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ENVIRONMENTAL CONSULTING

2025 WATER QUALITY MONITORING PROGRAM RESULTS

Haslam Lang Community Watershed

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Client:

POWELL RIVER SALMON SOCIETY

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EARTH WATER LAND

SUMMARY

The Powell River Salmon Society (PRSS) has monitored water quality within the Haslam Lang Community Watershed since 1997. The watershed supplies drinking water to the City of Powell River and the community of Brew Bay. It provides important habitat for salmon species, and the PRSS operates a hatchery on Lang Creek. Maintaining water quality is important for providing healthy drinking water and maintaining clean salmon habitat.

PRSS retained Statlu Environmental Consulting Ltd. (Statlu) to analyze water quality data collected during the 2025 monitoring program and to compare the results with data from previous years. PRSS recorded water temperature, creek stage, turbidity, pH, and salinity twice per month at six locations within the watershed. The measurements were taken at Lang Creek near the Alex Dobler Salmon Centre, the outlet of Duck Lake, Anderson Creek, Blackwater Creek, Haslam Lake, and the weir at the outlet of Haslam Lake named Slough Station. The water quality monitoring program, which began in 1997, documents a long period within the watershed which is a valuable tool for establishing baseline conditions. This allows land managers to detect potential problems and implement solutions to maintain good water quality for fish and water users.

The watershed received 14% less precipitation in 2025 than the previous year, and 12% less than the 30-year average from 1981 to 2010. The first half of the year was drier than normal, aside from short wetter periods in March and May respectively, which resulted in relatively low stage and discharge measurements during the warmer months. The minimum biweekly Lang Creek stage measurement of 0.28 m was recorded on September 11, which is 0.01 m lower than the minimum recorded in 2024.

The average biweekly water sampling temperatures in 2025 were warmer than 2024. Duck Lake had the highest recorded temperature this year at 26.3°C, which is 1.3°C warmer than the 2024 maximum which was also recorded at Duck Lake. The maximum water temperature from continuous measurements on Lang Creek in 2025 was 0.4°C lower than the 2024 maximum.

Turbidity, pH, and salinity generally varied within the normal and acceptable range for 2025, besides four high turbidity measurements on Duck Lake and Haslam Lake. The average turbidity measurements were higher than 2024 at all stations except for Slough station, which was 10% lower.

The maximum turbidity on Duck Lake (90.3 NTU) is higher than any turbidity level recorded across all six sites over the past 28 years on record, and the other elevated turbidity levels on Duck Lake and Haslam Lake are significantly higher than the maximum values recorded within the past five years. Average pH measurements were all slightly lower (more acidic) than the measurements from 2024. Average salinity at all six stations recorded 10% to 12% higher than average salinities in 2024 and maximum values ranged from a 20% decrease at Blackwater Creek to a 21% increase at Anderson Creek in comparison to 2024 maximum readings.

While 2025 had improved drought conditions from the previous two years, it was still the third year in a row of drought, and this has implications for water quality and hydrologic activity within the watershed. Extended drought can increase the duration of low flows and the residence time of base flow, i.e., the time it takes for groundwater to discharge into surface streams. This can affect water quality by increasing the salinity of water within the watershed, which was observed in Blackwater Creek and Anderson Creek in 2025.

This water quality data suggests that forest management strategies intended to protect water quality within the watershed are generally successful, although turbidity recordings at Lang Creek and Duck Lake showed an instance of unacceptably high turbidity. Industrial truck staging near Duck Lake and oil runoff, likely associated with the truck staging, showed poor management that had short-term but significant effects on water quality. Land managers should ensure that similar events do not occur in the future.

CONTENTS

Summary i

1.0 Introduction..... 1

2.0 Background..... 1

3.0 Methodology..... 2

4.0 Observations..... 4

5.0 Results..... 4

 5.1 Precipitation and Air Temperature..... 4

 5.2 Water Temperature 6

 5.3 Stage and Hydrograph..... 9

 5.4 Turbidity..... 14

 5.5 pH 16

 5.6 Salinity..... 18

6.0 Discussion 20

7.0 Conclusion 26

8.0 Limitations 28

9.0 Closure..... 29

References..... 30

APPENDICES

Appendix 1: Figures 31

Appendix 2: Photos 32

1.0 INTRODUCTION

The Powell River Salmon Society (PRSS), with funding from the Powell River Community Forest (PRCF), British Columbia Timber Sales (BCTS), and Thichum Forest Products of the Tla'amin First Nation (Thichum), monitors streams and lakes within the Haslam Lang Community Watershed to identify how development and land use affect water quality and habitat. The watershed provides important habitat for several fish species, and PRSS operates a hatchery on Lang Creek. The watershed provides drinking water to the city of Powell River and the community of Brew Bay.

As part of the ongoing water quality monitoring program, PRSS retained Statlu Environmental Consulting Ltd. (Statlu) to analyze water quality data collected during 2025 and to compare the results with previous years of monitoring.

2.0 BACKGROUND

Land managers have prioritized sustainable development within the Haslam Lang Community Watershed for the last three decades. Water quality monitoring within the watershed began in 1997 and a watershed management plan was implemented in 1999. Both initiatives aimed to study and maintain water quality to protect the communities and natural ecosystems that depend on the watershed.

The Haslam Lake and Lang Creek Integrated Watershed Management Plan (IWMP) and subsequent watershed assessments, most recently completed in 2026, have guided sustainable development within the watershed by identifying resources at risk and effectively managing public interests. Management planning, watershed assessments, stakeholder involvement, and implementation of best management practices have provided sound scientific and practical guidance for sustainable development in the watershed.

The water quality monitoring program provides important information to the watershed management plan process. The data analysis can identify short-term changes and long-term trends in water quality that can only be identified with active monitoring. If the monitoring identifies potential problems, the data can guide management strategies to reduce risks within the watershed

and to downstream resources. Land managers can use insights from these analyses to prioritize and respond to potential problems before they cause damage to watershed resources.

The monitoring program also ensures that water license operators meet sustainability requirements throughout the year. One requirement is to maintain a minimum flow greater than 15 ft³/s (0.42 m³/s) in Slough Creek downstream of the storage dam at all times of the year, and an increased discharge of 25 ft³/s (0.71 m³/s) during October and November to meet instream flow requirements for returning salmon runs. Maintaining the minimum flow requirements and good water quality is key for sustainable development within the watershed.

Four watershed assessments have been completed; the first in 1999 (Carson, 2000), the second in 2003 (Carson, 2003), and the third in 2015 (Carson Land Resource Management, 2015). Statlu completed the fourth watershed assessment in 2020 (Statlu, 2020), and conducted another watershed assessment in the period 2024-2026 which is being completed concurrently with this water quality analysis (Statlu, 2026). Additionally, Carson (2010) assessed how PRCF operations affect water quality within the Powell River area, including areas within the PRCF but outside the community watershed.

3.0 METHODOLOGY

The water quality monitoring program includes biweekly measurements at six locations in the watershed, continuous water temperature monitoring at several locations, and continuous water temperature and discharge monitoring on Lang Creek at the Alex Dobler Salmon Centre. The biweekly measurements include stream stage, turbidity, pH, water temperature, and salinity. They are taken at Lang Creek near the Alex Dobler Salmon Centre, the outlet of Duck Lake, Blackwater Creek, Anderson Creek, Haslam Lake near the community water intake, and Haslam Lake at Slough Station (Figure 1 in Appendix 1). Continuous water temperature monitoring occurs in Duck Lake and in Lang, Anderson, and Blackwater Creeks. The data, along with general observations and photographs taken during the sampling, were sent to Statlu for analysis.

Statlu first compared monthly precipitation and temperature data recorded during 2025 to the latest average monthly data collected during the 30-year period from 1981 to 2010 (Environment Canada, 2026). The climate normal data conditions for the 1991 to 2020 interval for Powell River

were supposed to be released in early 2025, but Environment Canada still has not published them as of early March 2026. When those data are made publicly available, they will provide a more accurate baseline against which to compare recently measured conditions. The data was recorded at the Powell River A climate station, located 130 m above mean sea level at the Powell River Airport, about 7 km southwest of Haslam Lake. The 30-year average of precipitation and temperature is referenced as normal climate conditions.

Statlu then prepared two graphs for each water quality variable measured during the biweekly sampling (water temperature, stage, turbidity, pH, and salinity). The data for all six sites within the watershed are plotted on each graph. The first graph shows how one of the water quality variables changed at each of the six locations during 2025. The second graph compares the data recorded during 2025 to data recorded from 1997 to present. The long-term graph shows how water quality within the watershed has changed over the history of monitoring and allows anomalous long-term trends to be identified.

Statlu compared the six water quality variables to the continuous hydrograph data recorded on Lang Creek at the Alex Dobler Salmon Centre. We extracted the daily maximum and minimum discharge (water volume) from the continuous stream flow data and compared those values to previous years. We plotted the stream flow data against daily precipitation data collected at the Powell River A climate station. Precipitation data from the Powell River climate station replaces missing Powell River A data on April 17 and 18, May 3, September 16, November 20, and December 3, 4, 13, 14, 15, and 16, 2025. Temperature data from the Powell River climate station replaces missing Powell River A data on June 8 and September 14, 2025. Both climate stations are located within Powell River and within an elevation range of 50 m and 130 m above mean sea level (a.s.l.). The Powell River A station is located at the Powell River Airport and the Powell River station is located on the Powell River Dam, approximately 6 km away. The comparison of discharge to precipitation shows how Lang Creek responds to short-term weather events. This also provides additional information about how the weather and climate affected water quality during the biweekly sampling and what may have occurred between sampling dates.

