2025/2026 Annual Summary Report

Water Monitoring of Small Watersheds Program
Project Number: ER-Water-2019-01

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Background

The collection of streamflow data (i.e. hydrometric information) has been declining over the past 20 years by the Water Survey of Canada; historically in northeast BC (NEBC) there were over 50 active hydrometric stations compared to the ~20 active stations today. The active stations are primarily collecting streamflow data for the larger systems such as the Kiskatinaw River or Halfway River, which leaves a data gap for the smaller, tributary systems. This data gap represents a challenge with water licence requests on many of these smaller watersheds which have little to no hydrologic data to support decisions.

The BC Energy Regulator (BCER), Ministry of Water, Land and Resource Stewardship (WLRS), and various other users, rely on the Northeast Water Tool (NEWT) to support water licence and short-term water use approval application decisions. The hydrologic model underlying NEWT relies on empirical (statistical) hydrologic regionalization methods; this approach is affected by the scalability of available data, where the representativeness over short time periods of weak spatial transferability to watersheds without streamflow data can severely limit the accuracy of estimates. It is widely accepted and acknowledged that NEWT is not without limitations and one of its greatest includes a higher degree of uncertainty for smaller basins, as data for calibration at this scale is limited.

The First Nation (FN) communities within Treaty Eight have each expressed water as their highest priority and concern. A specific concern relates to water withdrawals from small watersheds, the lack of data, and the reliance on NEWT for water management decisions given its potential limitations.

This project was designed to help address the small watershed data gap and FN concerns by collecting streamflow data in three smaller watersheds in NEBC. Once the data is processed it will be integrated into the hydrometric network and be used to inform future water allocation and watershed management. The long-term objective is to build stronger relationships with FNs, facilitate mutual knowledge transfer, gather streamflow information in smaller watersheds, and to update the hydrologic model supporting NEWT.

Funding for the Water Monitoring of Small Watersheds program is provided by the BC Oil and Gas Research and Innovation Society (BC OGRIS). The program was initiated in 2019, monitoring three watersheds (Osborn River, Le Bleu Creek, and Martin Creek), with the addition of a fourth (Blueberry River) in 2020. The program saw some changes for the 2024 monitoring season, with Beaver Creek replacing Martin Creek, removal of Le Bleu Creek, addition of three existing stations previously funded by Geoscience BC (Doig River, Blueberry River, and Hulcross Creek) and upgrading of the Osborn River station. These changes resulted in a total of six systems being monitored under the program, which is currently funded until the end of 2026.

The project is being led by Ryan Rolick, Marie King, and Cierra Redel with the BCER, with support from Barry Ortman with Peace Country Technical Services Ltd. We would like to thank the Blueberry River First Nations (BRFN), Doig River First Nation (DRFN), Prophet River First Nation (PRFN), and Saulteau First Nations (SFN) for their participation in the program.

Summary of Activities

Prior to spring freshet, the equipment was prepared on April 30 in the Doig River and Osborn River (DRFN), the Blueberry River and Aitken Creek (BRFN) on May 02, Hulcross Creek (SFN) on May 08, and Beaver Creek on May 23 to begin capture of open water measurements for the 2025 season. The team was able to visit each of these sites a minimum of four times to collect instream flow measurements and download sensor data.

Poor road conditions in July prevented the team from accessing the Blueberry and Aitken stations that month, reducing site visits to four. Overall, there was excellent participation from each of the community's staff and members. SFN Guardians continued their participation in the monitoring program this year.

Upon the close of the monitoring season, time series water level and manual streamflow measurement data was used to establish a stage discharge relationship and compute seasonal hydrographs for each system. Hydrograph generation was conducted using the Aquarius data management platform.

The location of the six stations and respective upstream watersheds are shown in Figure 1: Hulcross Creek for SFN, Upper Aitken Creek and Blueberry River for BRFN, Osborn River and Doig River for DRFN, and Beaver Creek for PRFN (upstream watershed yet to be delineated).

Over the past six years, BCER staff have been very successful at building positive relationships with the First Nation communities. Scheduling can often be a challenge as many of the participants are busy with other field programs in the summer, so it is essential that the field program is set out in advance to ensure successful participation.

Pictures of field activities and associated streamflow conditions at each site can be found in Figures 2 – 7. As of January 06, 2026, all of the information, data and photos collected during the 2025 field season has been shared with the communities and data from the stations is publicly available through the Water Portal (http://waterportal.geoweb.bcogc.ca/) and provincial Aquarius database.

