Government of
Northwest Territories

NWT Water Monitoring Bulletin – May 10, 2022

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 ENR 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:

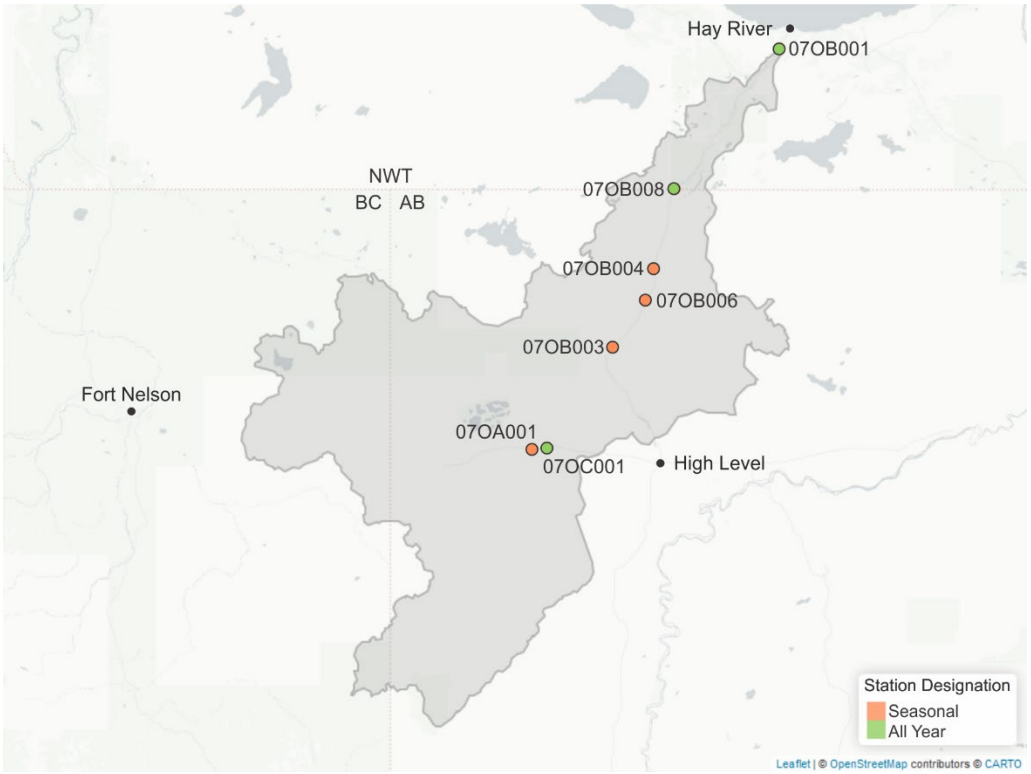
- Evacuation Orders and Alerts for the Town of Hay River and K'atl'odeeche First Nation remain in place for certain areas;
- Provisional water levels recorded at the Hay River near Hay River gauge are higher than the peak from last year;
    - Provisional data indicate that all tributaries to the Hay River are recording water levels higher than the ice-induced peak from last week and could be the highest in their respective periods of record (which in some cases is only 10 years);
- The potential for further/continued high water levels remains high while ice remains present on the river and recent snowfall continues to melt in the Hay River basin;
- Ice from the Liard River is moving down the Dehcho (Mackenzie River) past Fort Simpson. Water levels are currently at 11.0 m and were reported to have reached a peak of 11.7 m last night at a Village of Fort Simpson level sensor.

Contents

Hay River:

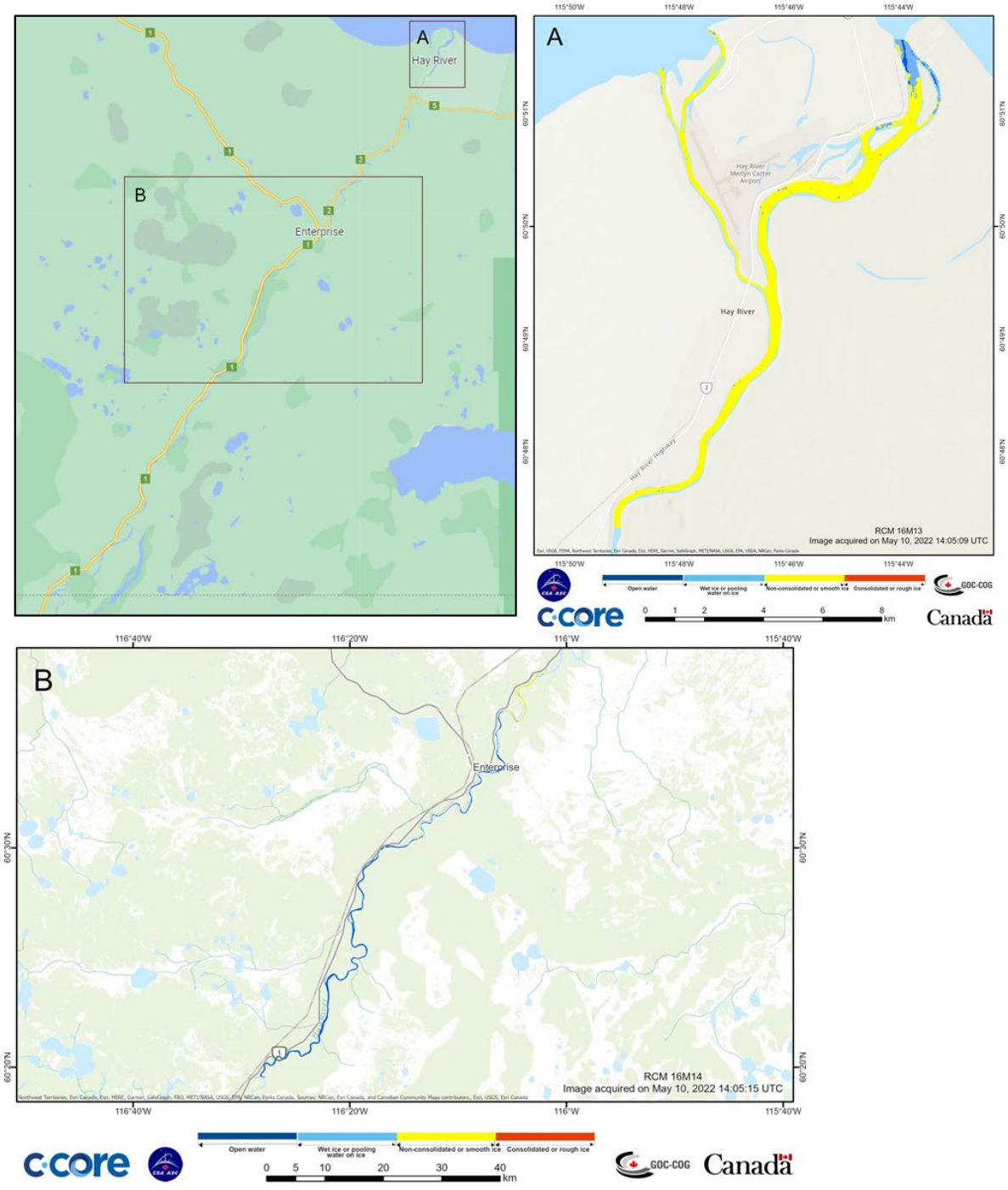
Current Status:

- Based on images from the border with Alberta, there has been no additional ice moving down river for over two days;
- The storm system that resulted in high precipitation over the basin has dissipated;
    - There no is significant precipitation in the forecast;
    - Sun and warmer temperatures should return tomorrow;
- All functioning gauges on the Hay River and its tributaries are currently showing the highest provisional water level on record;
    - **Note**: These are real-time, provisional values that have not been verified by the Water Survey of Canada;
    - **Note**: Some gauges have relatively short records (e.g., 2012 to present);
- Water levels at the Hay River near the AB-NT border site continue to slowly rise as recent rain and snow continues to move through the basin;
- The effect of how these rising water levels will affect the Town of Hay River will depend on how and when the ice clears out of the river;
- The water level response on the Hay River and its tributaries to precipitation is very rapid at this time of year due to low basin storage and frozen ground;
- Climate models from the Alberta River Forecast Centre reported up to 120 mm of precipitation in the Hay Basin over the weekend;
- Refer to the Town of Hay River website for the most up-to-date information, as well as webcam images of current conditions.



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

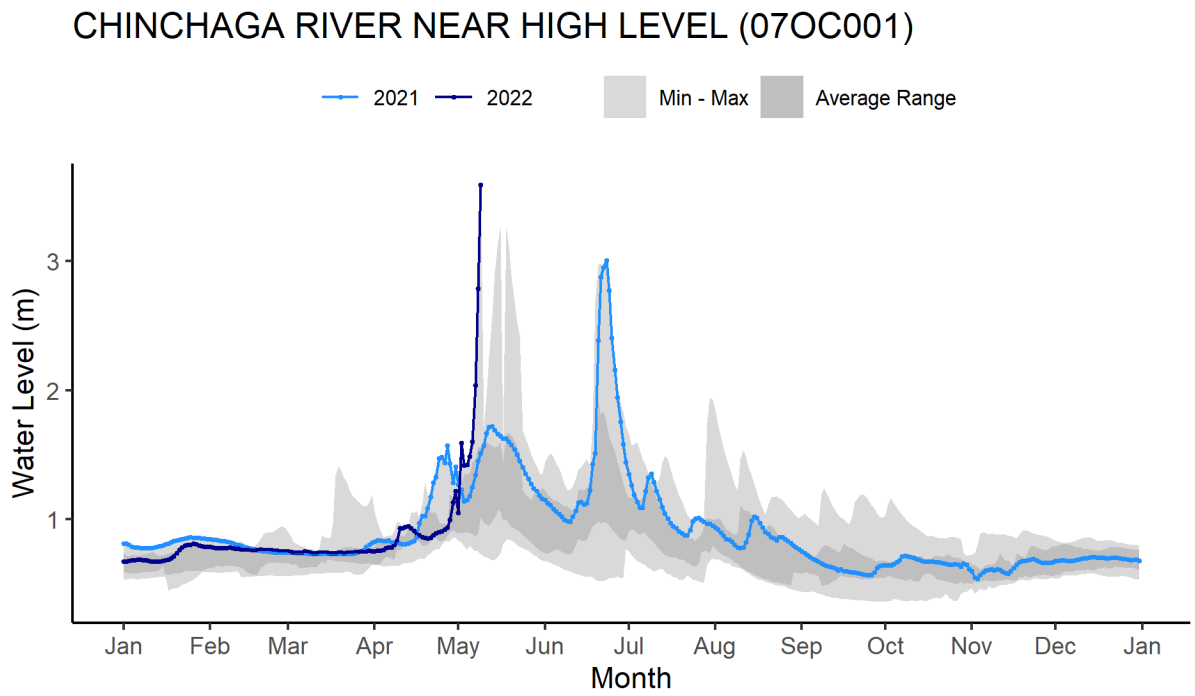
Imagery:

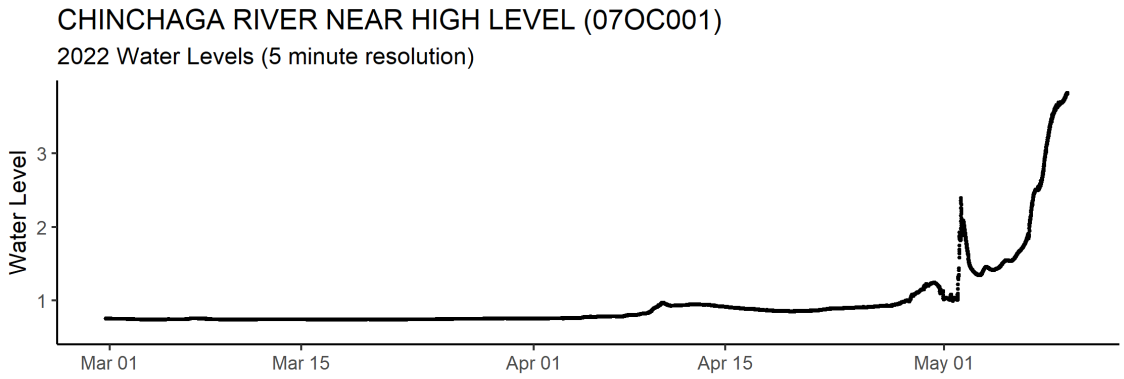


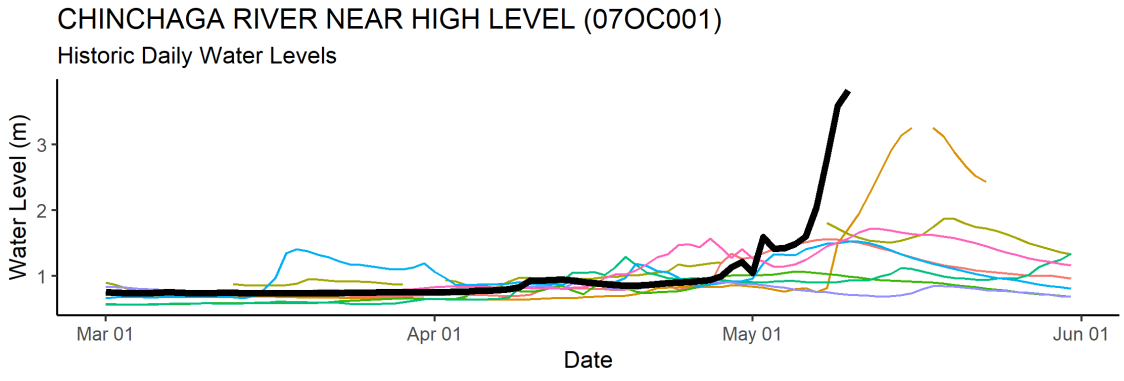
Above – Ice classification maps based on radar imagery of stretches of the Hay River taken on 10th May at 08:05 MDT.