PRSS has not collected their own precipitation data since 2021, due to their data very closely matching the Environment Canada data. The justification for duplicating precipitation data was

minimal given the similarity in values and that the Powell River data reasonably describes climactic conditions in the Lang Creek watershed. This analysis uses data collected in Powell River (Environment Canada, 2026).

Statlu compared the continuous water temperature data recorded in Duck Lake and Lang, Anderson, and Blackwater Creeks to air temperature data recorded in Powell River. Statlu compared the daily water temperature data to the biweekly water quality data recorded within the watershed.

The PRSS replaced the MX2201 Pendant model Tidbits with the MX2203 TIDBIT 400 models in 2024, and the new models worked well during the 2024 and 2025 collection years. Tidbits are small water temperature data loggers, which continuously monitor temperature data in Anderson, Blackwater, and Lang Creeks, and in Duck Lake. The turbidity meter used in 2025 had been replaced in late 2024.

4.0 OBSERVATIONS

The PRSS made field observations and took photographs within the watershed to record conditions that could influence the data. The photographs are shown in Appendix 2.

5.0 RESULTS

5.1 Precipitation and Air Temperature

We compared the total monthly precipitation and mean monthly air temperature, recorded at the Powell River A climate station during 2025, to the monthly 30-year averages (referred to as 'normal') recorded from 1981 to 2010 at the same location (Chart 1). As noted in Section 3, precipitation data from the Powell River climate station replaces missing Powell River A data on April 17 and 18, May 3, September 16, November 20, and December 3, 4, 13, 14, 15, and 16, 2025. Temperature data from the Powell River climate station replaces missing Powell River A data on June 8 and September 14, 2025.

The total precipitation recorded during 2025 was 1055 mm, which is 14% less than the 1222 mm recorded in 2024, and 12% less than the 30-year average from 1981 to 2010 of 1206 mm per year

(Environment Canada, 2026). March, May, August, September, and October had more precipitation than the 30-year average with 69%, 26%, 48%, 36%, and 34% increases relative to the long-term monthly averages, respectively. December had nearly the same amount of precipitation as the 30-year average (2% less) with 155 mm recorded. However, most of the year was drier than normal with January and February being 45% drier than the average, and April to July being 40% drier. Summer drought was widespread across the region, although not quite as intense overall as in the last few years and affected much of the coast, Vancouver Island, and the Interior Plateau. The Sunshine Coast and the Lower Mainland reached Stage 2 drought conditions, and East and West Vancouver Island reached Stage 3 drought conditions during the summer (BC Government Drought Information Portal, 2026). This compares to Level 4 drought conditions reached in 2023 and 2024. Although the 2025 drought was not as intense as in previous years, it was still the third year in a row with drought conditions, with implications for low flows and the composition of base flow from groundwater.

Southwest BC had a cool first half and warm second half of the year in 2025. Average air temperature was 0.5°C below normal in January to June, and 1.1°C above normal from July to December, with September having the greatest difference with an average temperature 2.0°C above normal. The warmest months were July and August, both with an average temperature of 18.7°C, which is 0.3°C less than the warmest average month in 2024 (19.0°C), and 1.5°C more than the 30-year average warmest month temperatures of 17.2°C.

The Powell River A climate station recorded four days with temperatures above 30°C in 2025, which is one day less than in 2024. The maximum 2025 air temperature was 30.7°C on August 12, 1.3°C cooler than the 2024 maximum of 32.0°C. During the 30-year average from 1981 to 2010, the Powell River A climate station recorded an average 1.6 days above 30°C per year. With four days above 30°C in 2025 and five days in 2024, that is a 150% to 200% increase from the 30-year average. It is likely that the average number of days above 30°C over the 1991 to 2020 climate interval will be shown to be more than 1.6 when that data is published.

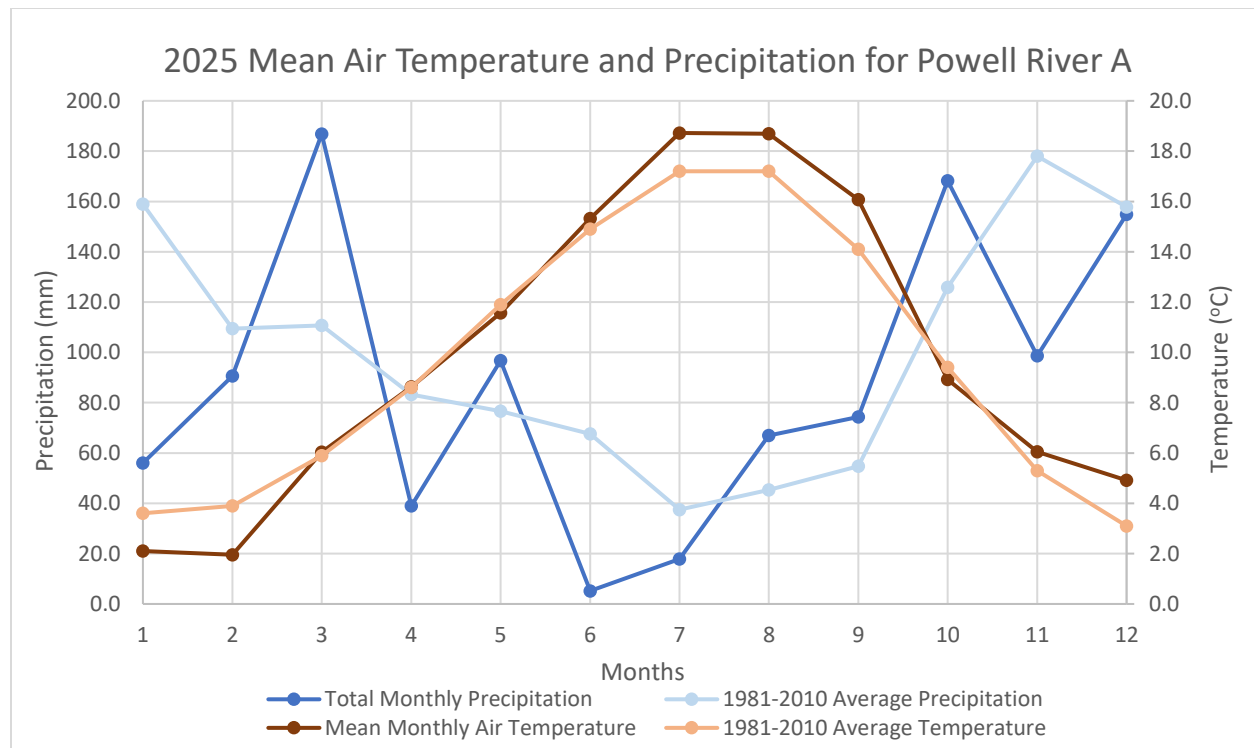


Chart 1: Mean air temperature (°C) and total monthly precipitation (mm) at the Powell River A climate station for 2025 compared to the 30-year average from 1981 to 2010. Precipitation data from the Powell River climate station replaces missing Powell River A data on April 17 and 18, May 3, September 16, November 20, and December 3, 4, 13, 14, 15, and 16, 2025. Temperature data from the Powell River climate station replaces missing Powell River A data on June 8 and September 14, 2025.

5.2 Water Temperature

Continuous water temperature monitoring in Duck Lake and at Lang, Anderson, and Blackwater Creeks show how water temperature responded to weather events (Chart 2). The continuous water temperature data is compared to air temperature data recorded at the Powell River A climate station (Environment Canada, 2026). The data show that water temperature spikes closely follow air temperature spikes. Lang Creek and Duck Lake have marginally larger temperature increases during summer than Anderson and Blackwater Creeks. In spring, Lang Creek and Duck Lake stay warmer than the minimum temperatures of the other creeks. In autumn, Duck Lake stays warmer than the minimum temperatures of the other creeks. The maximum water temperatures this year occurred on July 13, with 25.6°C in Duck Lake and 22.8°C in Lang Creek. The maximum water temperatures in Blackwater and Anderson Creeks occurred on August 12, with maximum

temperatures recorded as 15.5°C and 17.2°C, respectively. The high temperatures in Anderson and Blackwaters Creeks were recorded on the warmest day measured at the Powell River A climate station in 2025 and are likely not only related to high air temperature but also decreasing flow. The high temperatures in Lang Creek and Duck Lake were recorded on the third warmest day of the year. The maximum water temperature on Lang Creek in 2025 was 0.4°C lower than the 2024 maximum.



Chart 2: Comparison of maximum air temperature with maximum water temperatures in the watershed. Continuous water temperature data was recorded on Lang Creek at the Alex Dobler Salmon Centre. Air temperature data is from the Powell River A climate station (Environment Canada, 2026).

Biweekly sampling throughout the watershed shows how temperatures at all six sites varied during the year. Average water temperatures measured within the watershed ranged from 9.2°C to 13.7°C, which is warmer than the 2024 averages from 8.8°C to 13.3°C. The temperatures are coldest during the winter and warmest during the summer (Chart 3). The maximum water temperatures recorded were 0.7°C to 1.3°C warmer than in 2024 at Duck Lake, Anderson Creek, and Slough Station, and

0.1°C to 1.0°C cooler than in 2024 at Lang and Blackwater Creeks, and Haslam Lake. Duck Lake historically has the highest maximum water temperature within the watershed and this year had a maximum temperature of 26.3°C, 1.3°C higher than its 2024 maximum. The maximum biweekly water temperatures in 2025 remain within the normal variability recorded at the six sites from 1997 to present, though the peak temperature in Duck Lake is the second highest temperature recorded from the biweekly measurements (Chart 4).