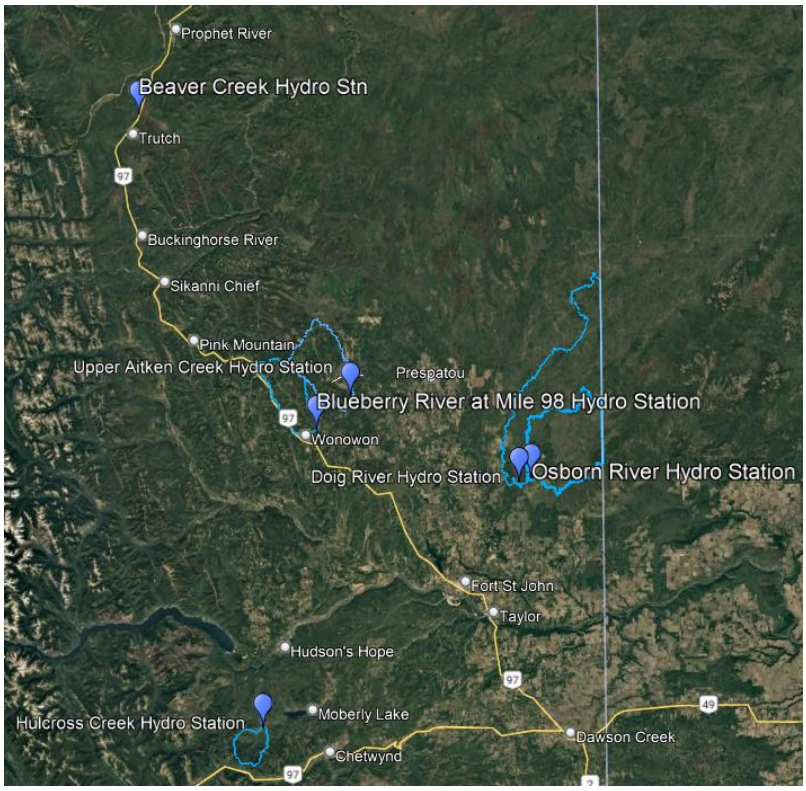


Figure 1. Location of the six hydrometric stations monitored in 2025. Outlines indicate upstream watershed areas and markers indicate monitoring station location. Note that the upstream watershed for Beaver Creek has not yet been delineated.

a. First flow measurement of the season, minimal freshet conditions, May 08, 2025.

b. Mid season low flows, June 03, 2025.

c. Early fall low flow measurement, September 15, 2025.

d. Late season low flows and sensor replacement, October 15, 2025.

Figure 2. Hulcross Creek with SFN field season photos.

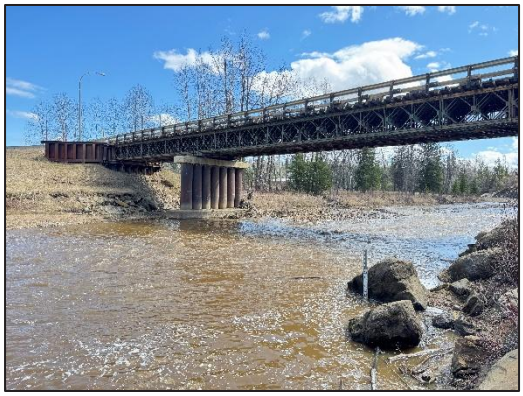
a. Final installation and survey of upgraded station, April 30, 2025.

b. Downstream beaver dam causing high water, low flow measurement, June 27, 2025.

c. Late season low flow measurement, September 26, 2025.

d. End of season flow measurement, October 30, 2025.

Figure 3. Osborn River with DRFN field season photos.



a. Early season during spring melt, April 30, 2025

b. Early season measurement, June 27, 2025.

c. Late season low flows, September 26, 2025.

d. End of season low flows, October 30, 2025.

Figure 4. Doig River with DRFN field season photos.

a. Early season flow measurement, May 02, 2025.

b. Streamflow conditions post summer high flows September 10, 2025.

c. The beaver dam downstream of the sensor persists, June 02, 2025.

d. Late season streamflow conditions, October 09, 2025.

Figure 5. Upper Aitken Creek at Mile 98 Road with BRFN field season photos.

a. Early season streamflow measurement, May 02, 2025.

b. High streamflow measurement setup, June 02, 2025.

c. Late season water level survey, September 10, 2025.

d. End of season water level survey, October 09, 2025.

Figure 6. Blueberry River at Mile 98 Road with BRFN field season photos.

a. Early season water level survey walkthrough and sensor install, May 23, 2025.

b. Early season high streamflow measurement, June 25, 2025.

c. Late season water level survey, September 24, 2025.

d. End of season water level survey, October 23, 2025.

Figure 7. Beaver Creek at Alaska Highway with PRFN field season photos.

Deliverables

Seasonal streamflow hydrographs were derived based on the information collected during the 2025 field season in Upper Aitken Creek, Blueberry River, Osborn River, Doig River, Hulcross Creek and Beaver Creek. Figures 8 – 18 show stream discharge over the monitoring periods at each hydrometric station. For the locations with several years of monitoring data (all excluding Beaver Creek), previous seasons, historical averages and other streamflow statistics were also plotted for a year-to-year comparison of seasonal flow progression.

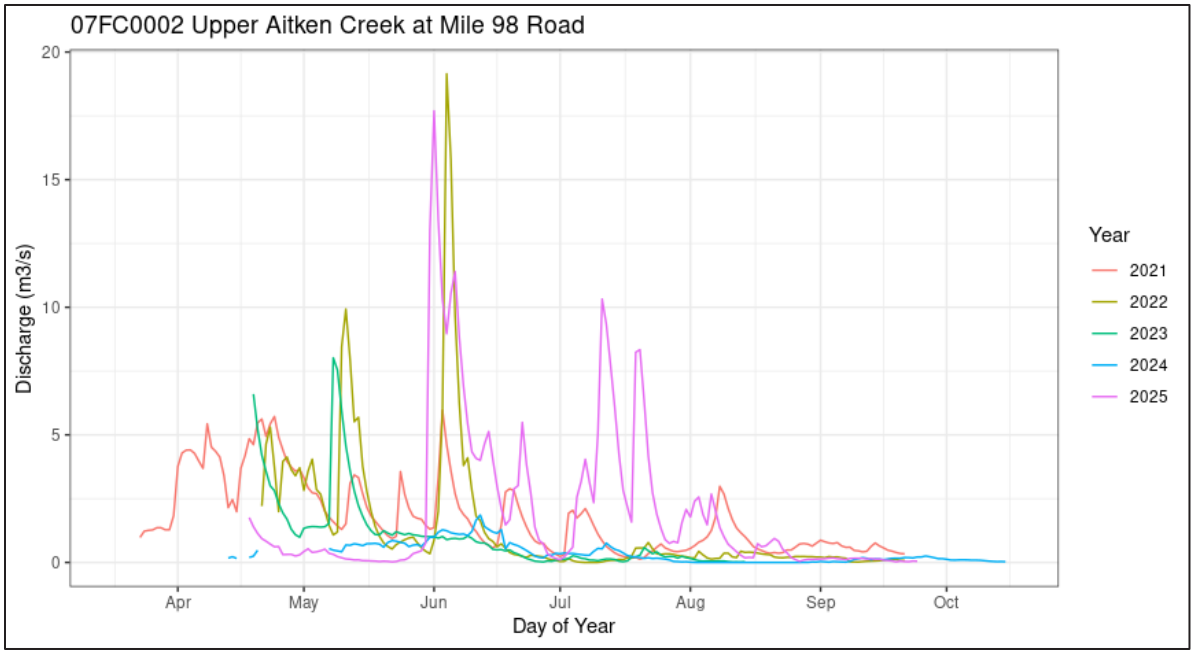


Figure 8. 2021 – 2025 seasonal discharge in Upper Aitken Creek at Mile 98 Road.