Hydrometric Data:

Chinchaga River near High Level (Alberta) [07OC001]:

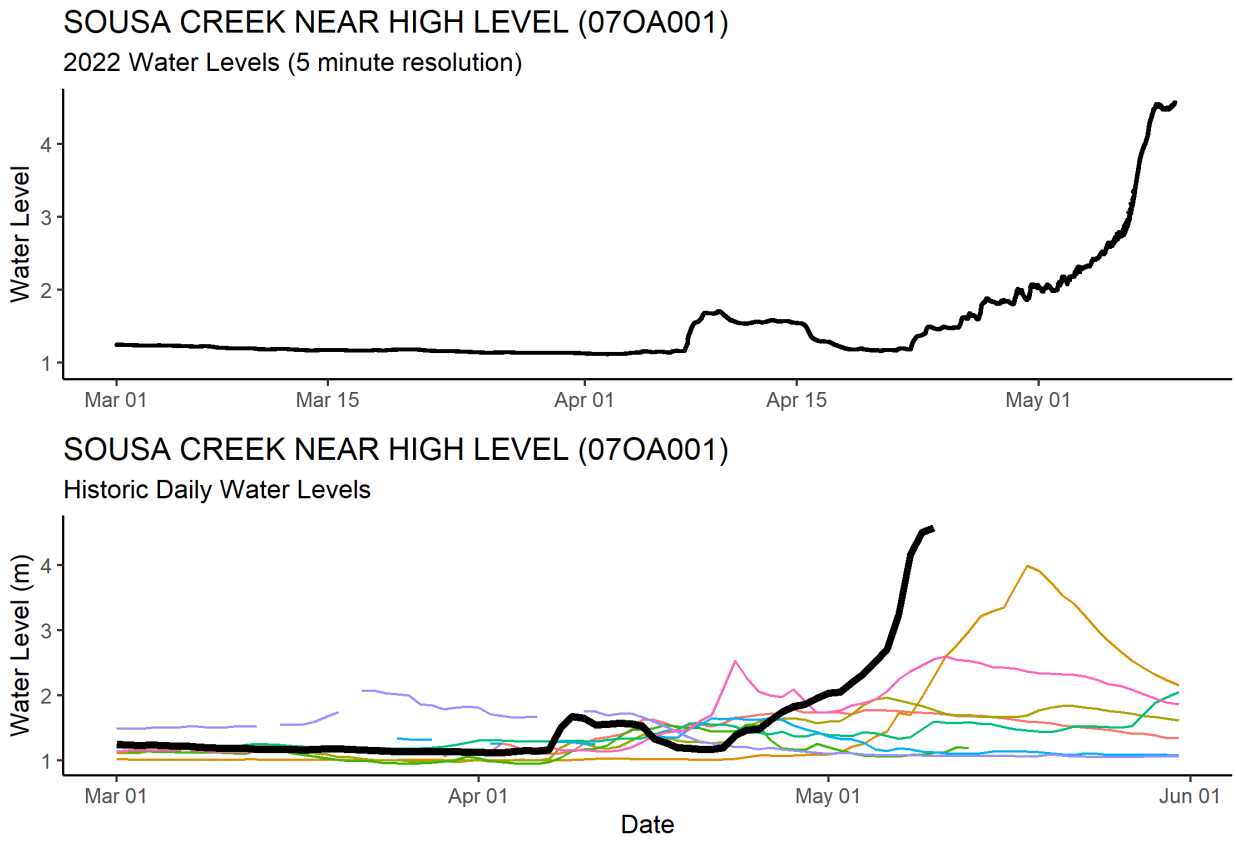






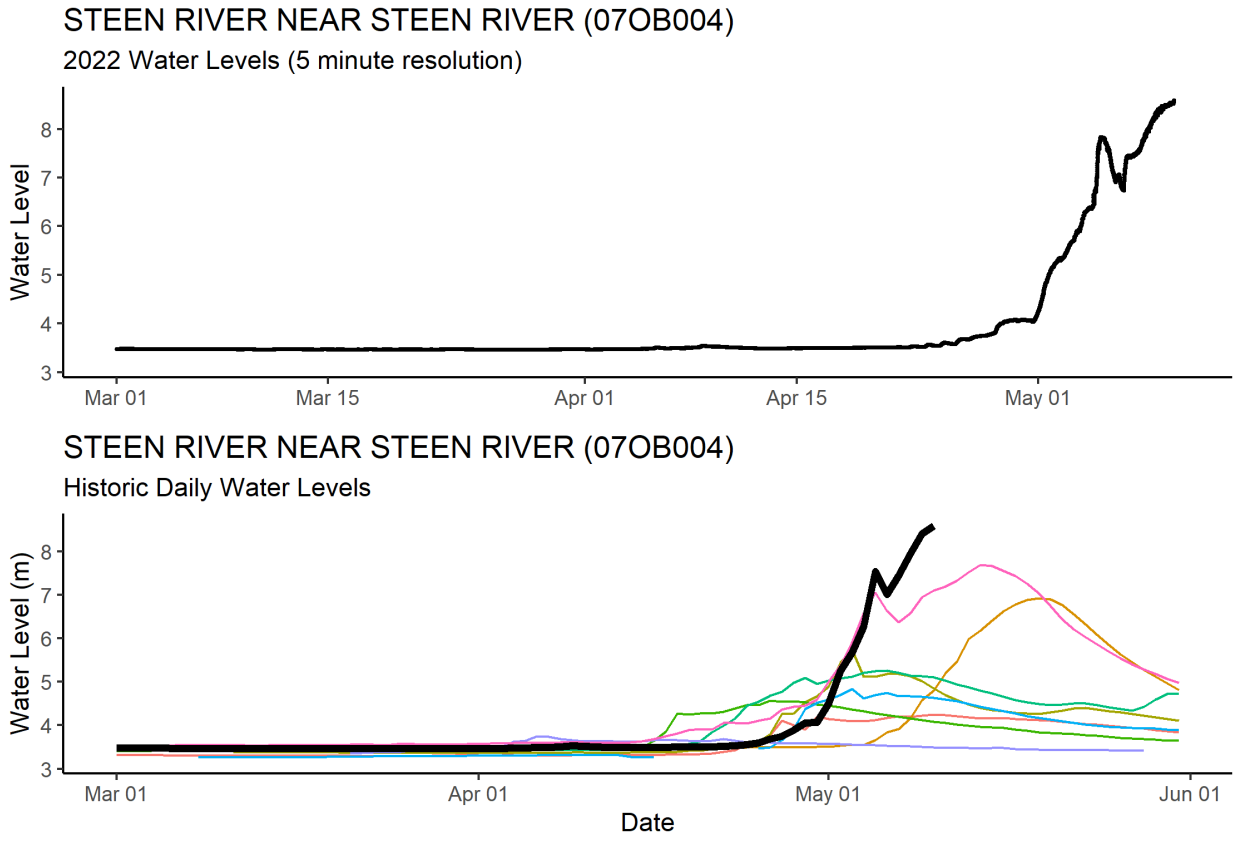
Above – Water level data at the Chinchaga River near High Level, AB. This plot shows high resolution (5 minute) water level data in the middle, and daily average data on the bottom. Water levels continue to rise and provisional water levels at the gauge have now exceeded the previous maximum recorded values (2012 to present).

Sousa Creek near High Level (Alberta) [07OA001]:



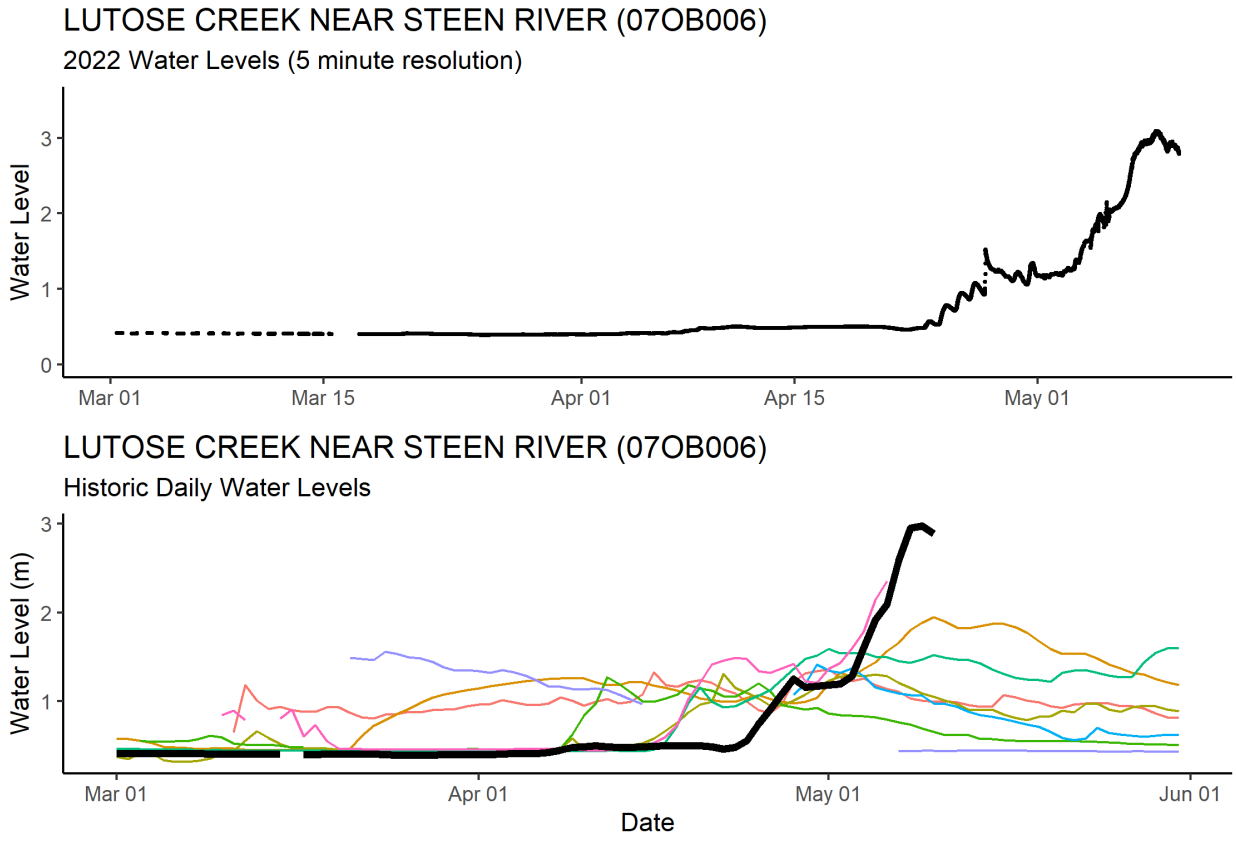
Above – Water level data on Sousa Creek near High Level, AB. The Sousa River is a small tributary to the Hay River. Water levels continue to slowly rise in response to daily snowmelt. Provisional water levels at the gauge have exceeded the previous maximum recorded levels (2012 to present).

Steen River near Steen River (Alberta) [07OB004]:



Above – Water level data on the Steen River near Steen River, AB. The Steen River is a tributary to the Hay River. Water levels continue to slowly rise in response to daily snowmelt. Provisional water levels at the gauge have exceeded the previous maximum recorded levels (2012 to present).