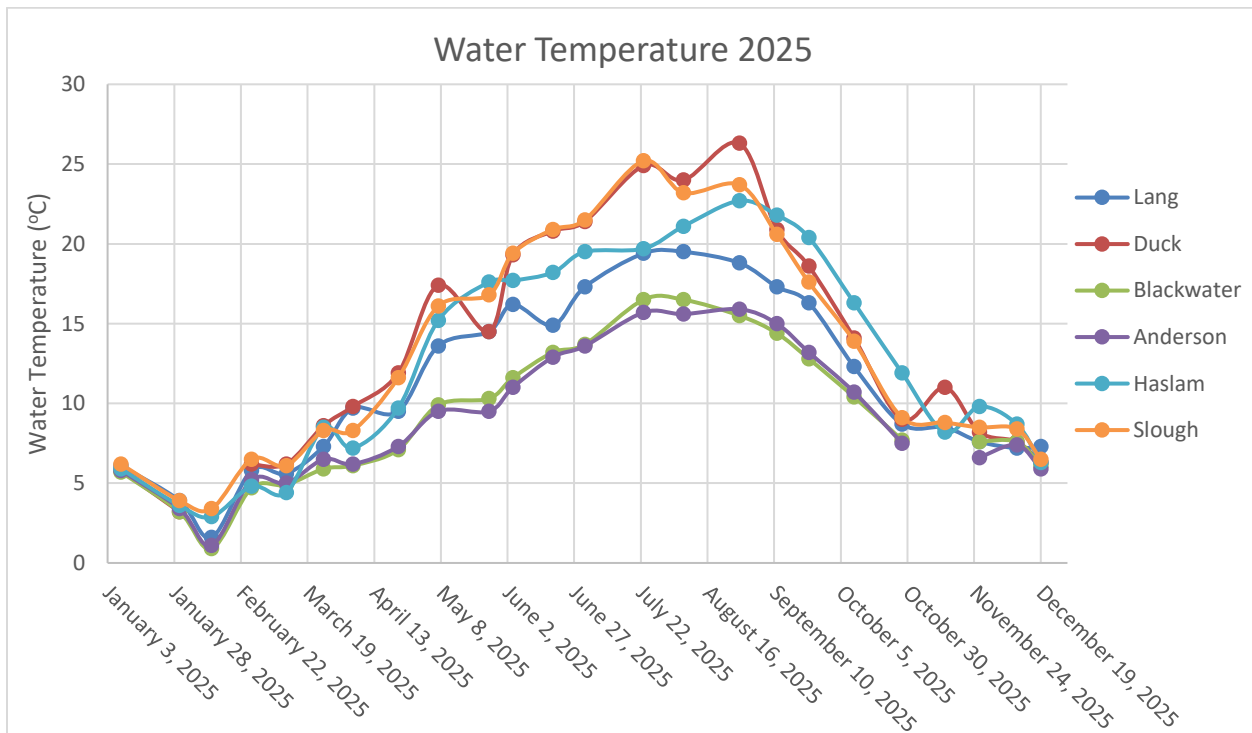


Chart 3: Water temperature measured at six sites within the Haslam Lang Community watershed.

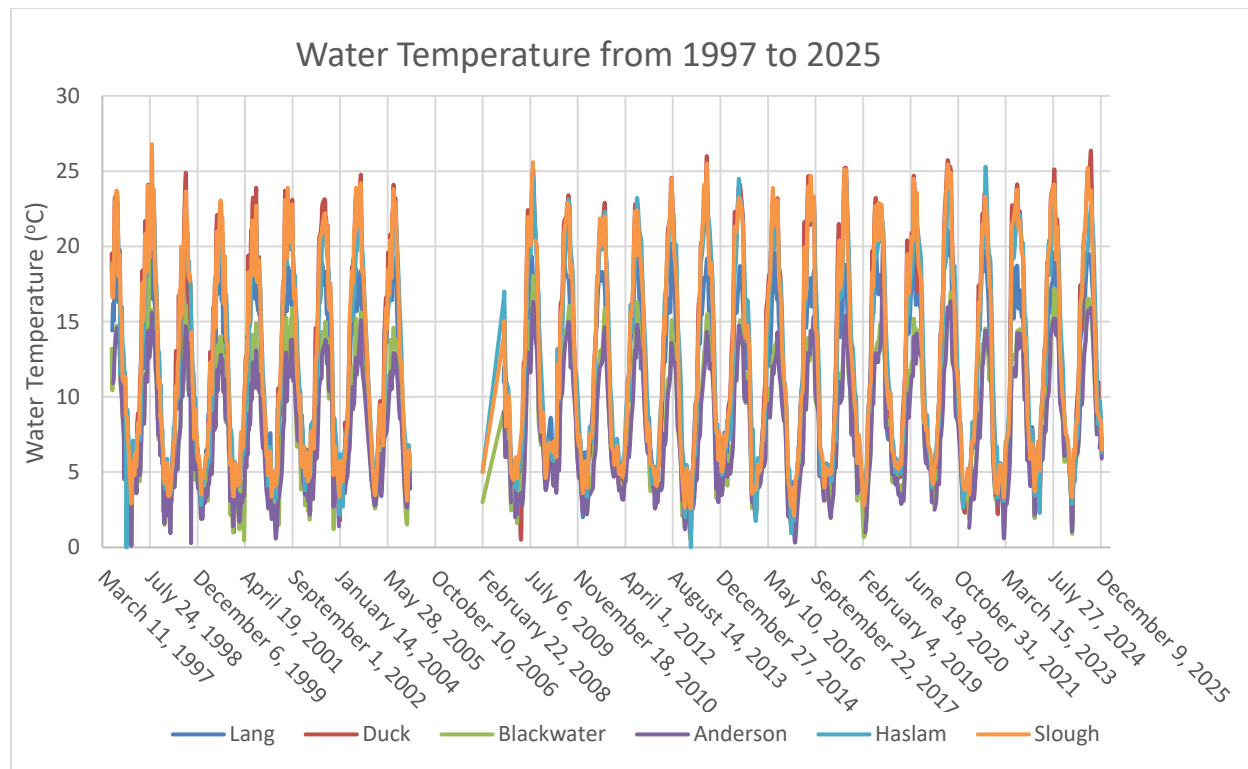


Chart 4: Water temperature at six sites within the Haslam Lang Community watershed between 1997 and present.

Chart 4 shows that 2025 had some of the warmest low water temperatures on record for the watershed. The stored heat from the summer season in these bodies of water is likely associated with the exceptionally milder winter temperatures the area has experienced through the end of 2025 to the start of 2026.

5.3 Stage and Hydrograph

Stage measurements record the height of the water surface relative to a known reference elevation (Chart 5). The stage data for Haslam Lake is plotted on a secondary axis as their stage reference points are geodetic elevations, which differ from the other four sampling locations. Slough Station had the same stage reference point as Haslam Lake Station until the end of 2024 and is now synonymous with the stations on the primary axis. Despite having two different reference points, the stage data for all six sites shows similar water level variations within the watershed during 2025.

The stage measurements at all six sites started high and dipped on the January 30 measurement, then rose again before gradually reaching minimum levels in early fall, and then rose back to meet

or exceed the water levels measured at the beginning of the year, in response to precipitation and temperature patterns (Chart 5). The overall trend of the 2025 stage measurements is similar to the 2024 measurements with higher stage during the winter, spring, and late fall, and lower stage during the summer and early fall. The Haslam stage measurements have more variability throughout the year than in previous years. The average stage measurements range from 0.05 m lower to 0.06 m higher than the 2024 measurements. The minimum stage measurements in 2025 on all creeks based on the biweekly measurements range from 0.08 m lower to 0.01 m higher than in 2024, while the continuous data from Lang Creek shows slightly lower stage values than in 2024. The minimum stage measurement on Lang Creek was 0.28 m, recorded on September 11. This stage measurement is 0.01 m lower than 2024 but slightly higher than the two years prior, which recorded 0.25 m in 2023 and 0.27 m in 2022. The stage measurements overall remained within the range of previous measurements in the watershed.

The low precipitation in January resulted in low stage measurements at all six stations by the end of the month, and the increased precipitation in March led to a peak in spring time stage measurements. The Powell River area received less precipitation in 2025 than 2024, which resulted in lower average stage measurements at all stations except for Anderson Creek, which had the same average stage measurement as 2024, and the Stage 2 measurement at the sloughs, which was 6% higher than 2024.

All measurements are similar to the normal range of values recorded since 1997 (Chart 6). The biweekly measurements recorded the stage of Lang Creek two days following the maximum discharge that occurred on March 9, which followed the second highest precipitation day of 2025, recorded on March 8 (Chart 7). The stage measured on December 19 shows a similarly high stage value to March 11, despite the continuous discharge data showing flows almost half that of the peak flows on March 9.