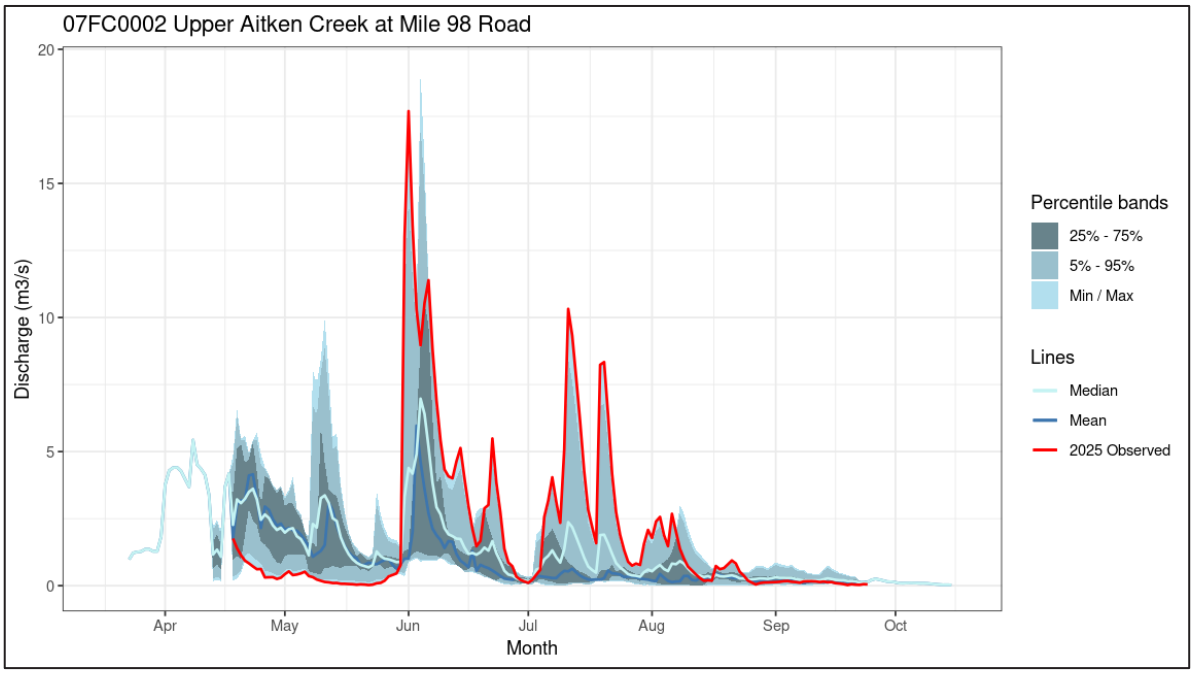


Figure 9. 2025 seasonal discharge overlaid with 2021 – 2025 streamflow statistics in Upper Aitken Creek at Mile 98 Road.

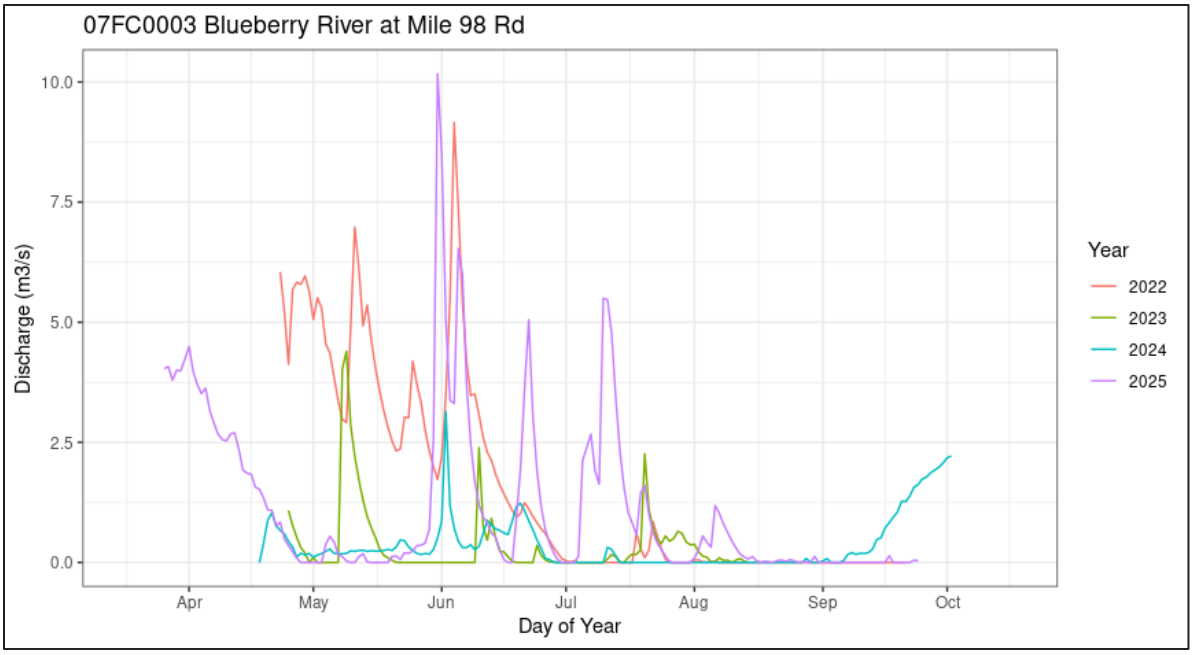


Figure 10. 2022 – 2025 seasonal discharge in Blueberry River at Mile 98 Road.