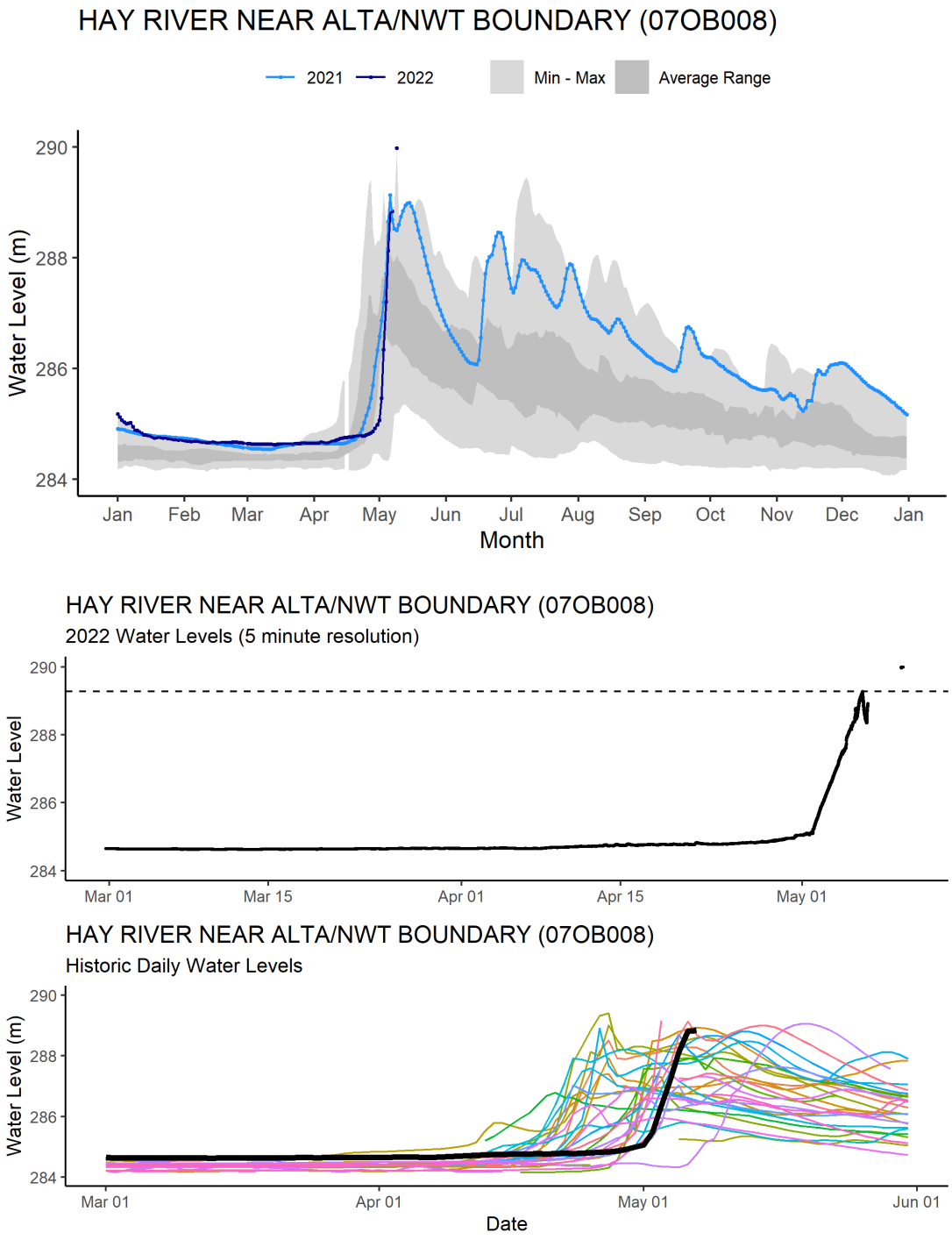
Lutose Creek near Steen River (Alberta) [07OB006]:



Above – Water level data on Lutose Creek near Steen River, AB. Lutose Creek is a small tributary to the Hay River. Water levels have started to drop from their peak but could continue to rise in response to snowmelt. Provisional water levels at the gauge have exceeded the previous maximum recorded levels (2012 to present).

Hay River near the border [07OB008]:

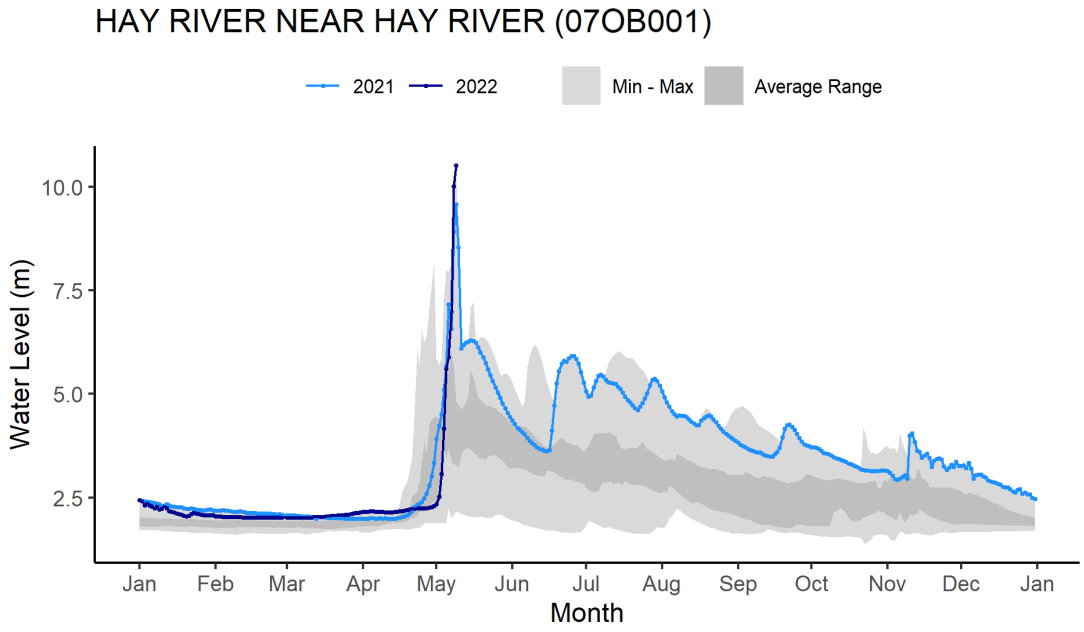
Note: Data were restored at this gauge on **May 09 at 16:15.**



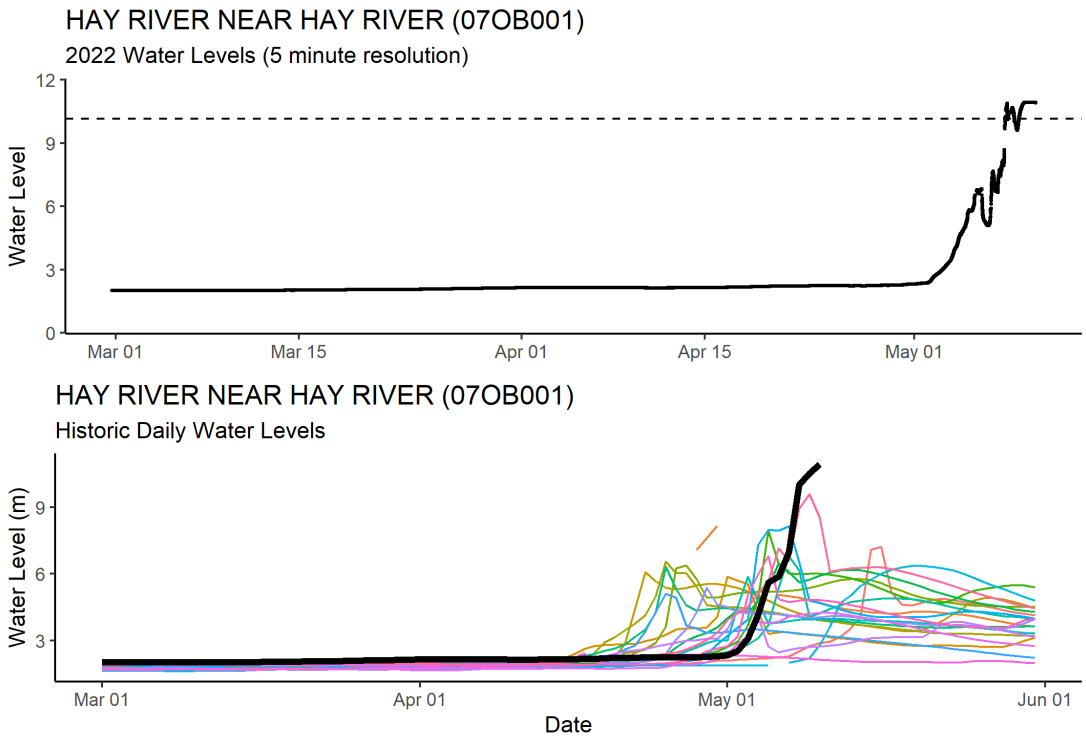
Above - The middle graph in this figure presents real time water level data at 5-minute resolution with the dashed line representing the peak water level from last year (2021). The lower graph shows daily average levels relative to the previous 20 years. Provisional water levels at the gauge have passed the instantaneous peak from last year and have also exceeded the previous maximum recorded levels (1986 to present).

Above – Hay River near the border hydrometric gauge photo on May 10 at 12:00. Photo courtesy of Water Survey of Canada and GNWT.

Hay River near Hay River [07OB001]:



Above – hydrograph of daily average levels for the previous two years. Note that the most recent point on this graph shows the **daily average level from May 09** (yesterday).

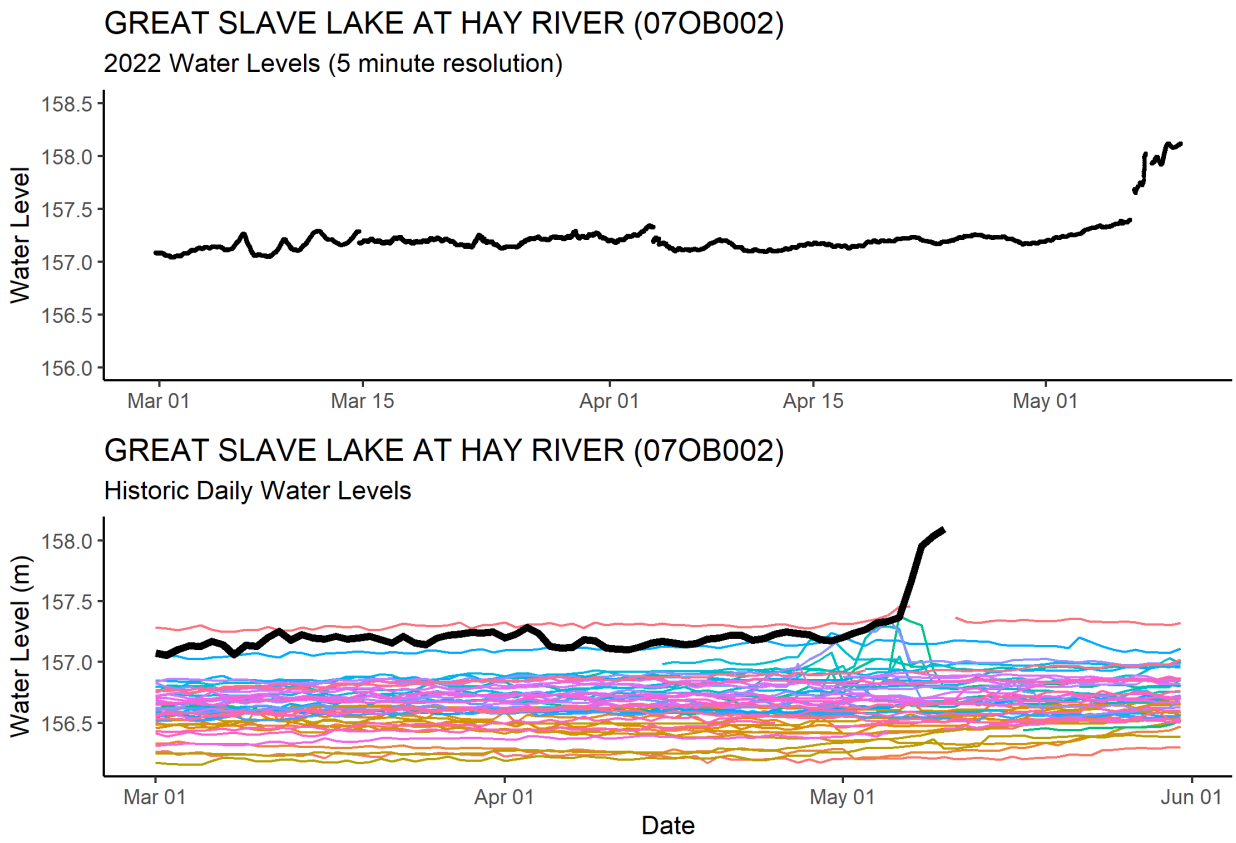


Above - The upper graph in this figure presents real time water level data at 5-minute resolution with the dashed line representing the peak water level from last year (2021). The lower graph shows daily average levels relative to the previous 20 years. Water levels at the gauge have passed the instantaneous peak from last year and continue to be affected by ice. Provisional water levels have also exceeded the previous maximum recorded levels (1964 to present).

Above – Hay River near the Town of Hay River hydrometric gauge photo on May 10 at 12:00. Photo courtesy of Water Survey of Canada and GNWT.

Great Slave Lake at Hay River [07OB002]:

Note: This gauge is at the mouth of the East Channel of the Hay River and is therefore sensitive to rising river levels. During ice break up, this gauge provides an indication of water levels on the East Channel of the Hay River and <u>not</u> water levels on Great Slave Lake.