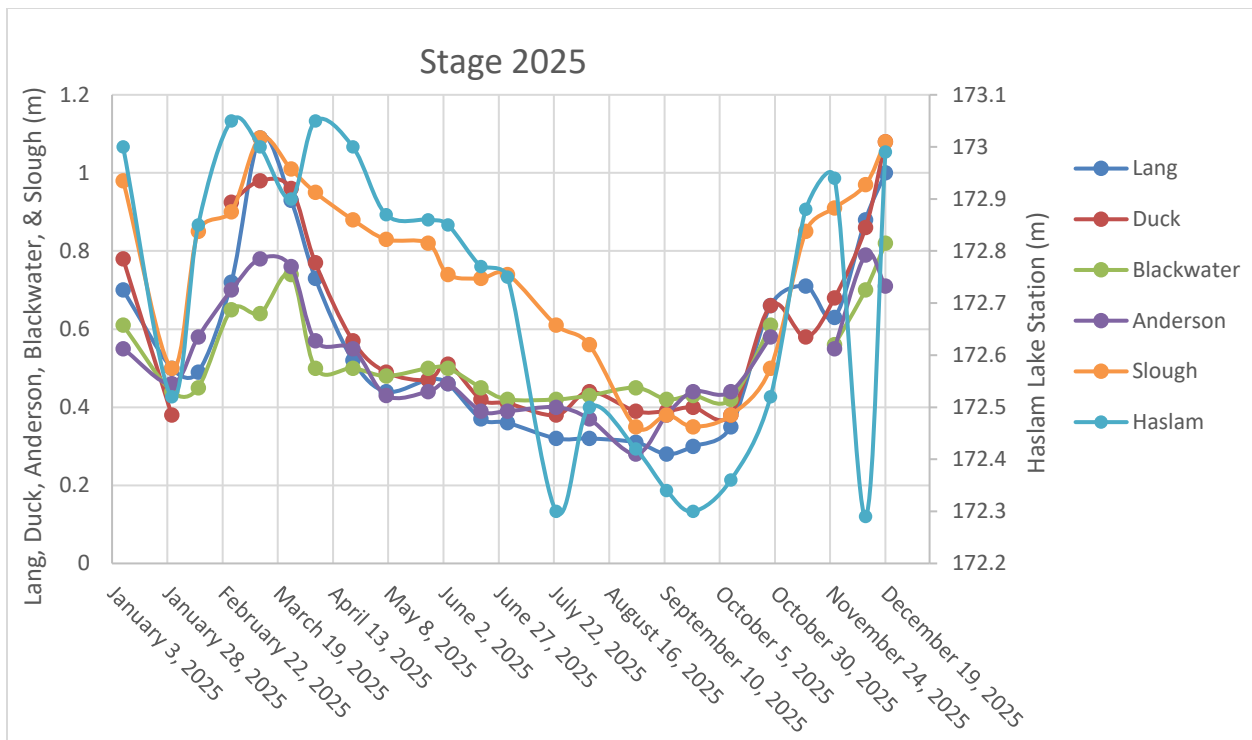


Chart 5: Stage level at six sites within the community watershed during 2025. Stage measurements for Haslam Lake are graphed on the secondary (right) axis.

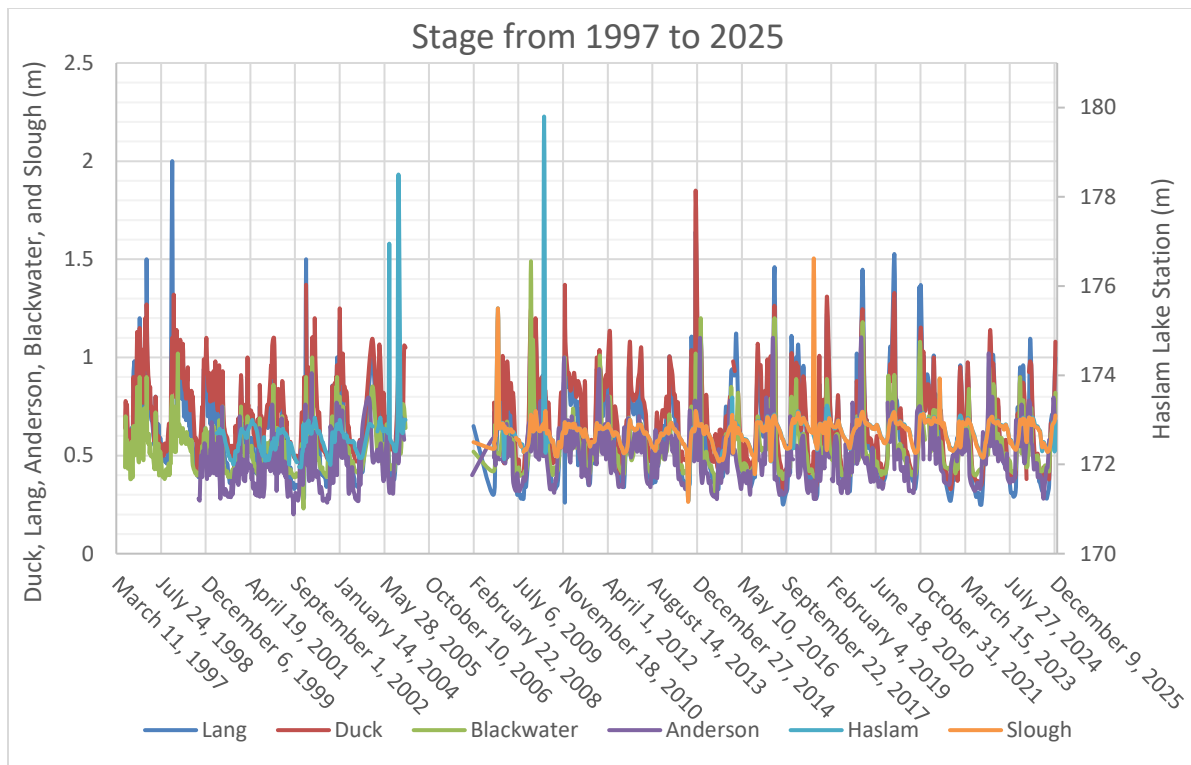


Chart 6: Stage discharge at six sites within the community watershed between 1997 and present. The stage for Haslam Lake and Slough Station is graphed on the secondary (right) axis.

Continuous data recording in Lang Creek measured discharge rates throughout 2025 (Chart 7). The maximum peak discharge in Lang Creek was recorded on March 9 at 31.9 m³/s, one day after the highest precipitation event of the year. The lowest discharge was on September 2 at 0.261 m³/s. The average discharge through 2025 was 3.78 m³/s and the median discharge was 1.91 m³/s. The 2025 maximum, minimum, average, and median discharge values are lower than those recorded in 2024 (Table 1, Chart 8). The maximum discharge is 12% lower, the minimum discharge is 26% lower, the average discharge is 19% lower, and the median discharge is 39% lower than the 2024 values. The 2025 discharge measurements lie within the range of the values recorded in the last 5 years (Table 1, Chart 8).

Haslam Lake was below the level of the outlet weir from about June 30 to about September 27, resulting in consistently low flow in Lang Creek, with the exception of three rainy days which resulted in slightly higher flows in Lang Creek. Several rainstorms beginning around day 269

(September 26) gradually raised the level of Haslam Lake, overtopped the weir, and allowed water to raise the level of Lang Creek. After this date, smaller single day rain events in October, November, and December resulted in discharge spikes because Haslam Lake’s weir was no longer suppressing downstream peak flows. The low flow period in 2024 lasted for approximately 52 days, between August 1 and September 22, due to rainstorms that occurred in June. The low flow period in 2025 was approximately 89 days long due to the lack of precipitation beginning in June.

Table 1: Yearly discharge rates of Lang Creek from 2021 to 2025.

Year	Maximum (m ³ /s)	Average (m ³ /s)	Median (m ³ /s)	Minimum (m ³ /s)
2021	70.1	7.56	4.14	0.490
2022	38.1	3.94	2.18	0.282
2023	30.6	3.71	2.63	0.219
2024	36.2	4.70	3.13	0.352
2025	31.9	3.78	1.91	0.261