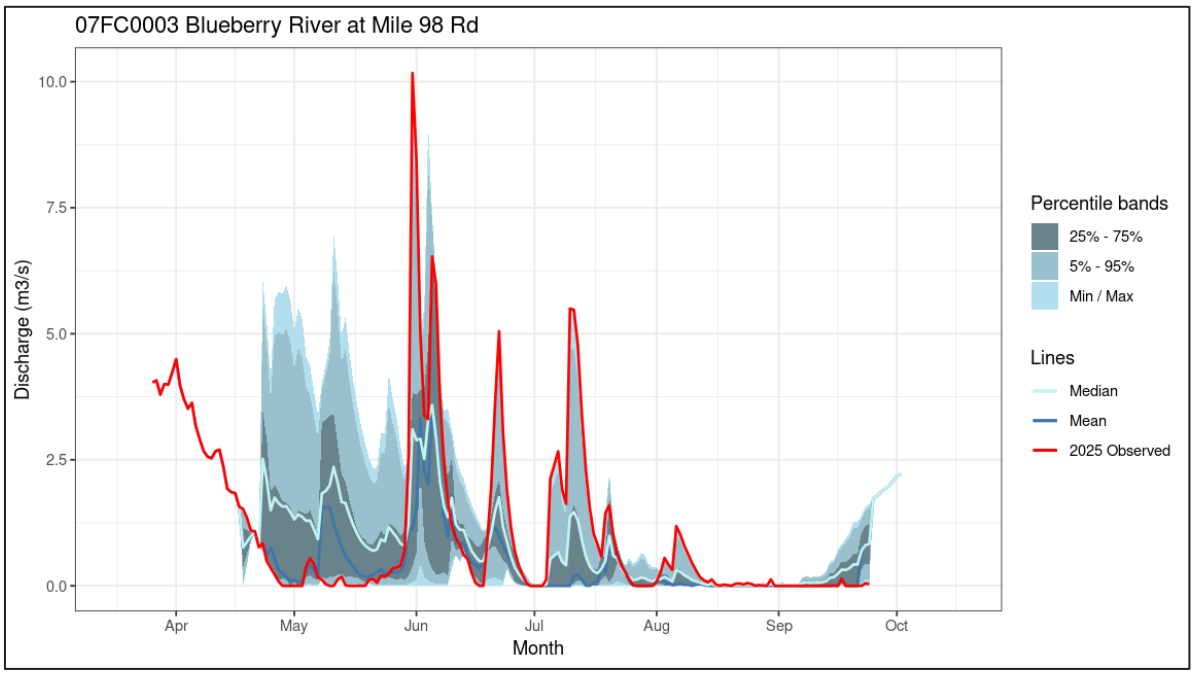


Figure 11. 2025 seasonal discharge overlaid with 2022 – 2025 streamflow statistics in Blueberry River at Mile 98 Road.

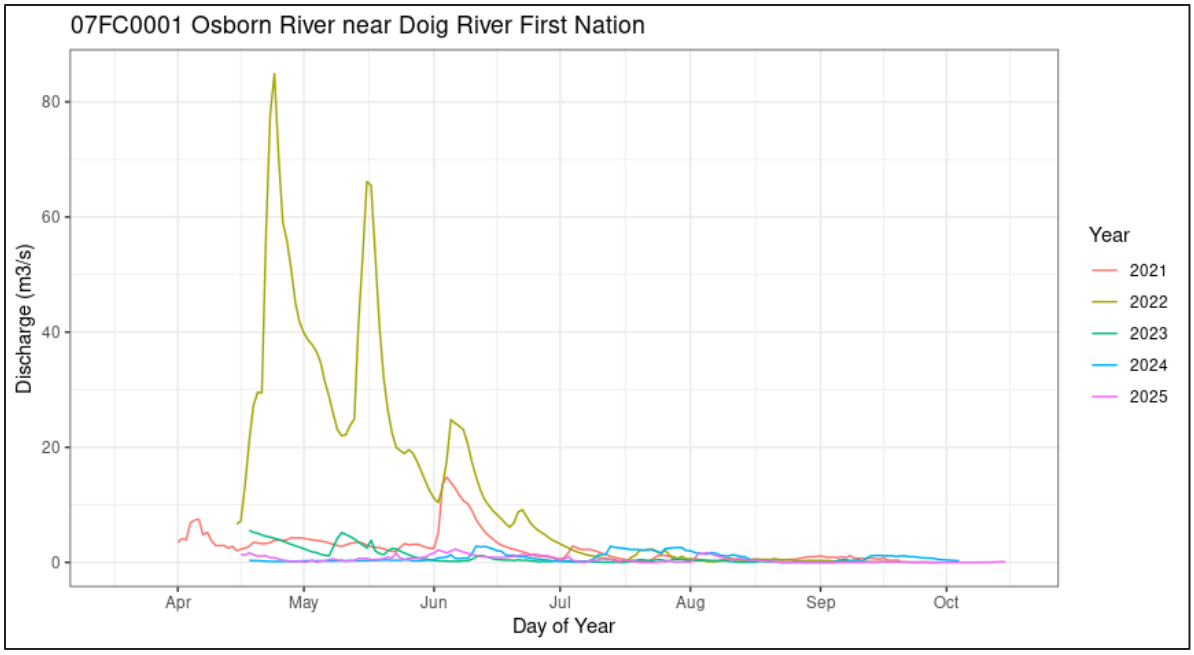


Figure 12. 2021 – 2025 seasonal discharge in Osborn River near Doig River First Nation.