Above – Water levels at the Great Slave Lake at Hay River gauge. The pink line at the top of the lower graph was the water level last year (2021). The peak level this year has now passed the peak level from last year. **Note**: these values are all **provisional** and may be subject to sensor drag from ice. Provisional water levels at the gauge have exceeded previous maximum recorded levels (1983 to present).

Liard River:

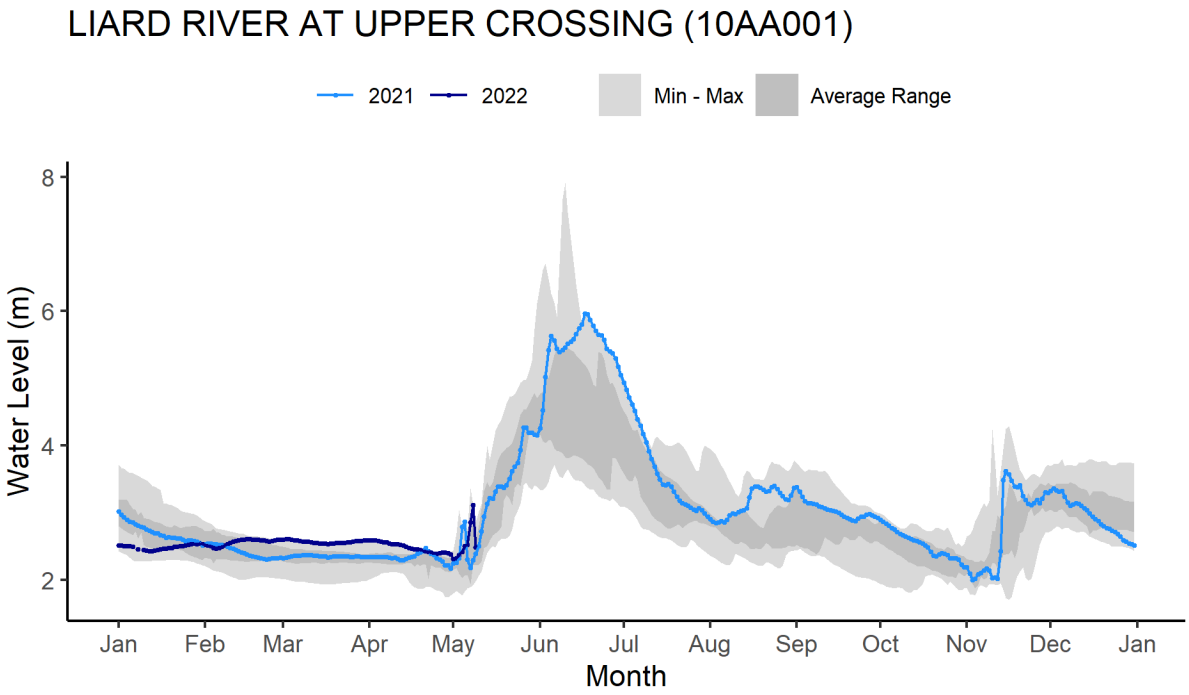
Current Status:

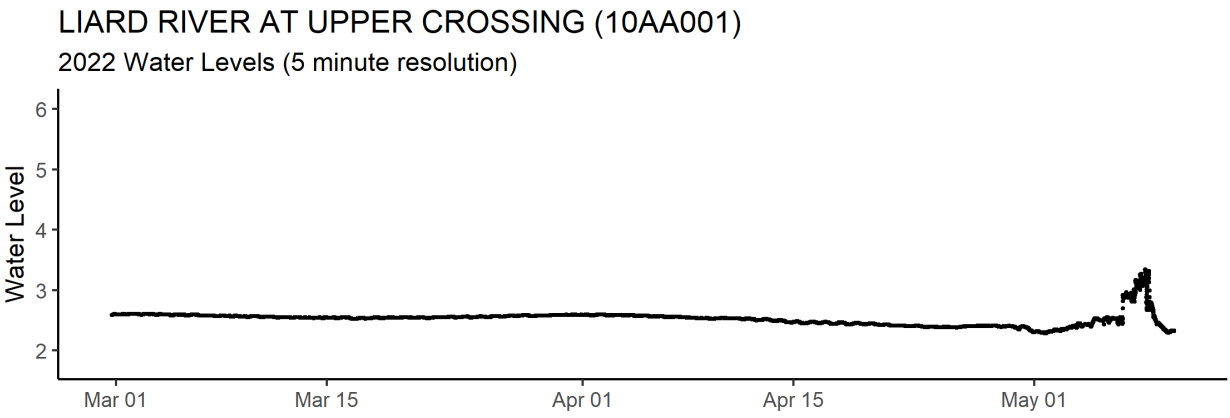
- Ice has broken up along the Liard River;
  - It is running in some locations and jammed in others;
  - Ice remains jammed at Fort Liard as of 12:00 today;
- Ice is running at the Liard River ferry crossing near Fort Simpson and is pushing down the Dehcho (Mackenzie River).

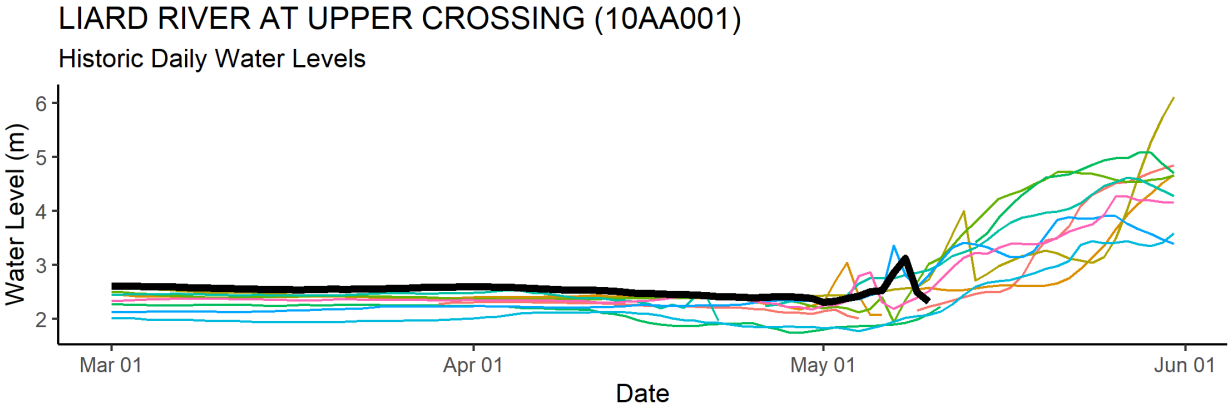
Above – Map of hydrometric stations in the Liard River basin. The station numbers are referenced in the water level plots below.

Hydrometric Data:

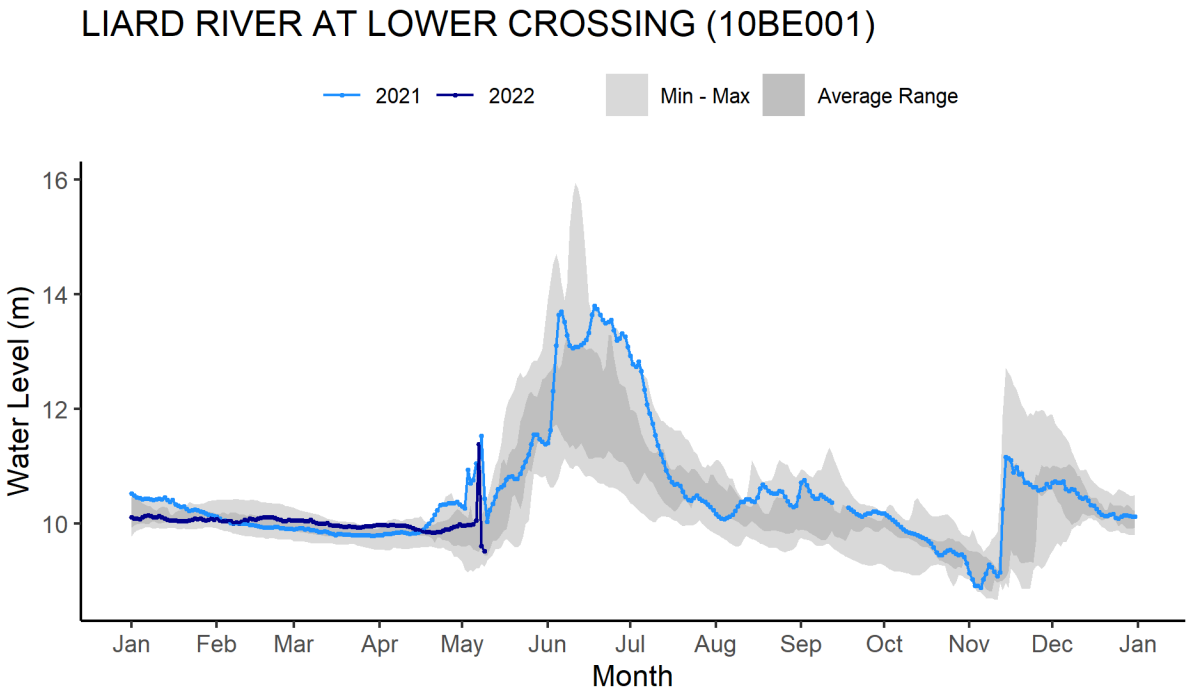
Liard River at Upper Crossing (Yukon) [10AA001]:

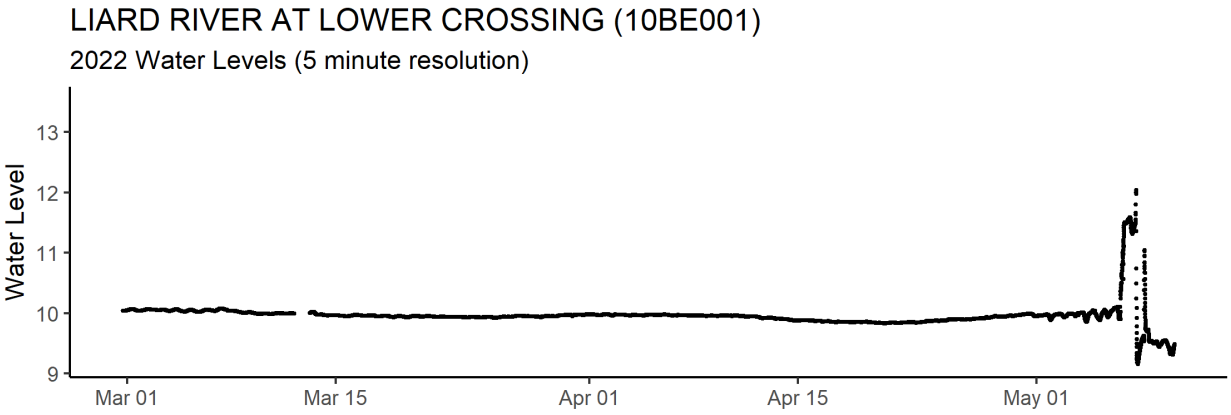


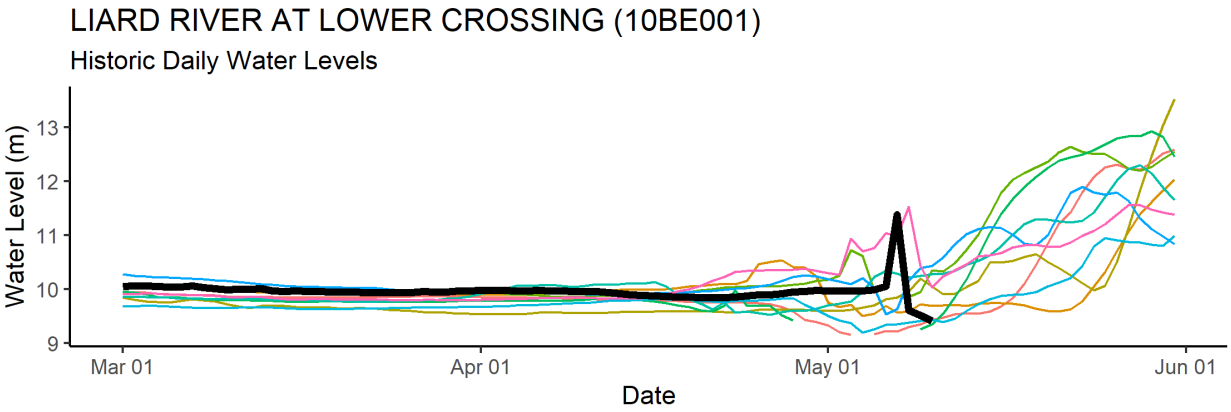




Liard River at Lower Crossing (British Columbia) [10BE001]:

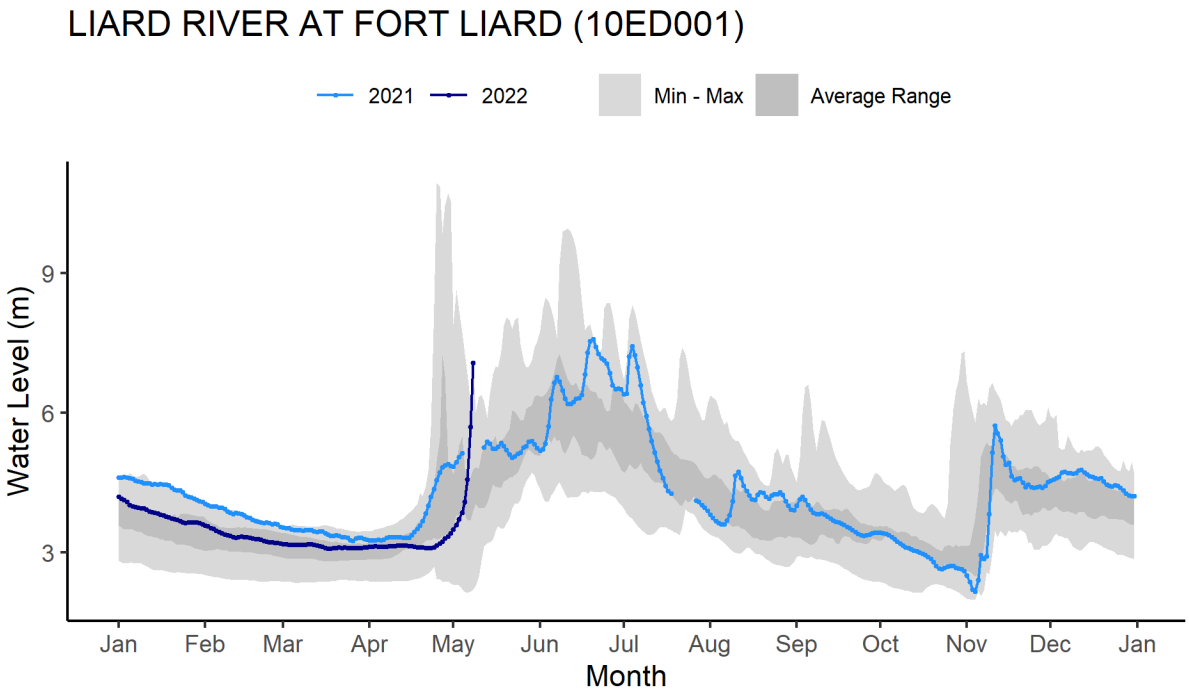


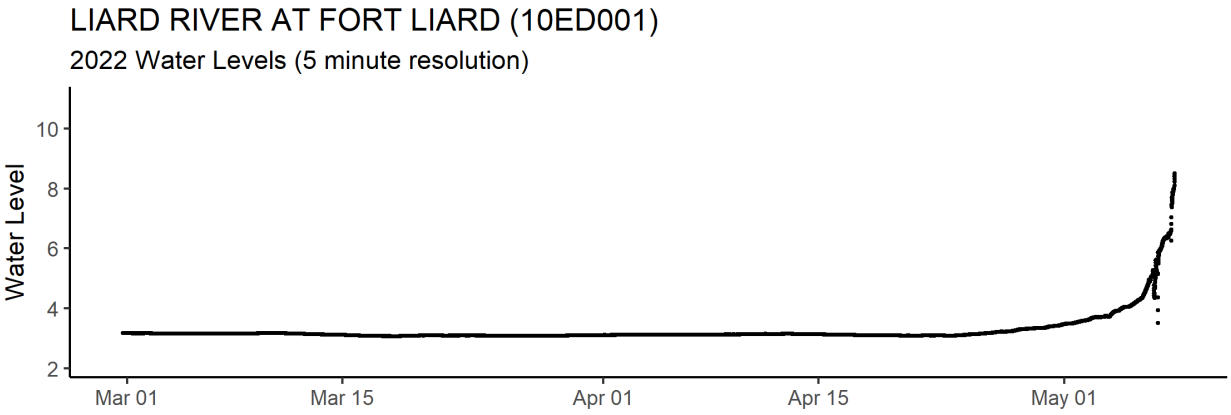


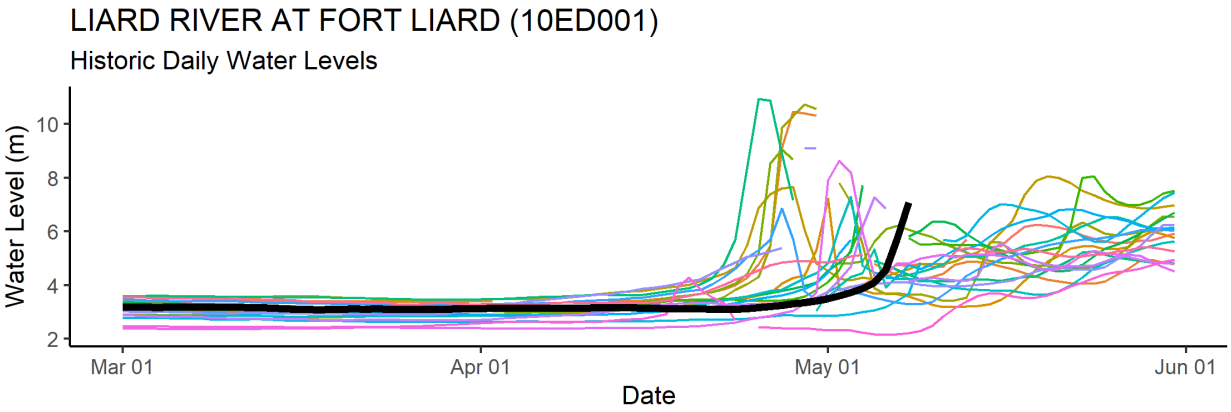


The gauge appears to be affected by ice at this time.

Liard River at Fort Liard [10ED001]:



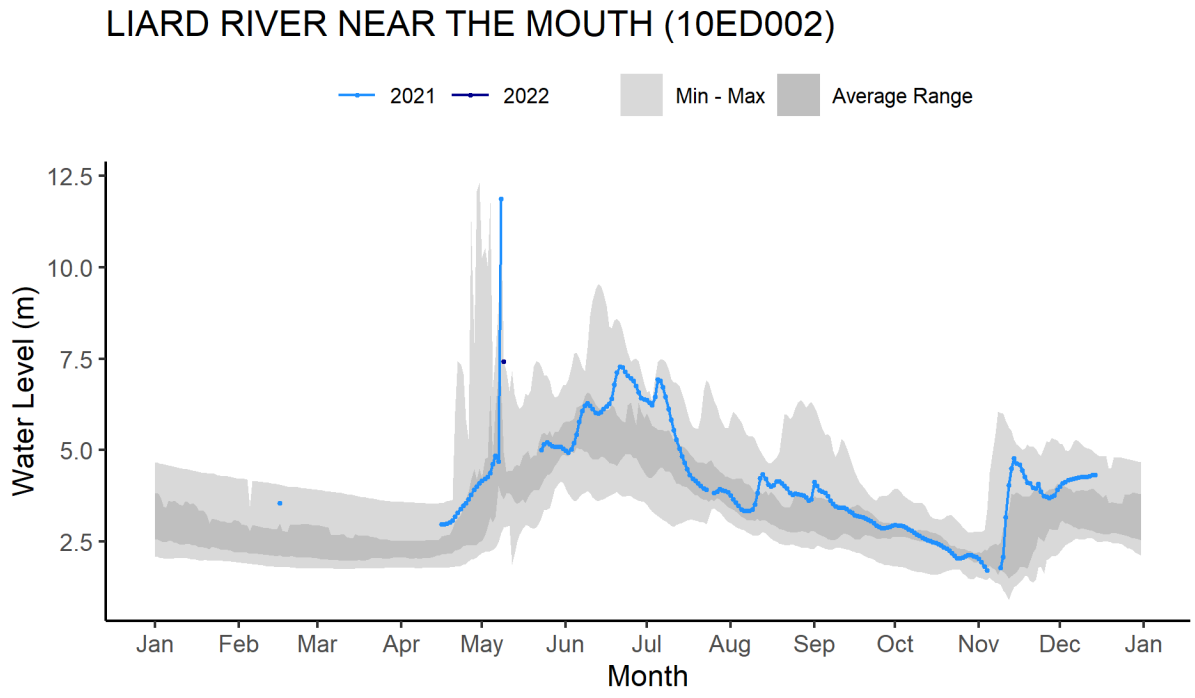




Above – Liard River at Fort Liard hydrometric gauge photo from May 10 at 11:00. Photo courtesy of Water Survey of Canada and GNWT.

Liard River near the mouth [10ED002]:

Note: The sensor is not currently producing data. Water survey of Canada of Canada staff visited the gauge on May 07 at 10:20 and measured an instantaneous water level of 4.55 m and on May 09 at 10:15 and measured an instantaneous water level of 9.16 m.

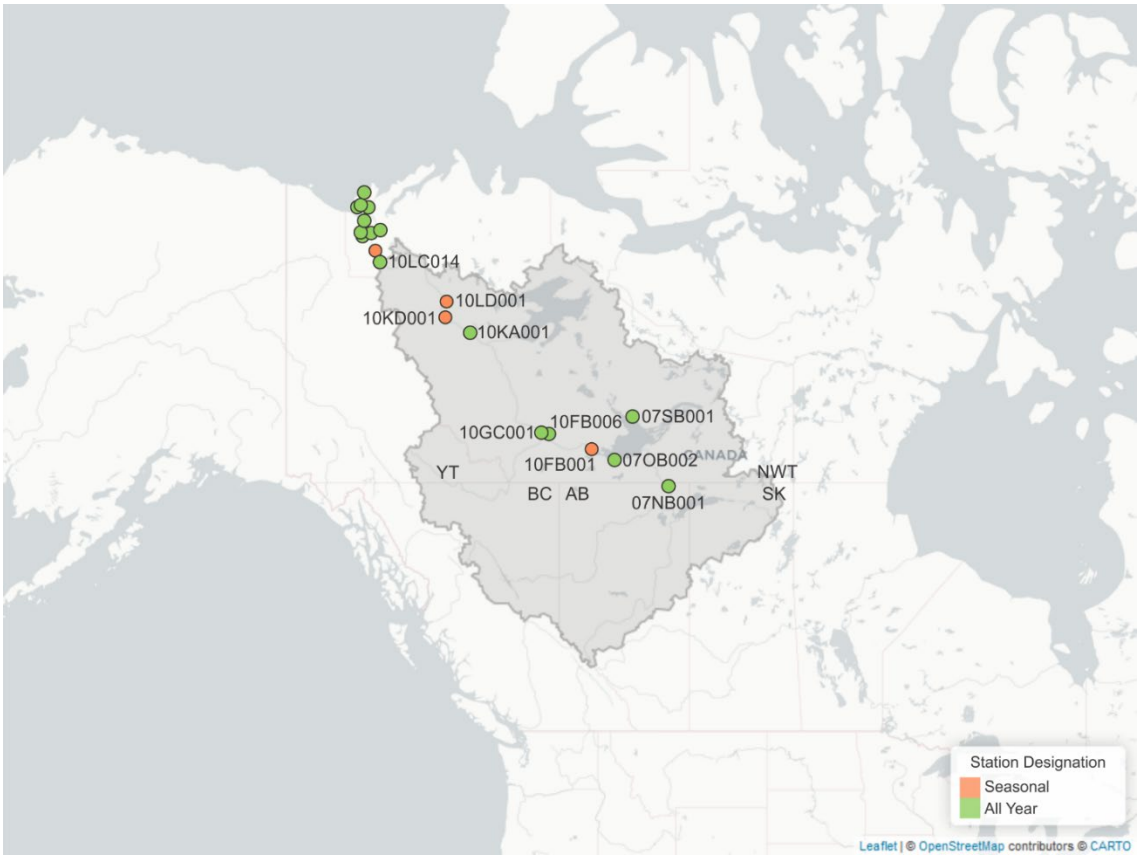


Above – Liard River near the mouth hydrometric gauge photo from May 10 at 11:00. Photo courtesy of Water Survey of Canada and GNWT.