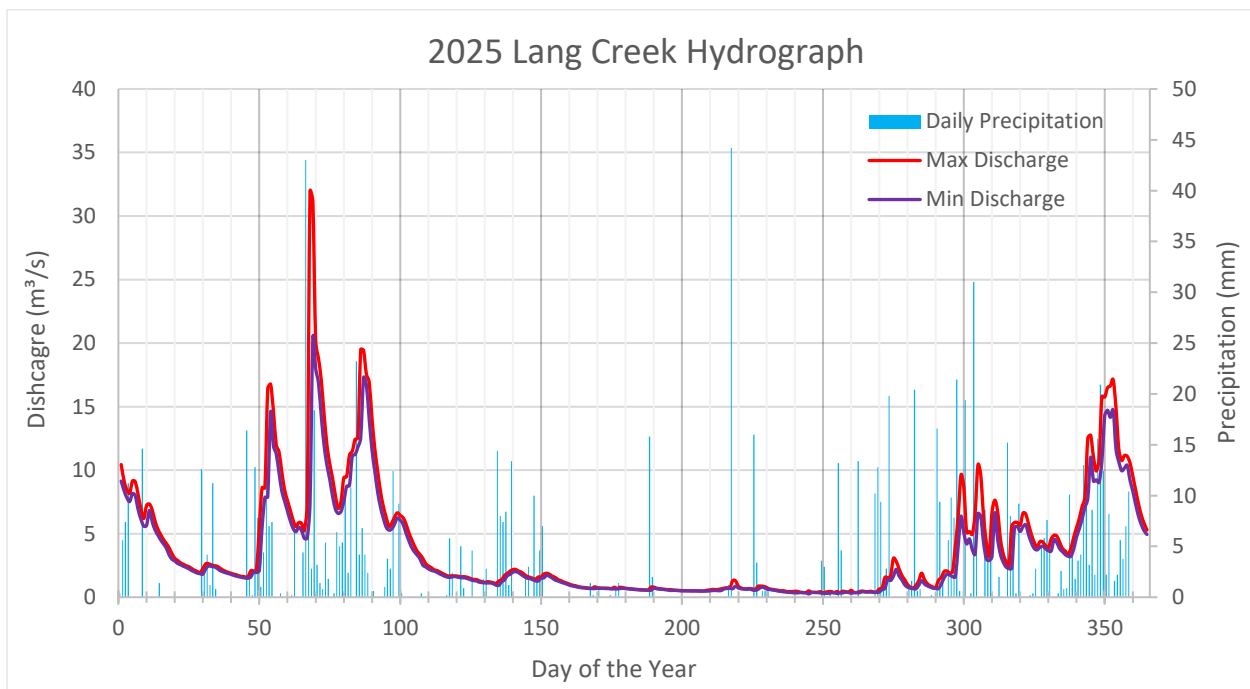


Chart 7: 2024 Hydrograph for Lang Creek. The minimum and maximum daily discharge (m³/s) for Lang Creek is plotted against the total daily precipitation (mm) recorded at the Powell River A climate station. Precipitation data from the Powell River climate station replaces missing Powell River A data on April 17 and 18, May 3, September 16, November 20, and December 3, 4, 13, 14, 15, and 16, 2025.

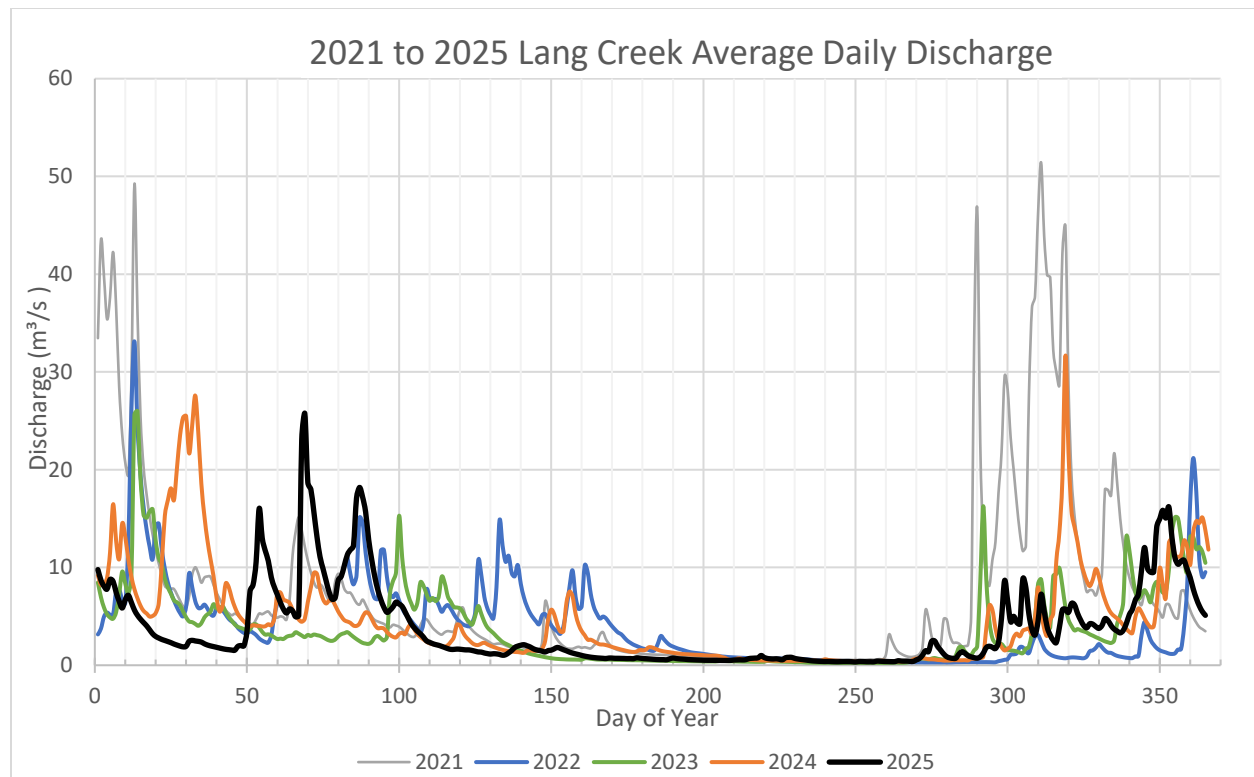


Chart 8: Average daily discharge data for Lang Creek comparing 2020 to 2024 data.

5.4 Turbidity

The bimonthly turbidity measurements in 2025 ranged from 0.10 NTU to 90.3 NTU, with average readings between 0.71 NTU and 6.32 NTU (Chart 9). The highest turbidity reading occurred on November 13 in Duck Lake, with elevated turbidity also recorded at Haslam Lake. Other elevated readings occurred on March 11 on Haslam Lake, August 7 on Duck Lake, and December 10 on Duck Lake. All other turbidity readings were below or around 3 NTU. The November Duck Lake and Haslam Lake high turbidity measurements were taken on a day that off-road industrial truck staging was observed by PRSS near Duck Lake, and oil was observed leaching into the lake along the boat ramp.

The turbidity levels in 2025 are generally higher than the levels in 2024. The maximum turbidity on Duck Lake (90.3 NTU) is higher than any turbidity level recorded across all six sites over the past 28 years on record (Chart 10). The other elevated turbidity levels on Duck Lake and Haslam Lake are significantly higher than the maximum values recorded within the past five years. The

maximum turbidity value in 2024 was 5.2 NTU, and the 2023 maximum level was 10.2 NTU, both on Lang Creek. However, in 2025, the maximum turbidity level on Lang Creek was 3.3 NTU lower (38% lower) than the previous year maximum, which is one of only two sites which had lower maximum turbidity readings in 2025 (the other site being Slough Station). The average turbidity measurement from Slough Station was 10% lower than the 2024 value, and the average turbidity measurements from the rest of the stations were 10% to 642% higher. When the three highest turbidity readings (90.3, 55.0, and 23.1) that are outside of the normal variability of the data are removed as outliers, the average turbidity measurements from the rest of the stations range from 10% to 78% higher.

Turbidity data from 1997 to present shows low average turbidity with episodic spikes through the years (Chart 10). The 2025 data shows that average turbidity levels within the watershed are normal but have a higher frequency of elevated data and the highest turbidity recorded over the time period due to the specific events described above.

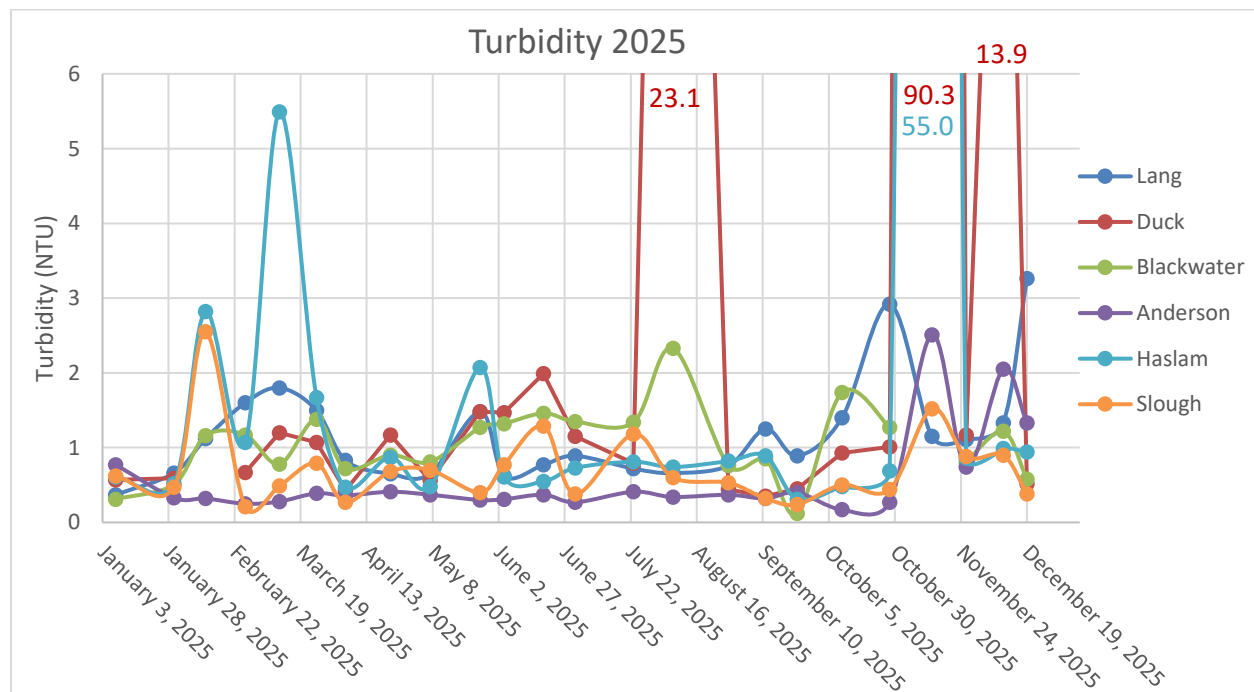


Chart 9: Turbidity measurements through 2025 at six sites within the Haslam Lang Community watershed.