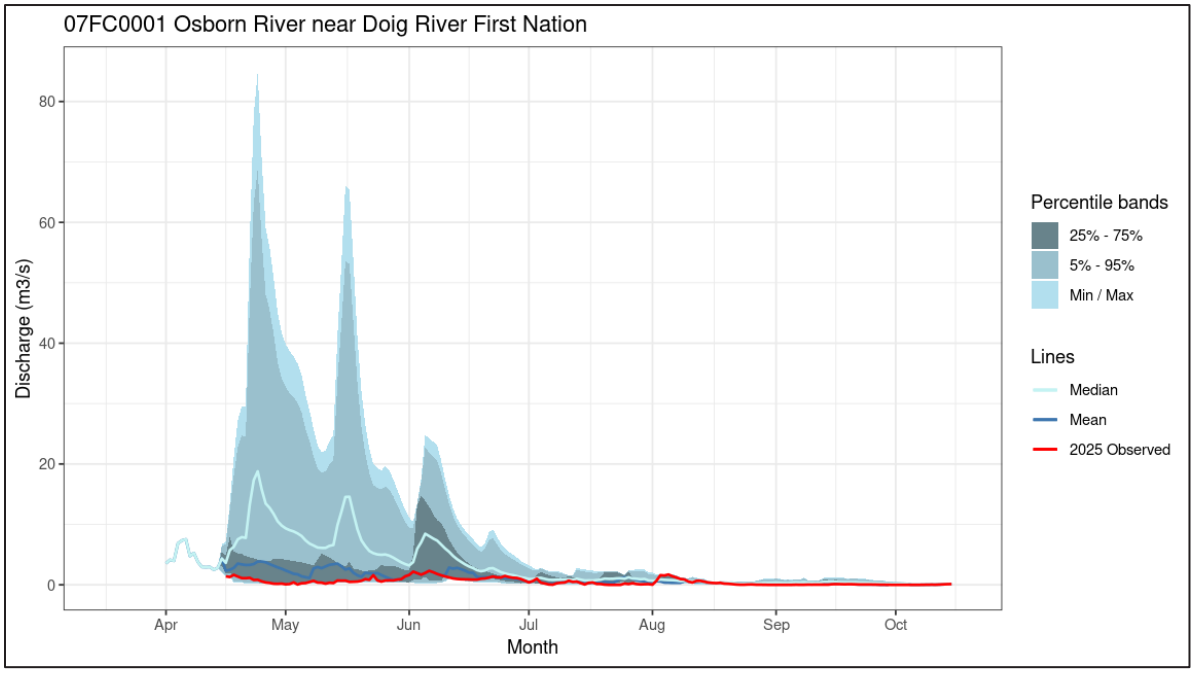


Figure 13. 2025 seasonal discharge overlaid with 2021 – 2025 streamflow statistics in Osborn River near Doig River First Nation.

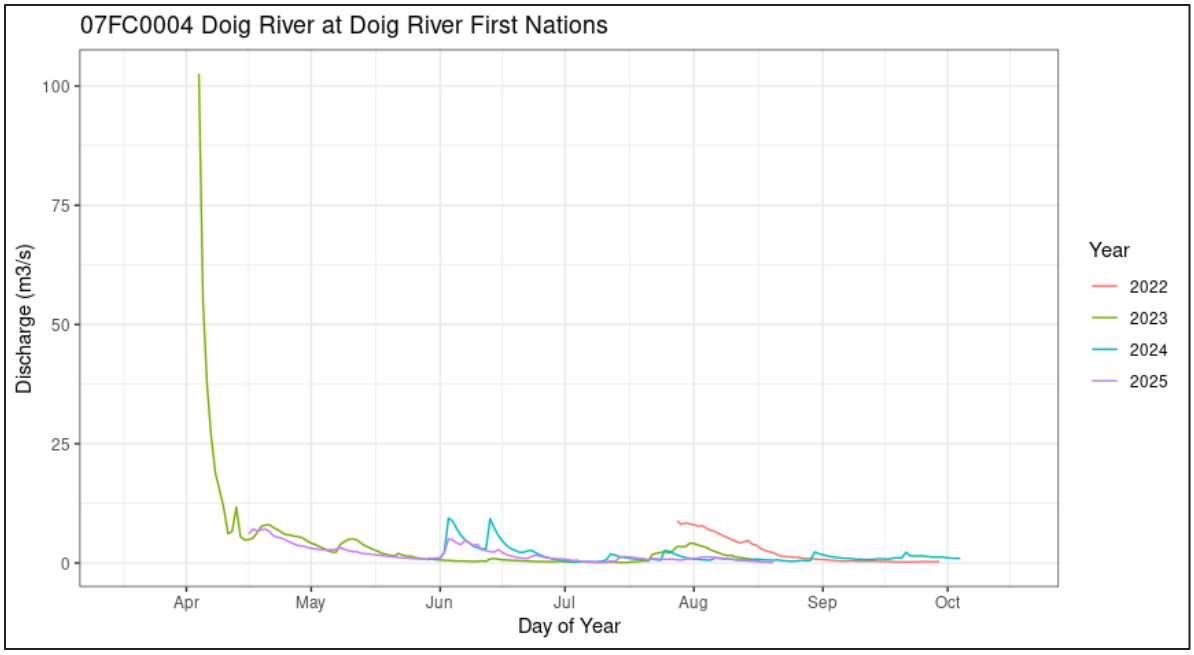


Figure 14. 2022 – 2025 seasonal discharge in Doig River at Doig River First Nation.