Slave River / Great Slave Lake / Dehcho (Mackenzie River)

Current Status:

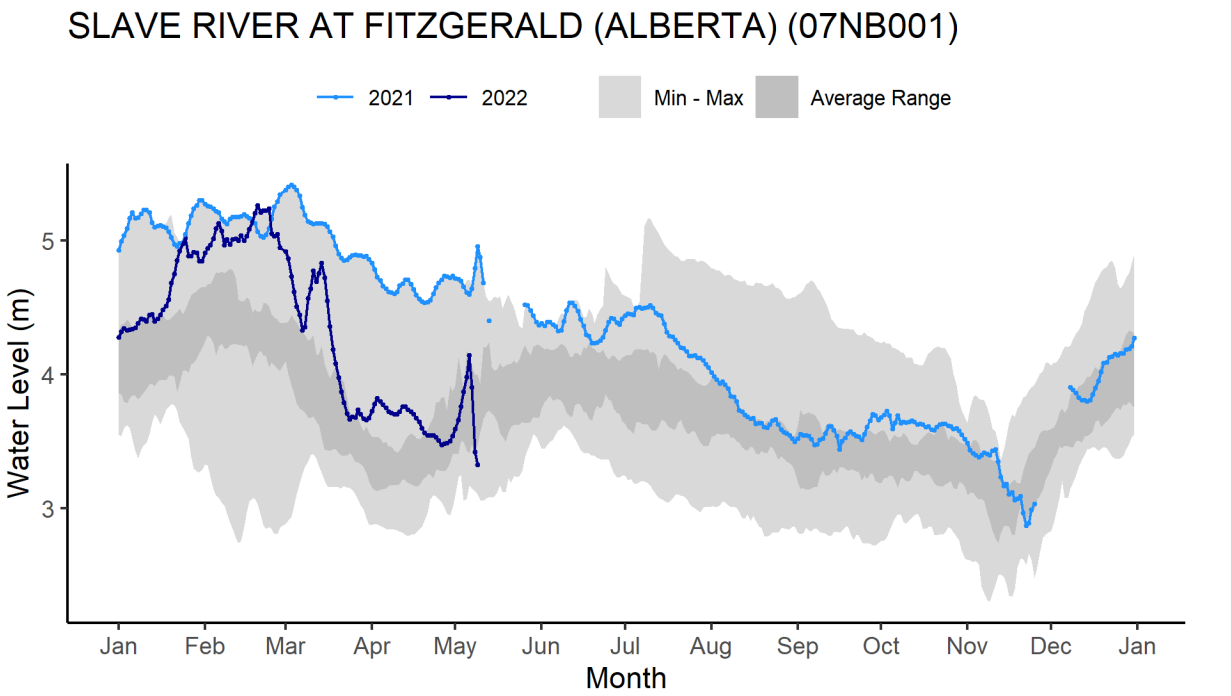
- Ice is breaking up on the Slave River;
    - Parks Canada is hoping to fly the river this afternoon to get a better idea of river ice (cloudy conditions over the past four days have prevented optical imagery);
- Ice from the Liard River has been moving on the Dehcho (Mackenzie River) at Fort Simpson, beginning yesterday evening;
    - Water levels (manual readings at the Village of Fort Simpson Pumphouse) reached a peak of 11.7 m last night and are currently reading 11.0 m;
    - Ice has impacted the Mackenzie River at Fort Simpson hydrometric gauge so real time data are not available;
- Temperatures are forecast to return to normal for the next five days.

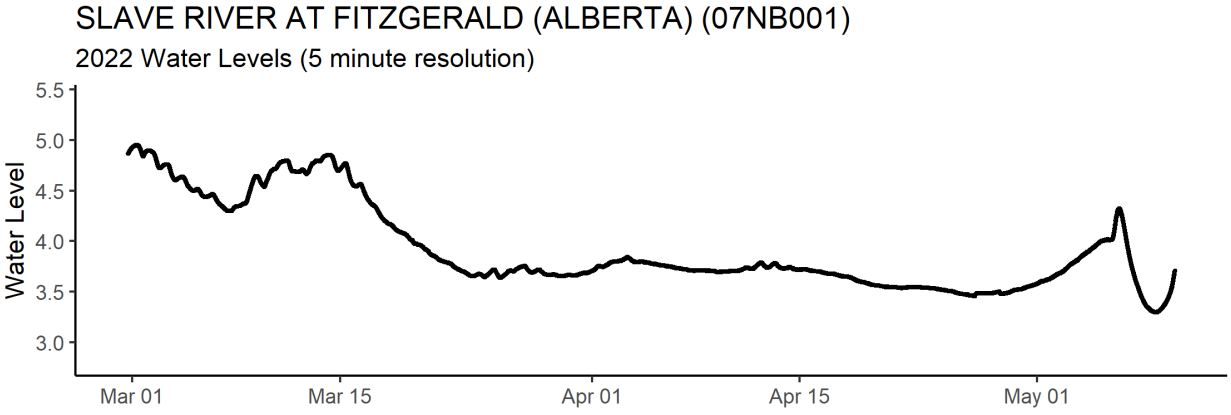


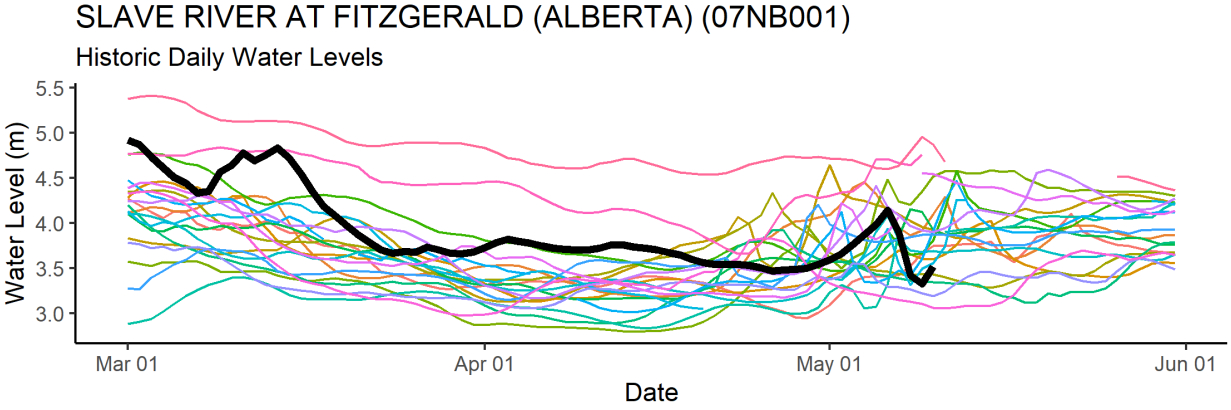
Above – Map of hydrometric stations in the Dehcho (Mackenzie River) basin. The station numbers are referenced in the water level plots below.

Hydrometric Data:

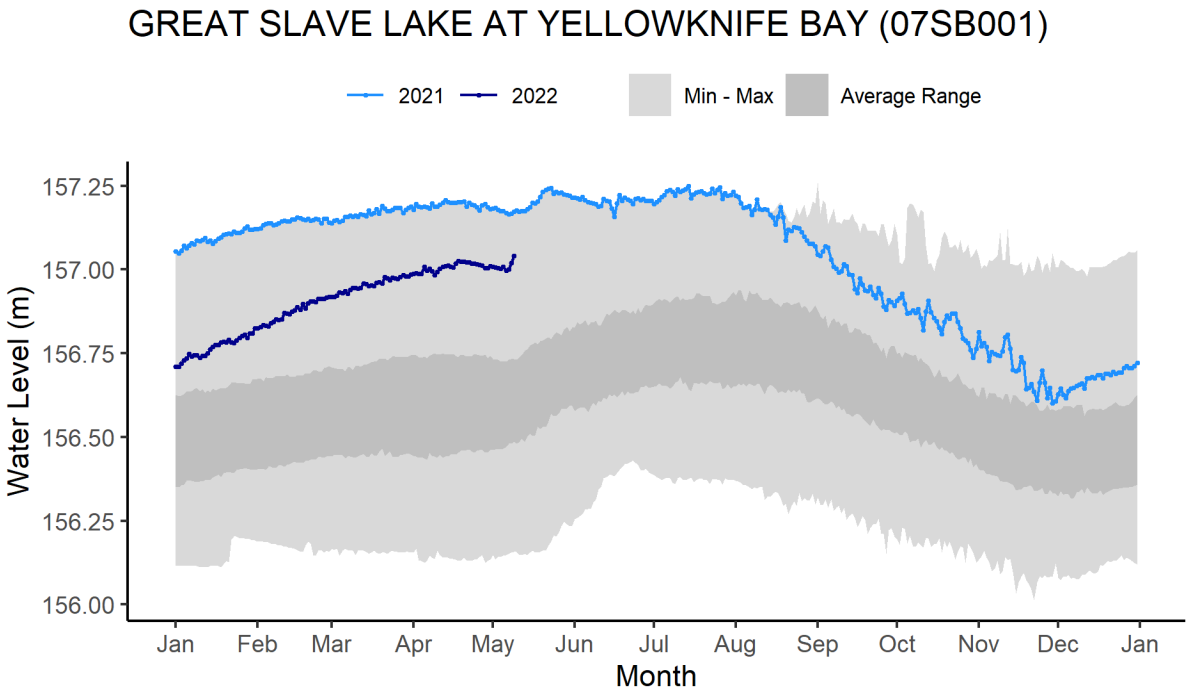
Slave River at Fitzgerald (Alberta) [07NB001]:





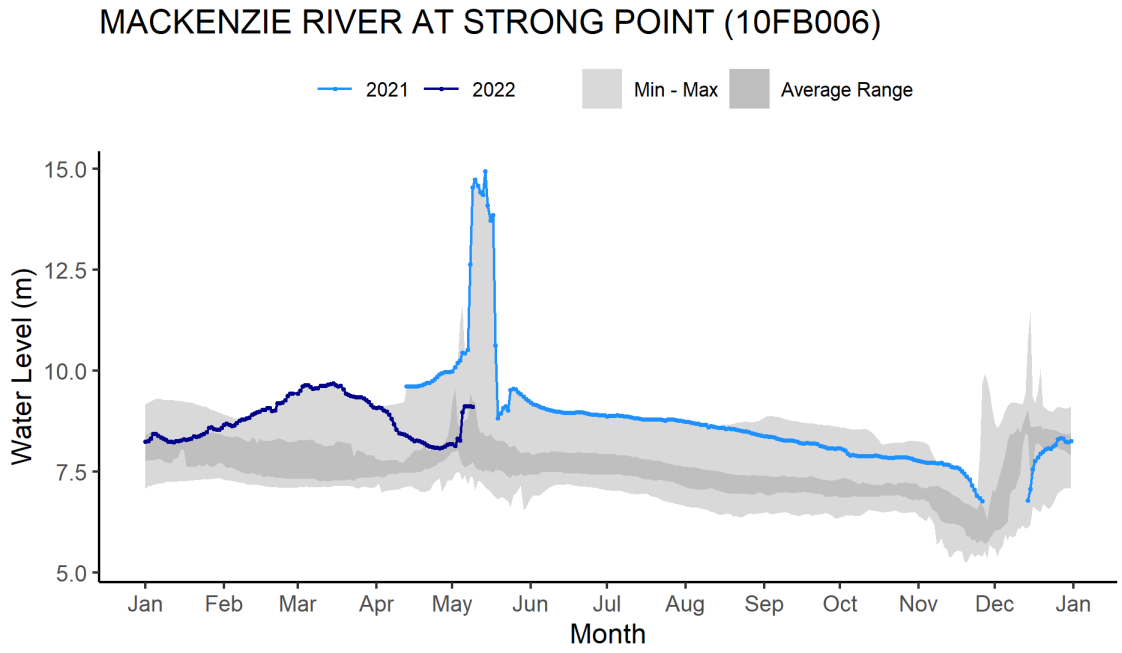


Great Slave Lake at Yellowknife Bay [07SB001]:

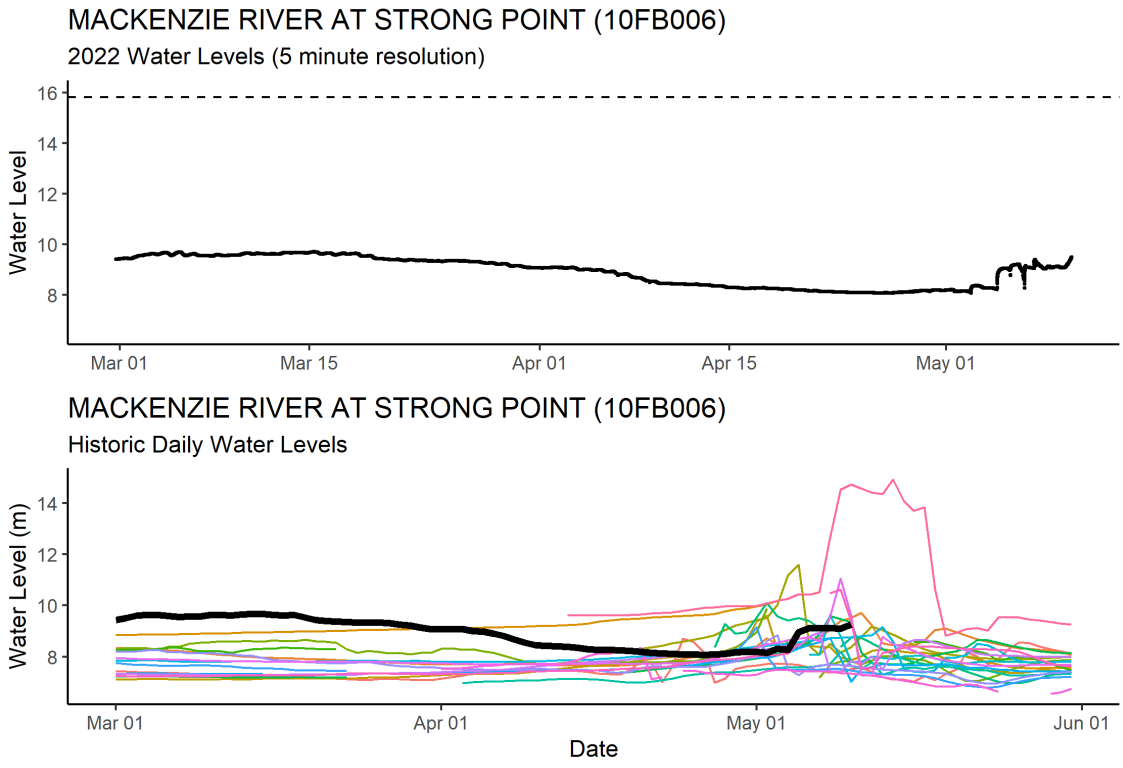


Above – Water levels on Great Slave Lake at Yellowknife Bay for the previous two years. Although water levels have receded since the highs of 2020 and 2021, levels remain much higher than normal.

