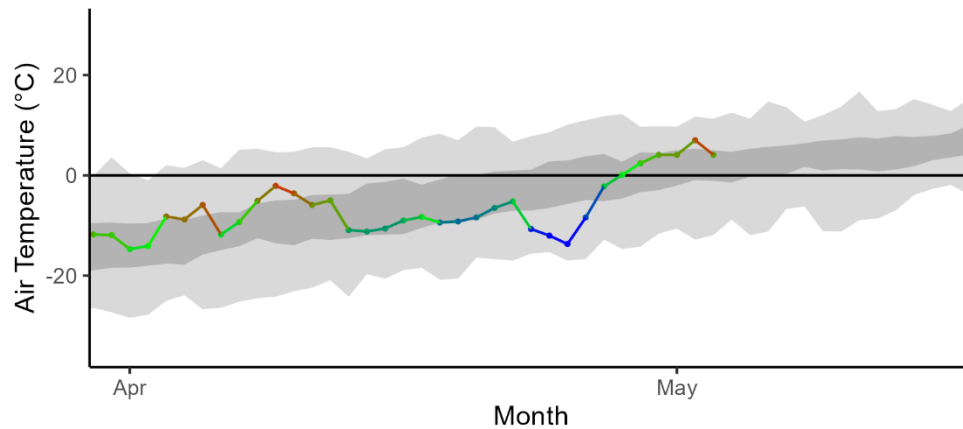
Fort Simpson:

2023 Fort Simpson Mean Daily Air Temperatures
















Norman Wells:

2023 Norman Wells Mean Daily Air Temperatures
















Seven-day weather forecast:














Fort Liard:

Thu 4 May	Fri 5 May	Sat 6 May	Sun 7 May	Mon 8 May	Tue 9 May	Wed 10 May
 19°C Mainly sunny	 24°C Mainly sunny	 29°C Sunny	 26°C Sunny	 24°C Sunny	 18°C A mix of sun and cloud	 20°C A mix of sun and cloud
Tonight	Night	Night	Night	Night	Night	
 9°C A few clouds	 13°C Clear	 11°C Clear	 12°C Cloudy periods	 3°C Cloudy periods	 3°C Cloudy periods	

Fort Simpson:

Thu 4 May	Fri 5 May	Sat 6 May	Sun 7 May	Mon 8 May	Tue 9 May	Wed 10 May
 20°C Sunny	 24°C Mainly sunny	 29°C Sunny	 27°C Sunny	 25°C Sunny	 17°C A mix of sun and cloud	 21°C Sunny
Tonight	Night	Night	Night	Night	Night	
 9°C A few clouds	 8°C Clear	 12°C Clear	 11°C Clear	 4°C Cloudy periods	 3°C Cloudy periods	

Norman Wells:

Wed 3 May	Thu 4 May	Fri 5 May	Sat 6 May	Sun 7 May	Mon 8 May	Tue 9 May
 8°C A few showers	 7°C Sunny	 9°C A mix of sun and cloud	 16°C A mix of sun and cloud	 9°C Cloudy	 10°C A mix of sun and cloud	 11°C A mix of sun and cloud
Tonight	Night	Night	Night	Night	Night	
 -4°C 30% Chance of showers	 0°C Clear	 -1°C Cloudy periods	 0°C Cloudy periods	 -1°C Cloudy periods	 -1°C 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.