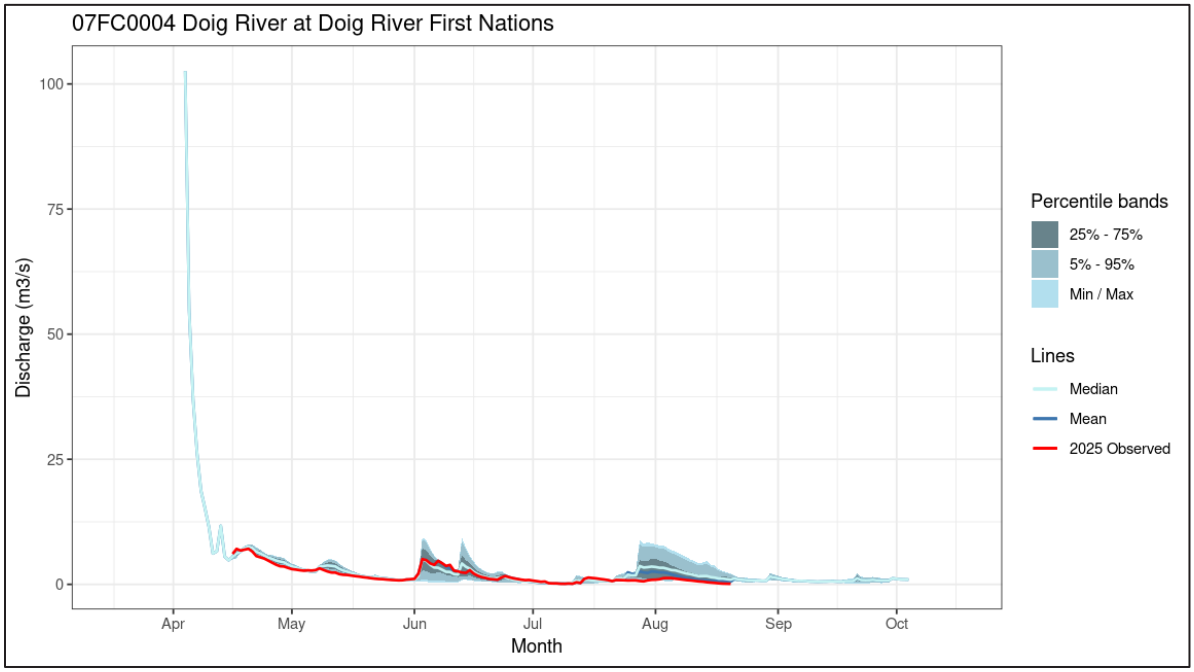


Figure 15. 2025 seasonal discharge overlaid with 2022 – 2025 streamflow statistics in Doig River at Doig River First Nation.

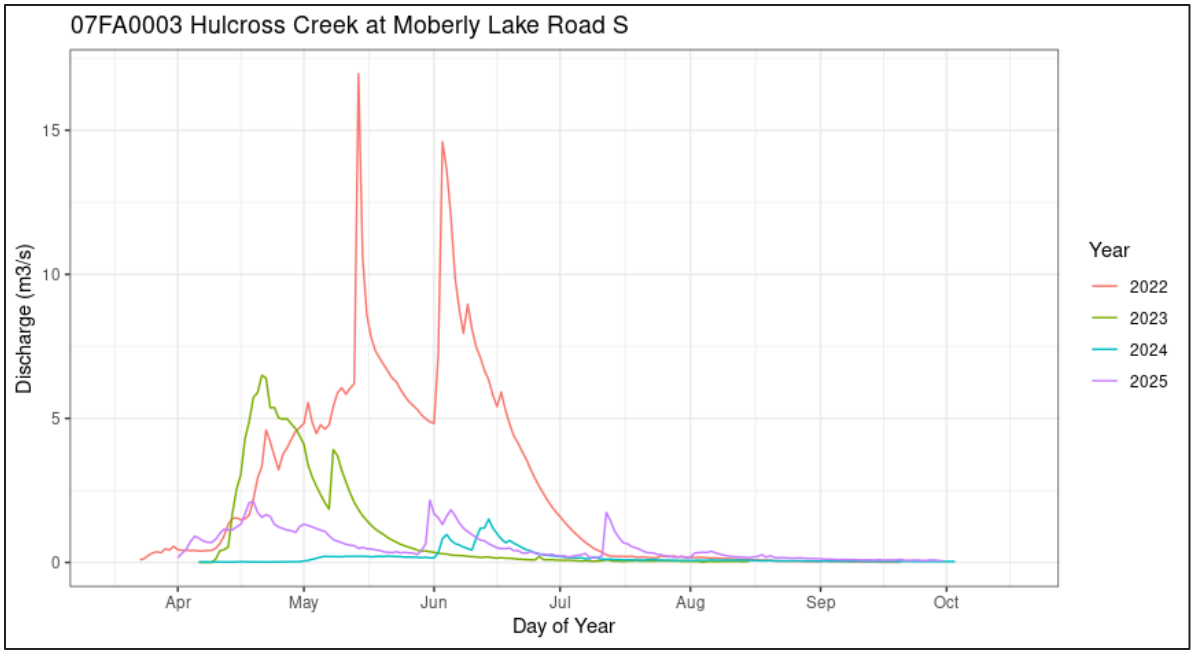


Figure 16. 2022 – 2025 seasonal discharge in Hulcross Creek at Moberly Lake Rd S.