Mackenzie River at Strong Point [10FB006]:



Above – hydrograph of daily average levels for the previous two years. Note that the most recent point on this graph shows the **daily average level from May 09** (yesterday).

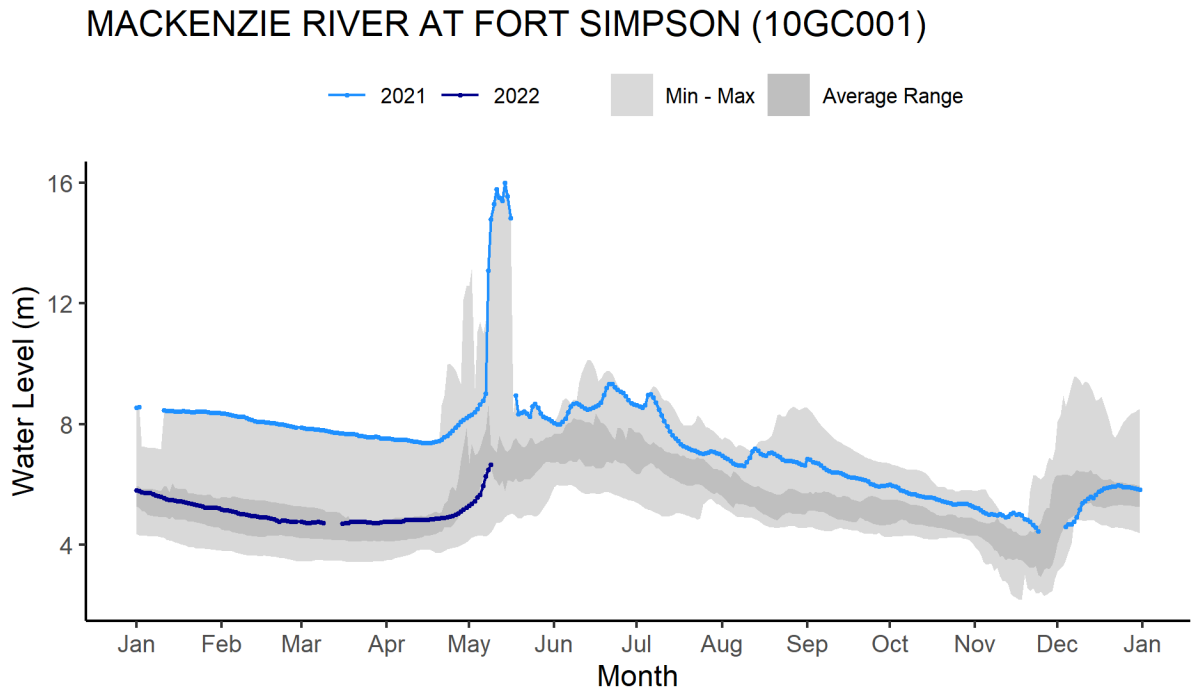


Above - The upper graph in the figure presents real time water level data at 5-minute resolution with the dashed line representing the peak water level from last year (2021). The lower graph shows daily average levels relative to the previous 20 years.

Above – Dehcho (Mackenzie River) at Strong Point hydrometric gauge photo from May 10 at 12:00. Photo courtesy of Water Survey of Canada and GNWT.

Mackenzie River at Fort Simpson [10GC001]:

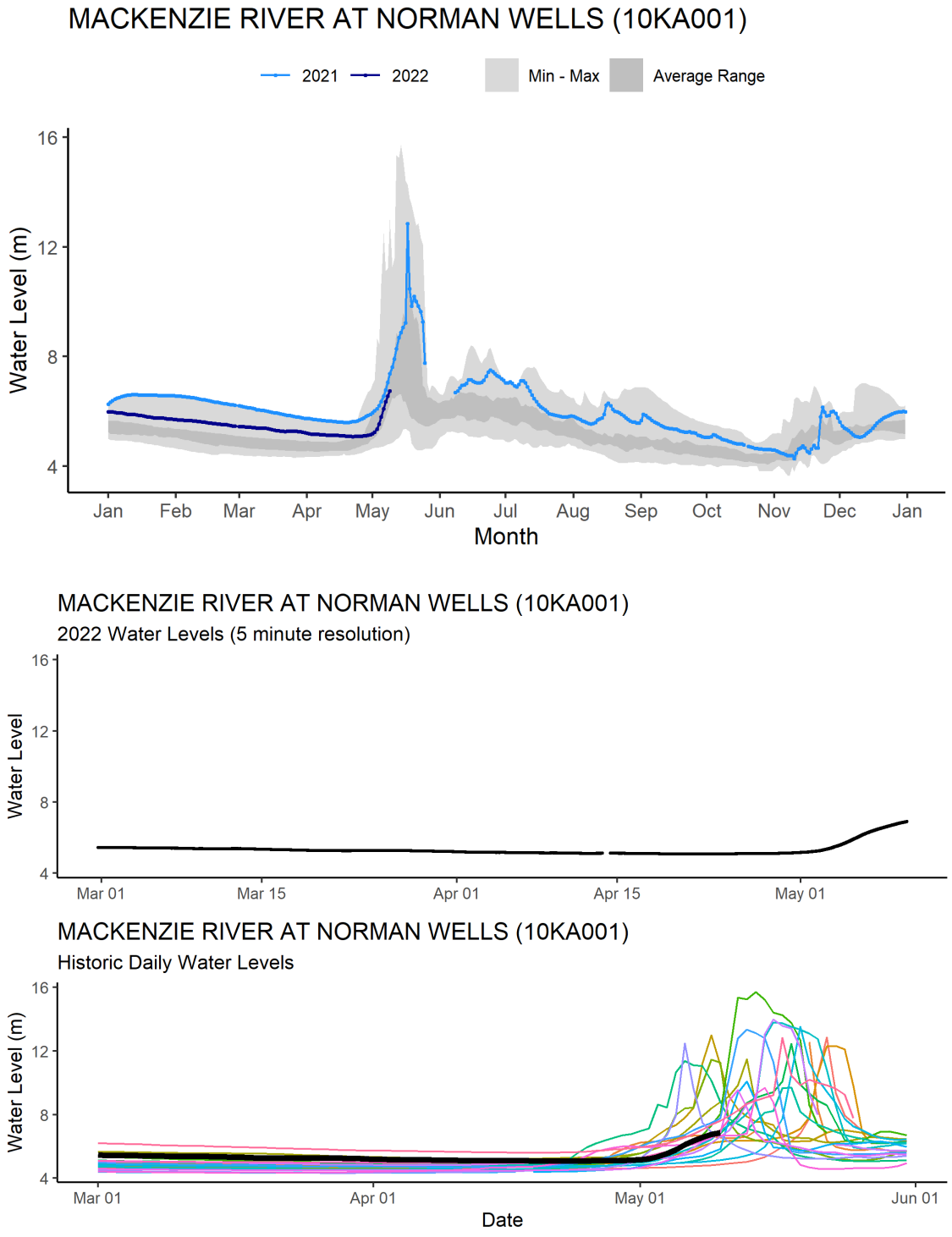
Note: The sensor is not currently producing data. The most recent data are from May 09 at 06:30 with a level of 6.974 m. Manual readings from the Village of Fort Simpson pumphouse showed a peak of 11.7 m last night, and are reading ~11.0 m as of May 10 at 11:00.



Above – hydrograph of daily average levels for the previous two years. **Note: this plot does not show real-time data but is presented as a reference point for the high water levels last year. Maximum 2022 water levels to-date have been 11.7 m**

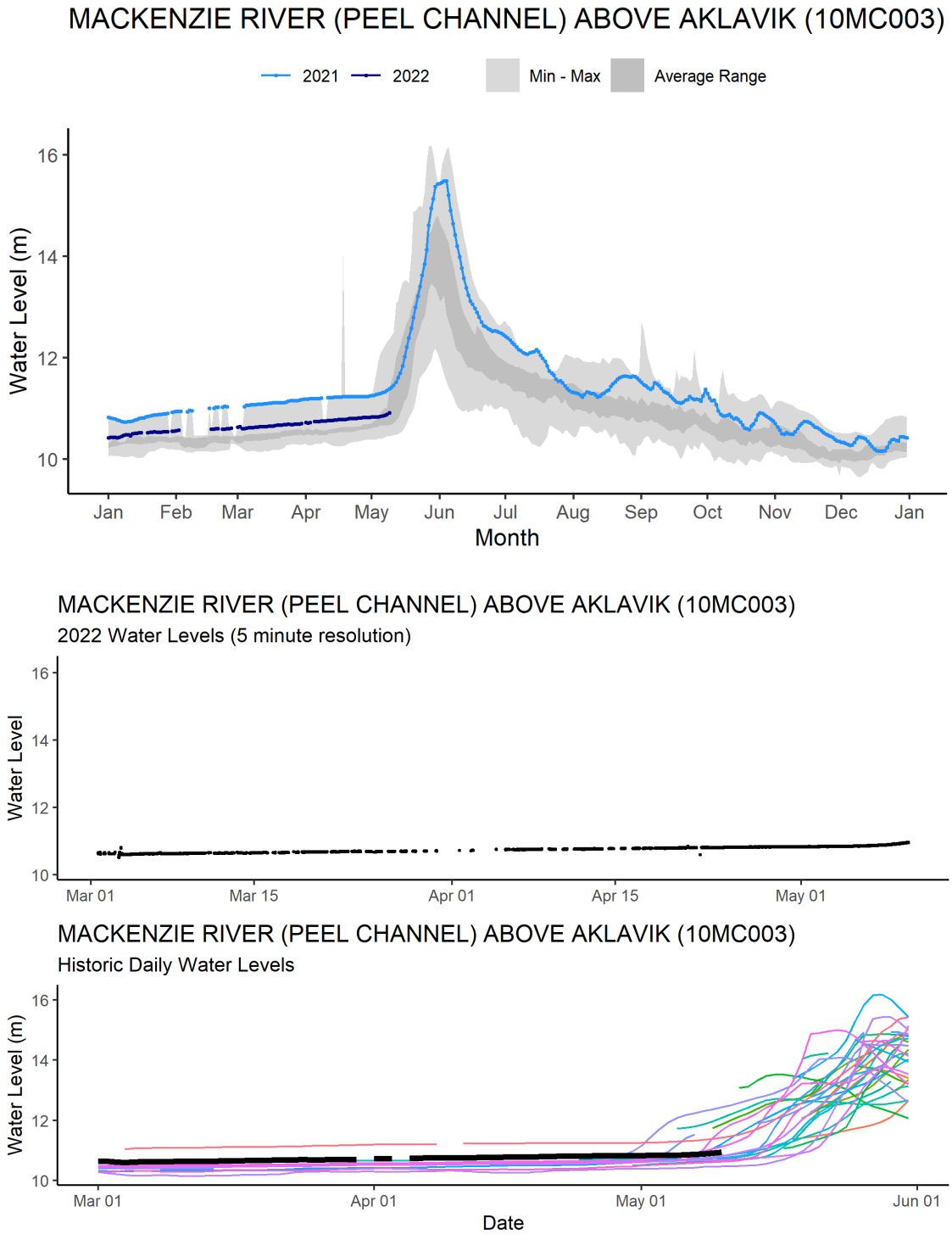
Above – Dehcho (Mackenzie River) at Fort Simpson hydrometric gauge photo from May 10 at 11:00. Photo courtesy of Water Survey of Canada and GNWT.

Mackenzie River at Norman Wells [10KA001]:



Above – The middle graph in the figure presents real time water level data at 5-minute resolution while the lower graph shows daily average levels relative to the previous 20 years. Water levels on the Mackenzie River at Norman Wells have begun to rise, with the timing being approximately average to previous years.