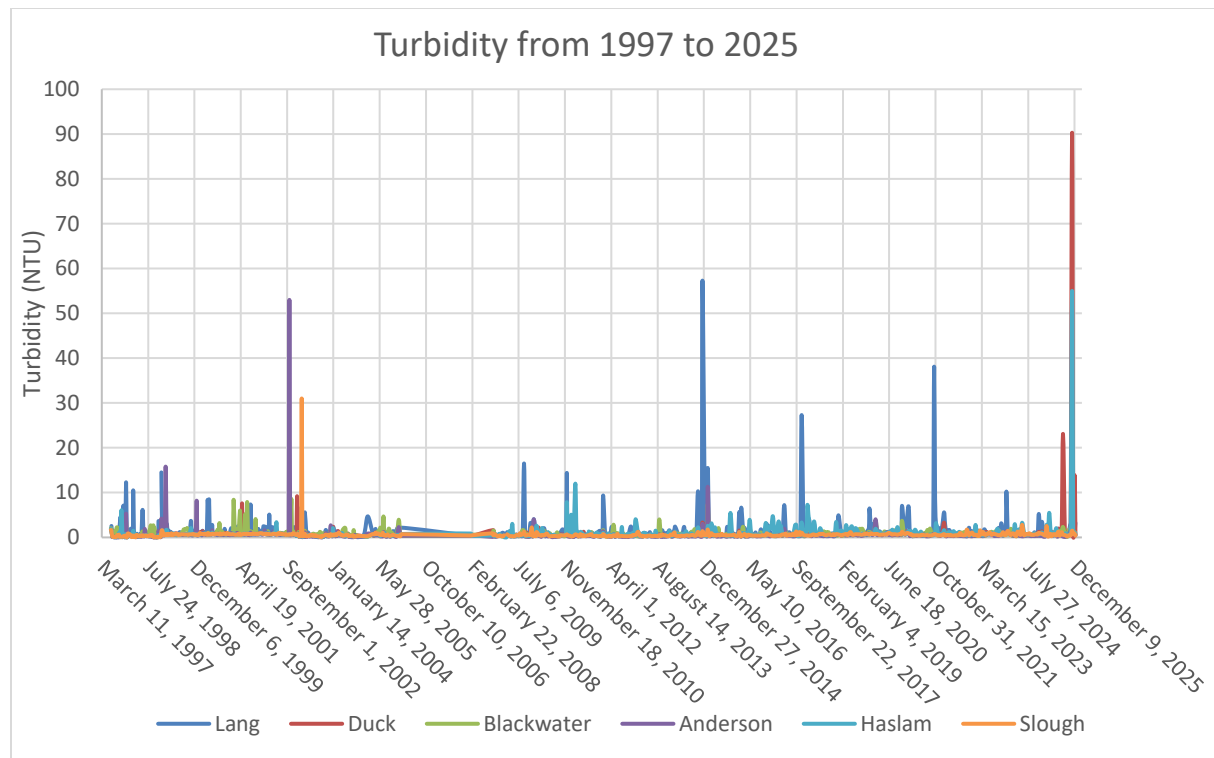


Chart 10: Turbidity at six sites within the Haslam Lang Community watershed between 1997 and present.

5.5 pH

The pH ranged between 6.3 and 7.2 within the watershed during 2025 (Chart 11). Overall, pH varies with a level trend during the year with some lower pH measurements early in the year, a slight increase into the warmer months, and then a quicker decrease in the fall into the winter. Average pH measurements at all sites were slightly lower (more acidic) than recorded in 2024. The 2025 averages were all at 6.9, slightly more acidic (less basic) than the 2024 pH averages which were all at 7.0. The maximum (basic) pH measurements of 7.2, recorded at Haslam Lake, Blackwater Creek, and Slough Station, are 0.2 (2%) less than the maximum pH recorded in 2024 which was at Haslam Lake. The minimum pH measurement of 6.3 occurred in February at Haslam Lake. This measurement is 0.4 (5%) less than the 2024 minimums which were recorded at Lang Creek, Anderson Creek, and Duck Lake.

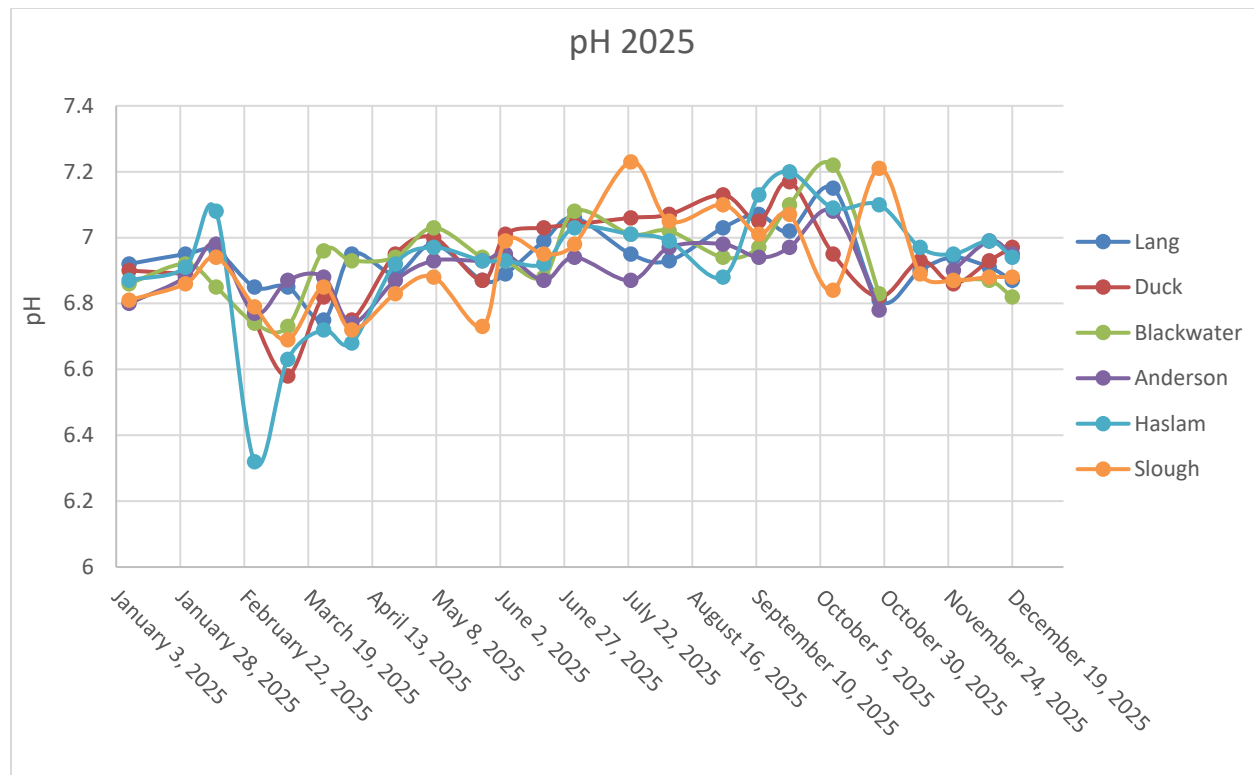


Chart 11: pH at six sites within the Haslam Lang Community watershed.

Variations in pH for the recorded history for all sites are shown in Chart 12. The pH values over the last few years show slightly more variability than between 2016 and 2021, where the pH generally varied between 6.7 and 7.3 (with the exception of one low pH spike in 2019). Despite the increased variability, pH range over the last few years remains within normal variability and is much less than pH variation recorded from 1997 to 2013.

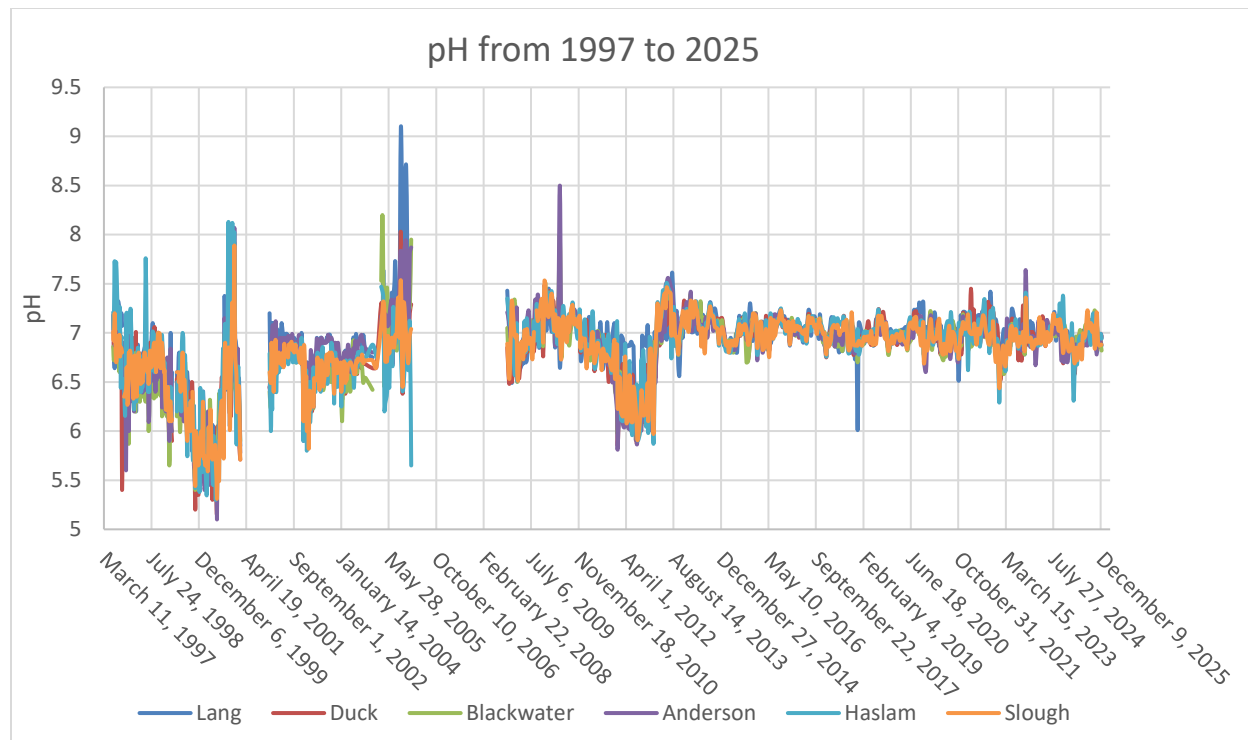


Chart 12: pH at six sites within the Haslam Lang Community watershed between 1997 and 2025.