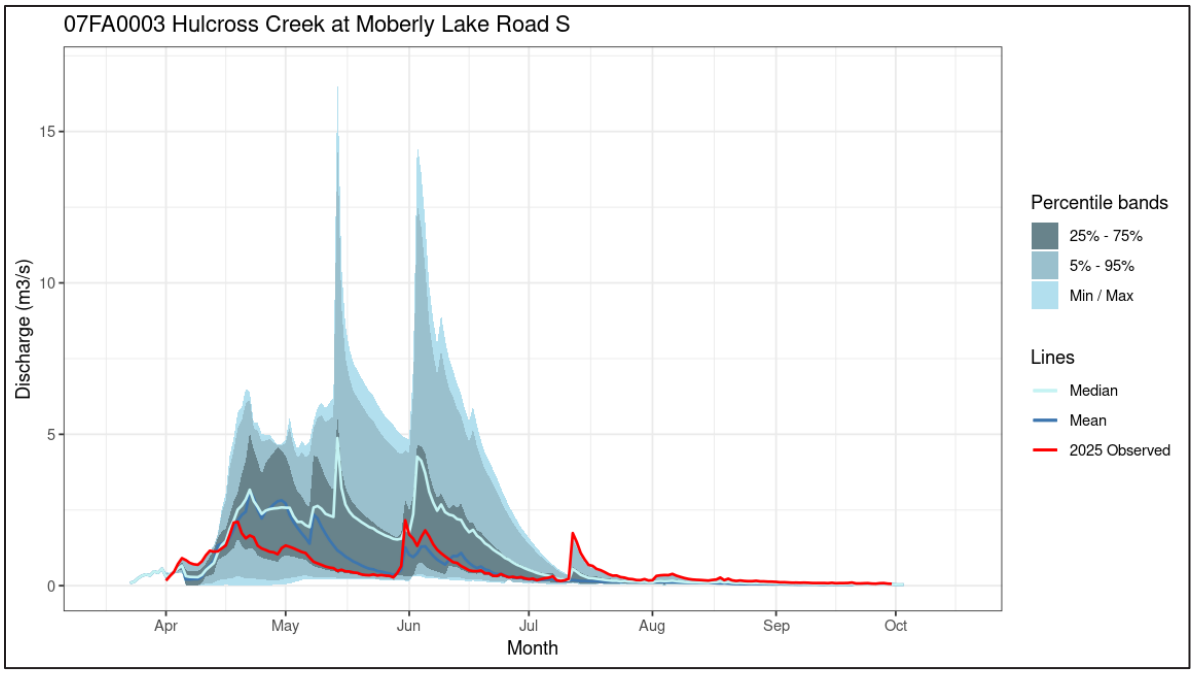


Figure 17. 2025 seasonal discharge overlaid with 2022 – 2025 streamflow statistics in Hulcross Creek at Moberly Lake Rd S.

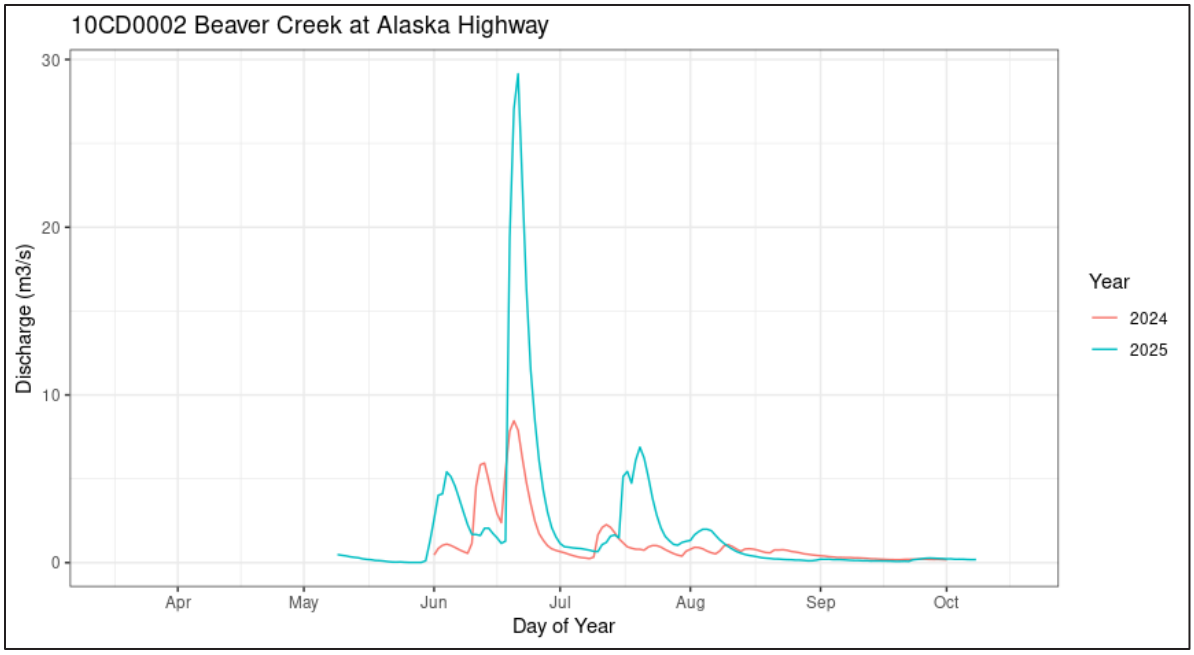


Figure 18. 2024 – 2025 seasonal discharge in Beaver Creek at Alaska Highway.

A common trend seen across all stations, especially those with a historical record, was the impacts of the ongoing drought experienced over the last several years in northeast BC. This resulted in very low flows persisting for much of the monitoring season and much more muted responses to precipitation inputs. However, observed flows in some systems appear to be indicative of the potential beginning of a return to normal climatic conditions. Observed flows in 2025 were higher than in 2024 for all sites except Osborn River and Doig River, speaking to a different catchment area dominated by muskeg in those systems, likely playing a role in limiting peak flows in response to precipitation inputs.