Mackenzie River (Peel Channel) at Aklavik [10MC003]:

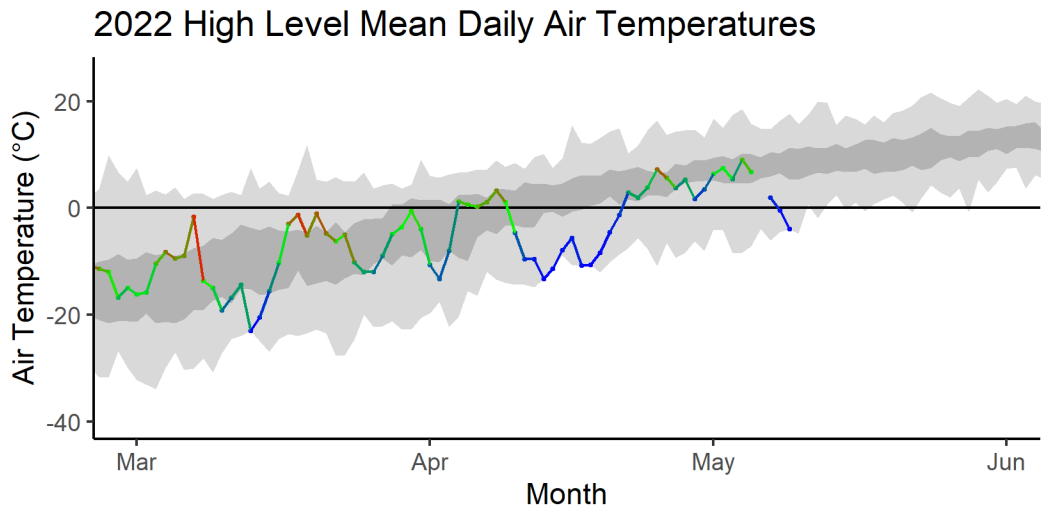


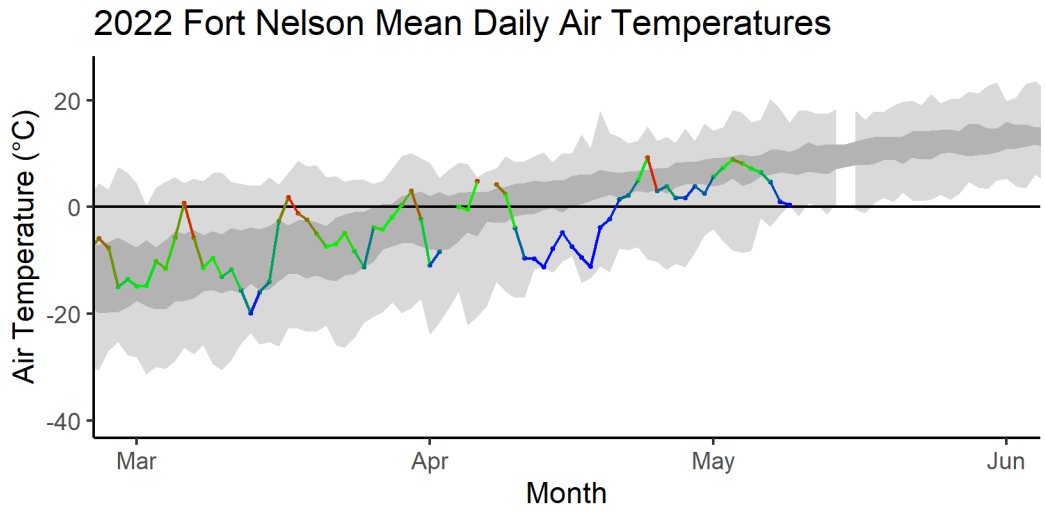
Above – The middle graph in the figure presents real time water level data at 5-minute resolution while the lower graph shows daily average levels relative to the previous 20 years. Water levels in the Delta have not yet started to rise. Water levels are lower than last year but have been higher than average throughout the winter.

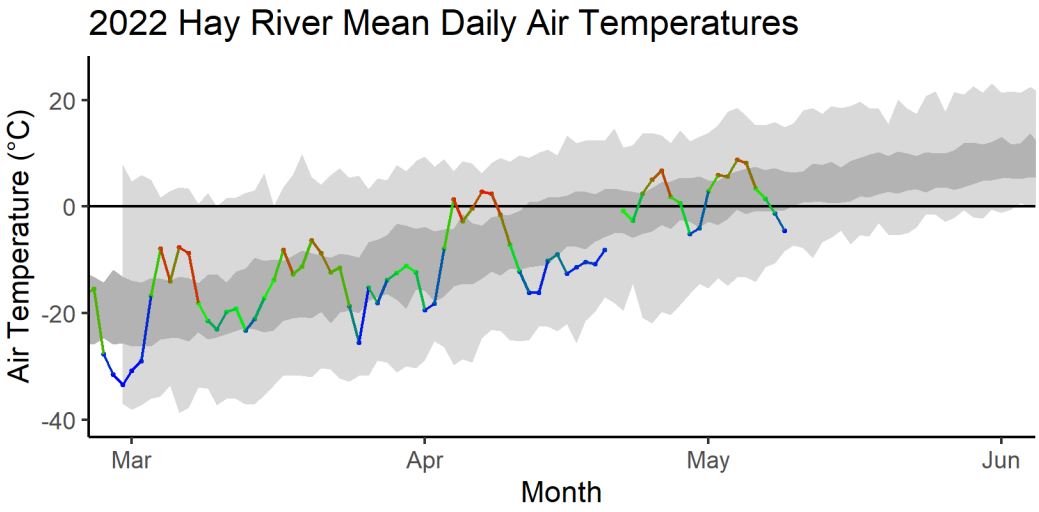
Weather Data:

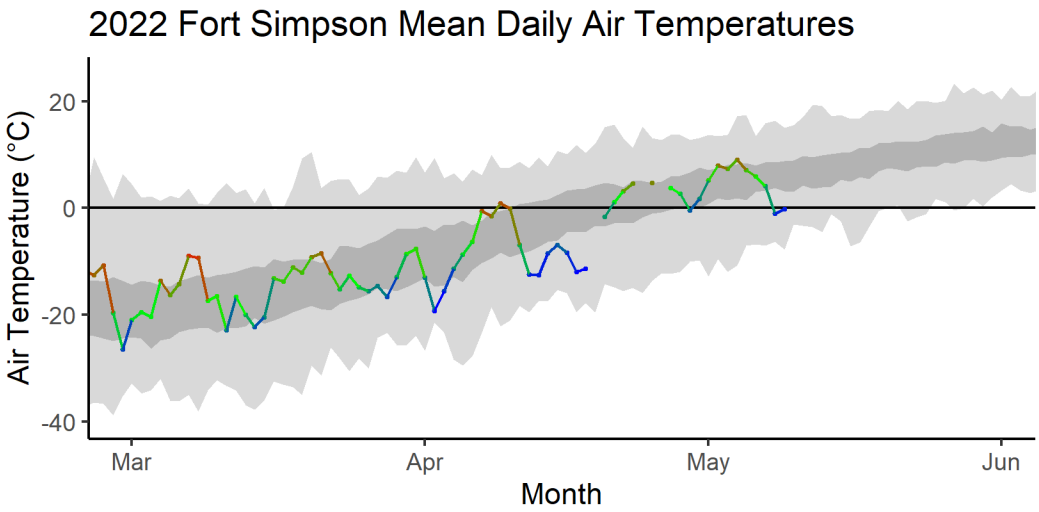
Weather information informs how snow and ice will melt and provides information about how this spring is unfolding relative to previous springs. Locations included here cover basin areas that feed into NWT rivers that are currently undergoing break up. The first set of plots show how temperatures have been relative to average (dark grey band) this spring, while the second set is Environment and Climate Change Canada (ECCC) weather forecast data for the next seven days.

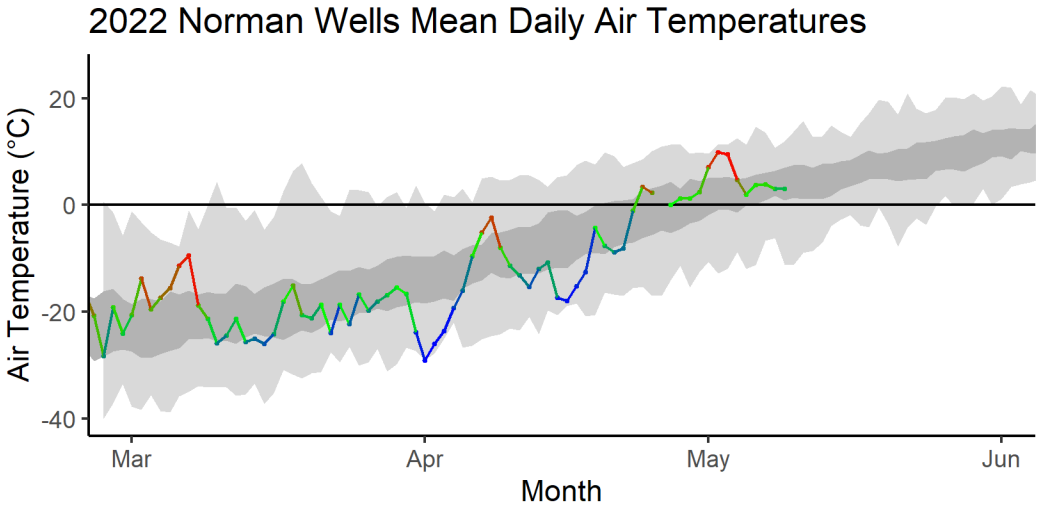
Temperatures are expected to return to normal over the next few days with no significant precipitation event forecast over the southern NWT.






2022 Hay River Mean Daily Air Temperatures
Air Temperature (°C)
20
0
-20
-40
Mar
Apr
May
Jun
Month


2022 Fort Simpson Mean Daily Air Temperatures
Air Temperature (°C)
20
0
-20
-40
Mar
Apr
May
Jun
Month


2022 Norman Wells Mean Daily Air Temperatures
Air Temperature (°C)
20
0
-20
-40
Mar
Apr
May
Jun
Month

High Level seven-day weather forecast:

Tue 10 May	Wed 11 May	Thu 12 May	Fri 13 May	Sat 14 May	Sun 15 May	Mon 16 May
8°C 30% Chance of rain showers or flurries	13°C 30% Chance of showers	15°C Sunny	17°C Sunny	16°C 60% Chance of showers	16°C A mix of sun and cloud	17°C A mix of sun and cloud
Tonight	Night	Night	Night	Night	Night	
-4°C Partly cloudy	-1°C Clear	2°C Cloudy periods	5°C Cloudy periods	2°C Cloudy periods	4°C Cloudy periods	

Fort Nelson seven-day weather forecast:

Tue 10 May	Wed 11 May	Thu 12 May	Fri 13 May	Sat 14 May	Sun 15 May	Mon 16 May
11°C A mix of sun and cloud	12°C 30% Chance of flurries	15°C A mix of sun and cloud	15°C Cloudy	16°C Sunny	15°C A mix of sun and cloud	15°C 60% Chance of showers
Tonight	Night	Night	Night	Night	Night	
-1°C 30% Chance of flurries	2°C Cloudy periods	1°C Cloudy periods	4°C 60% Chance of showers	3°C Cloudy periods	5°C Cloudy periods	

Hay River seven-day weather forecast:

Tue 10 May	Wed 11 May	Thu 12 May	Fri 13 May	Sat 14 May	Sun 15 May	Mon 16 May
1°C 30% Chance of flurries	7°C Mainly sunny	7°C Sunny	11°C Sunny	9°C A mix of sun and cloud	10°C A mix of sun and cloud	11°C A mix of sun and cloud
Tonight	Night	Night	Night	Night	Night	
-6°C 30% Chance of flurries	-6°C Clear	-3°C Clear	-3°C Clear	2°C Cloudy periods	3°C Cloudy periods	

Fort Simpson seven-day weather forecast:

Tue 10 May	Wed 11 May	Thu 12 May	Fri 13 May	Sat 14 May	Sun 15 May	Mon 16 May
9°C	10°C	15°C	16°C	15°C	15°C	13°C
Mainly sunny	A mix of sun and cloud	Sunny	A mix of sun and cloud	A mix of sun and cloud	A mix of sun and cloud	Cloudy
Tonight	**Night**	**Night**	**Night**	**Night**	**Night**	
-6°C	0°C	2°C	4°C	3°C	3°C	
Partly cloudy	Clear	Clear	Clear	Cloudy periods	Cloudy periods	

Norman Wells seven-day weather forecast:

Tue 10 May	Wed 11 May	Thu 12 May	Fri 13 May	Sat 14 May	Sun 15 May	Mon 16 May
9°C	8°C	15°C	18°C	17°C	10°C	12°C
30% Chance of showers	30% Chance of flurries	Sunny	Sunny	Sunny	A mix of sun and cloud	A mix of sun and cloud
Tonight	**Night**	**Night**	**Night**	**Night**	**Night**	
-3°C	-2°C	0°C	2°C	1°C	2°C	
30% Chance of flurries or rain showers	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.