5.6 Salinity

Salinity varied from about 5 ppm to 21 ppm at the six sites during 2025 (Chart 13). Average 2025 salinity ranged from 10 ppm to 12 ppm, which is higher than the 2024 averages which were between 9 ppm and 11 ppm. The average salinity at all six stations recorded 6% to 17% higher average salinities than in 2024.

The maximum 2025 salinity measurement occurred on September 23 on Anderson Creek at 21 ppm. Blackwater Creek had elevated salinity levels from June to September. Overall, the maximum salinity readings ranged from a 9% decrease at Blackwater Creek to a 40% increase at Anderson Creek when compared to the measurements taken in 2024.

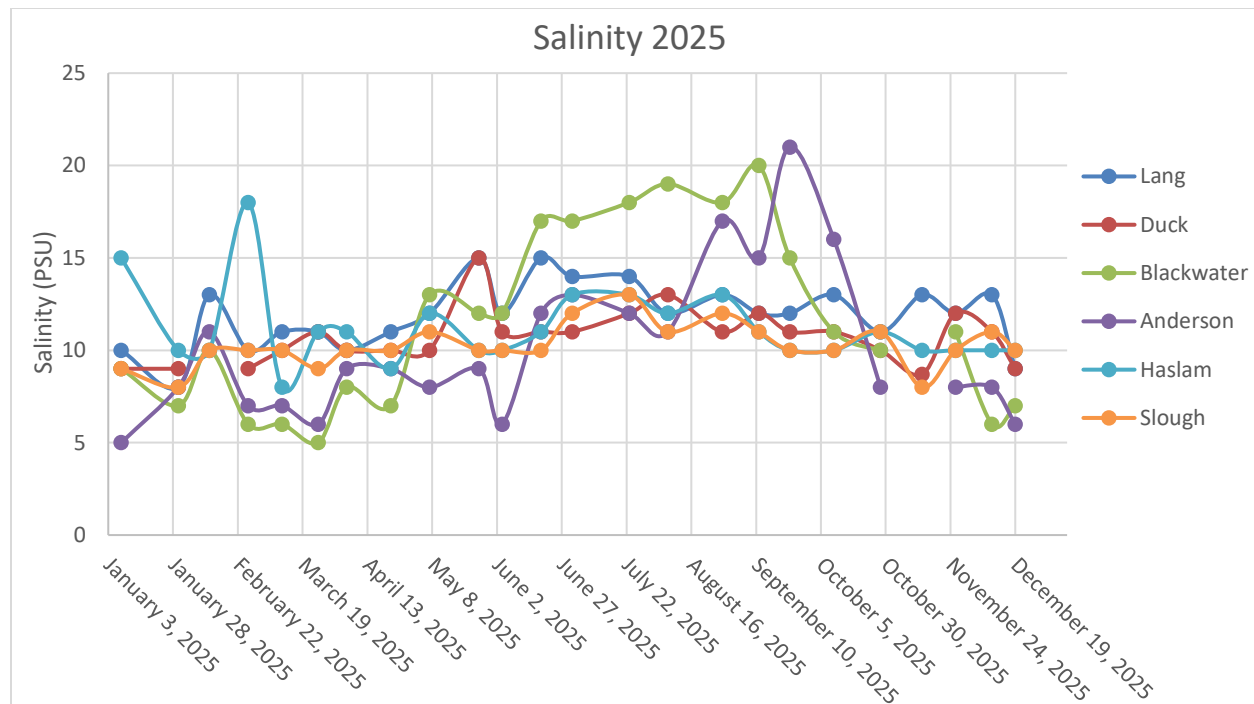


Chart 13: Salinity at six sites within the Haslam Lang Community watershed.

The salinity in Blackwater and Anderson Creeks has higher variability but generally increases gradually from winter to the end of the summer and decreases quickly from summer back to winter. Lang Creek, Haslam Lake, Duck Lake, and the Slough Station have lower salinity readings early in the year, before increasing marginally during the warmer drier months, and decreasing to the starting values by the end of the year. Haslam Lake has high variability in the salinity measurements during the first few months of the year but becomes more stable starting in the spring.

Salinity data from 2000 to present are graphed on Chart 14 with a gap at all stations between 2006 and 2008 when no monitoring occurred. Salinity data recorded from 2000 to 2006 are greater than salinity data recorded from 2008 to 2019. The abrupt decrease in salinity could result from equipment or measuring differences between the two periods. From 2009 to 2018, the salinity data for all six creeks varies from 0 ppm to 16 ppm and has average values between 4 ppm and 6 ppm. Salinity values started to increase at the end of 2018, and they continued to increase through 2019. The PRSS purchased a new salinity probe in 2020. It recorded similar, but slightly lower salinity levels in 2020 and again in the following years. Despite the elevated salinity in Blackwater and Anderson Creeks in the summer, average salinity levels are similar to previous years and remain

within normal salinity levels for the watershed. Because the watershed was in the third year of a three-year drought in 2025, a slow increase in salinity is not unexpected. Droughts that extend across multiple years cause the average age (residence time) of base flow, i.e., groundwater discharge into surface streams at low water levels, to increase. Older groundwater tends to have higher salinity than younger groundwater because it has had longer to remain in contact with and dissolve minerals in the ground, leaching salts from them.

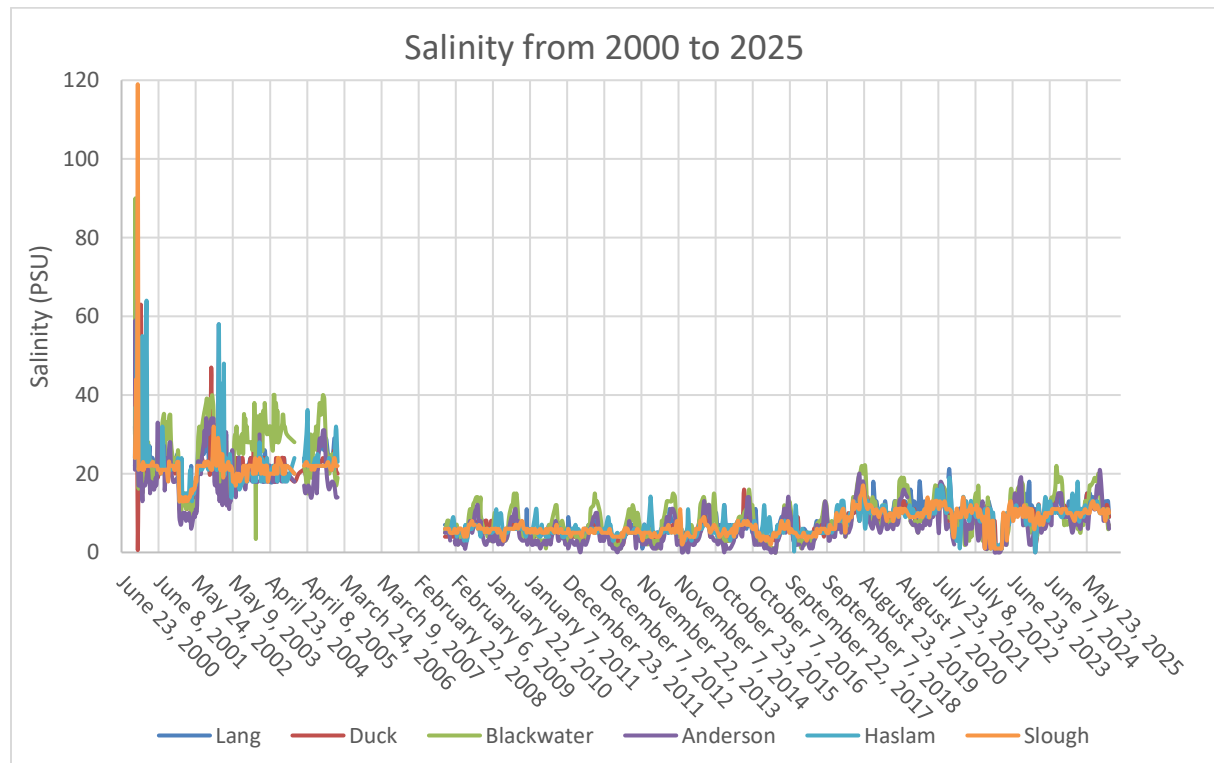


Chart 14: Salinity at six sites within the Haslam Lang Community watershed between 2000 and present.