Streamflow in Upper Aitken Creek from early May through late October ranged from approximately 0.028 m^3/s to 17.7 m^3/s, in response to snowmelt and rain events, with the peak event occurring on June 15. Impacts of the ongoing drought across the region in previous years can be seen in comparison of peak flows, whereby the peak event in 2024 was 4.68 m^3/s compared with 19.2 m^3/s and 10.2 m^3/s in 2022 and 2023, respectively. The 2025 peak event of 17.7 m^3/s followed by subsequent peaks from precipitation inputs is indicative of a potential return to normal conditions and the team is hopeful that the 2026 monitoring season will produce similar results. An ongoing challenge with this station is measuring water flows amidst ongoing beaver activity and poor road conditions restricting site access at times. Timing of visits to this site is crucial moving forward, if heavy precipitation is expected, scheduling of visits may change to ensure site access. Currently, the impacts of beavers at this site have been noted and are addressed accordingly as needed.

Blueberry River streamflow from early April through early October ranged from approximately 0.00 m^3/s to 12.4 m^3/s, in response to snowmelt and rain events, with the peak event occurring on June 15. Impacts of the ongoing drought across the region can be seen in comparison of peak flows, whereby the peak event in 2024 was 3.76 m^3/s compared with 9.18 m^3/s and 5.53 m^3/s in 2022 and 2023, respectively. Similar to conditions observed in Aitken Creek, the 2025 peak event of 12.4 m^3/s followed by subsequent peaks from precipitation inputs is hopefully indicative of a potential return to normal conditions. Low flows over the last couple years

of monitoring have presented favourable conditions for beaver activity and water levels at this site are now controlled by a developing downstream beaver dam. Although the season was punctuated by high flow periods comparable to conditions seen in 2022, these events were not large or persistent enough to encourage the beavers to move elsewhere.

Osborn River streamflow from early May through late October ranged from approximately 0.00 m^3/s to 3.11 m^3/s, in response to snowmelt and rain events, with the peak event occurring on June 20. Similar to the 2024 season, low flows persisted for the majority of the monitoring season due to the ongoing drought. Annual comparison of peak flows shows the peak event in 2024 of 2.88 m^3/s compared with 91.0 m^3/s and 5.92 m^3/s in 2022 and 2023, respectively. The peak event in 2025 was slightly higher than in 2024, whereas subsequent 2025 seasonal peaks from precipitation were similar to that of 2024 indicating the lasting impacts of the current drought conditions in a muskeg dominated headwater. At the outset of the season, the station upgrades were completed, allowing for safer collection and better preservation of seasonal streamflow data for future monitoring seasons.

Streamflow in Doig River from late April through early September ranged from approximately 0.103 m^3/s to 7.41 m^3/s, in response to snowmelt and rain events. Peak flows occurred on May 04, with a secondary peak of lower magnitude on June 17 in response to heavy rains. Flows for the remainder of the monitoring season were punctuated by several rapid rises and falls of low magnitude in response to precipitation events. Annual comparison of peak flows shows an ongoing reduction in peak flows in this system, with the peak event in 2025 of 7.41 m^3/s compared with 10.7 m^3/s and 113 m^3/s in 2024 and 2023, respectively. Due to persisting low flows over the last several years, this site is now impacted by beaver activity upstream. Unfortunately, this caused streamflow to drop below the elevation of the sensor, limiting the ability to generate a hydrograph for September and October. With current snowpack in the Peace basin being at 158% of average as of January 01, it is hoped that a return to higher flows in this system will be observed in the 2026 monitoring season.

Streamflow in Hulcross Creek from mid April through late October ranged from approximately 0.0632 m^3/s to 2.86 m^3/s, in response to snowmelt and rain events. Peak freshet flows in response to snowmelt occurred on May 04, with the seasonal peak occurring on June 14 in response to heavy rains. Annual comparison of peak flows shows persistent impacts of the ongoing drought conditions over recent years.
Impacts of the ongoing drought across the region can be seen in comparison of peak flows, whereby the peak event in 2025 was 2.86 m^3/s compared with 6.59 m^3/s and 3.03 m^3/s in 2023 and 2024, respectively. Although the 2025 peak flow is lower than that of 2024, the secondary 2025 peak events in response to precipitation are of much greater magnitude than observed in 2024. An early season sensor failure resulted in lower quality data for this season, but a full season hydrograph was still able to be generated. The sensor was replaced and tested during the final visit on October 15 and is ready to record for the 2026 field season.

Beaver Creek streamflow from late May through to late October ranged from approximately 0.0978 m^3/s to 29.1 m^3/s, in response to snowmelt and rain events. Peak flows occurred on July 05 in response to heavy rains. Flows for the remainder of the monitoring season were punctuated by two low magnitude rises in response to precipitation events. Although there is minimal historical record at this station, it is assumed that the peak flow event on July 05 is more representative of normal conditions, while streamflow for the remainder of the season is likely well below what can be expected as average, due to the ongoing drought in the region. The team is excited to observe what 2026 conditions present following the current snow accumulation season being above average. Current snowpack in the Liard basin is reported at 196% of average as of January 01.

Participant Comments

Appendix A is the 2025 Annual Report from BRFN. Ian Ruttenberg provides some excellent recommendations and comments, pointing out the importance of the Aitken Creek and Blueberry River stations to their overall environmental monitoring program and the potential for BRFN to take over management of these stations in the future.

Conclusions

All the stations are ready for equipment re-installation pre-freshet in 2026 to capture peak flows. The increased effort to ensure the Beaver Creek station was visited at a greater frequency resulted in increased dataset quality, and this will be continued in 2026. There is also discussion for potentially upgrading this station to a more permanent installation in future years to streamline data collection.

As the long-term dataset continues to grow, its value is becoming increasingly evident. Recent years of severe drought conditions highlight the importance of this program in understanding how these small systems respond to changing conditions and equilibrate in the long-term. Additionally, we are starting to see the results of capacity building with some of the participating Nations, where they are becoming better positioned to take this monitoring on for themselves in coming years. Overall, the project is a success; the data being collected will continue to support water management decisions and the First Nation communities are excited to be part of the project.

The BCER is grateful to BC OGRIS for their ongoing commitment to funding this program and increase the dataset of small watershed streamflow information within northeast BC.