6.0 DISCUSSION

Climate, weather, and land use affect water quality within the Haslam Lang community watershed. Precipitation controls the volume and timing of water that enters the watershed, which determines how much erosive power streams have and the proportion of stream flow composed by runoff and groundwater. Variances of these properties control the physical and chemical characteristics of the stream such as temperature, discharge, turbidity, pH, and salinity. Land use within the watershed

affects the amount of dust and sediment on road surfaces and the number of potential contaminants within the watershed. Forest harvesting can affect runoff and forest cover near streams, which influences discharge and water temperature. This section compares water quality measurements within the watershed to identify trends between variables and understand how the hydrology of the Haslam Lang Community watershed may vary over time.

Maintaining suitable water temperature is important for maintaining healthy habitat within the watershed, as increasing water temperature results in lower water oxygen levels, which can kill aquatic organisms. Water temperatures are closely related to air temperature. The 2025 monthly average air temperatures in Powell River were 0.5°C below normal from January to June, and 1.1°C above normal during the second half of the year, with September having the greatest difference with an average temperature 2.0°C above normal. The warmest 2025 Lang Creek water temperature was 0.4°C less than in 2024. Bimonthly sampling recorded warmer average water temperatures in 2025 than in 2024 at all stations. Duck Lake historically has the highest maximum water temperature within the watershed and this year had a maximum temperature of 26.3°C, 1.3°C higher than its 2024 maximum. 2025 was drier than 2024 with lower peak air temperatures in the summer, but a longer period of slightly higher-than-normal temperatures in the second half of the year. The overall warmer water temperatures are likely due to the extended period of warm air temperature beginning in June.

Continuous water temperature monitoring in Duck Lake and in Lang, Anderson, and Blackwater Creeks show how water temperature varies in the watershed. The highest water temperatures occur on Duck Lake and Lang Creek, while Anderson and Blackwater creeks are much cooler. The larger surface area of Duck Lake and Lang Creek, along with the north-south orientation of Lang Creek, likely allow more solar heating than in Anderson and Blackwater Creeks, which flow roughly east-west and are shaded by forest. Additionally, the storage time of water in Duck Lake allows more solar heating than the flowing water in Anderson and Blackwater Creeks.

The 30-year average from 1981 to 2010 recorded 1.6 days above 30°C in Powell River. The Powell River A climate station recorded four days with temperatures above 30°C in 2025, which is less than 2024, which had five days above 30°C. The most recent climate normal interval from 1991 to 2020 remains unpublished. We expect the 1991 to 2020 interval will have more annual days above

30°C than from 1981 to 2010. Despite the increased number of warmer than normal days, water temperatures within the watershed remain within normal values recorded since 1997. The suitable water temperatures may be helped by effective land management strategies related to riparian retention that help maintain water temperature during the heat waves.

Precipitation and temperature control runoff, groundwater, evaporation, and the intensity of floods and droughts. March, May, and August through October had higher precipitation than the 30-year average with increases from 26% to 69%. The rest of the year was drier than normal with January and February being 45% drier than the average, and April to July being 40% drier. In 2024, Sunshine Coast and the Lower Mainland reached Stage 3 drought conditions and East Vancouver Island had Stage 4 drought and Stage 5 drought conditions during the summer (BC Government Drought Information Portal, 2025). This year, Sunshine Coast and Lower Mainland only reached Stage 2 drought levels and East Vancouver Island had Stage 3 at the maximum (BC Government Drought Information Portal, 2026). Stage measurements were low at all sites throughout the summer months of 2025 and increased towards the end of the year with the increased precipitation that fell in the fall. In 2025, Lang Creek had 119 days of flow below a reference discharge of 1 m³/s, which is the second longest low flow period on record. The longest low flow period occurred in 2023, with 137 days below the reference discharge. 2022 had 117 days of low flow, which was previously the second longest period on record. Due to the slightly higher than average precipitation that fell in May and September of 2024, there were only 91 days of low flow on Lang Creek. 2021, 2020, and 2019 each had 73 days, 46 days, and 86 days below 1 m³/s, respectively.

Peak flow in Lang Creek in 2025 occurred in March, following the second rainiest day of the year. The day with the heaviest precipitation recorded at the climate station occurred in August and appears to have been localized convective precipitation from a thunderstorm but did not cause peak discharges as large as in March, indicating that the convective cell did not likely cause precipitation over the whole watershed at that intensity. With decreased groundwater levels in the summer, as indicated by lower stage measurements in the creeks, the infiltration capacity of the land increased and reduced runoff and floods caused by similar rainstorms in the summer. Additionally, in July and August, the water level in Haslam Lake was lower than the weir, and the

heavy rainfall in August refilled the reservoir before overtopping the weir and temporarily increasing streamflow down Lang Creek.

Following May, precipitation was 78% less than normal from June to July, and 41% wetter from August to September. This period was also 1.4°C (9%) warmer than normal, resulting in higher evaporation along with slightly less precipitation. This resulted in a minimum discharge in Lang Creek of 0.261 m³/s on September 2, which is 26% lower than the 2024 minimum and is within the range of minimum discharges recorded over the last five years. The average discharge in 2025 was 19% (0.9 m³/s) lower than the 2024 average and 24% lower than the average over the past 5 years. The average temperature and total precipitation in 2025 were 2% (0.2°C) higher and 4% (46 mm) lower than the average over the same period. Compared to the previous year, 2025 had lower discharge and precipitation with slightly higher average temperatures.

Hydrological drought conditions throughout 2025 had improved from the previous two years, but was still the third year in a row with drought conditions. The Powell River area was not identified as having extreme precipitation and streamflow deficits by the end of 2025, and in general, the British Columbia coast received enough precipitation in late summer and early fall to recharge most systems (BC Government Drought Information Portal, 2026). However, these prolonged multi-year drought conditions can decrease baseflow and increase the duration of low flows, which can further worsen future drought conditions.

Similar to discharge, the average stage measurements at all sites within the watershed except for Slough Station were lower in 2025 than in 2024. The minimum stage and discharge recorded in Lang Creek occurred around the same time in 2024 and 2025. Lang Creek had high stages recorded in March and December of 2025, though the continuous discharge data during the December high stage was almost half of the peak flows in March. Several intense rainstorms brought large amounts of precipitation to southwestern British Columbia and northwestern Washington, that may have contributed to increased stage on December 19. While precipitation was slightly elevated around Lang Creek, it was not as intense around Powell River as it was in areas like Fraser Valley. Additionally, the stage of Haslam Lake decreases drastically in early December and then increases to late November levels by the end of December. Late November was unusually dry, and early

December had normal precipitation amounts. The stage of Haslam Lake may reflect the lake's response to these changes in precipitation, with a couple weeks delay.

The minimum flow downstream of the dam that is required by the monitoring program was not met during the end of August and in September in 2025. This year, 34 days recorded minimum discharge values under $0.42 \text{ m}^3/\text{s}$, 26 of these days were in September. In 2024, 24 days, 23 in September, did not meet the minimum discharge value of $0.42 \text{ m}^3/\text{s}$. In October 2025, 4 days recorded minimum discharge values under $0.71 \text{ m}^3/\text{s}$, which is 14 days less than 2024. In 2023, 78 days had minimum discharges under $0.42 \text{ m}^3/\text{s}$ and the first 10 days in October had discharges under $0.71 \text{ m}^3/\text{s}$. The last time the minimum flow requirements were met was in 2021. The minimum stage measurements at Haslam Lake and Slough Station were slightly higher this year than in 2021 which might suggest that more water could have been released from Haslam Lake to help maintain minimum flow in Lang Creek this year.

Although low flows in Lang Creek were lower than the required minimum flow requirements, PRSS has not requested additional flow during the warmer months as they are concerned that the additional water from the warm lakes would warm all of Lang Creek and create an unfavourable environment for returning salmon and juvenile salmon in the system. Allowing discharges in Lang Creek to be lower than the required low flow through the weir during high temperature events results in Blackwater and Anderson Creeks contributing higher relative inputs of cooler water to lower Lang Creek. This keeps Lang Creek downstream of these two tributaries more hospitable during the spawning period and encourages salmonids in the system to preferentially move into these colder water tributaries to offset warm temperatures in the main creek. The Lang Creek discharge data shows little variability between about June 30 and September 27 suggesting that water levels in Haslam Lake fell below the elevation of the weir that controls water flow into Lang Creek. Water levels likely overtopped the weir after several rainstorms in late September to October, and all subsequent spikes represent the full drainage area of the watershed.

The turbidity levels in 2025 were generally higher than the levels in 2024, with only the Slough Station presenting a lower average turbidity. PRSS used a new turbidity meter for 2025 which is recording turbidity levels that are within the expected range produced by the previous meter. The turbidity spikes in most creeks are associated with elevated stage and discharge readings. The

highest turbidity readings occurred on Lang Creek and Duck Lake in mid-November. Off-road industrial truck staging near Duck Lake was observed by PRSS on the same day, and oil was observed leaching into Duck Lake along the boat ramp (Photo 1 in Appendix 2). This is likely what caused the turbidity spike at the two stations. August 7 records another higher-than-normal turbidity reading, which was measured the day following the heaviest precipitation day of the year, which appears to have been a localized convective downpour that may have resulted in infiltration-excess overland flow into the lakes. Other high turbidity readings in March and December also align with high precipitation and discharge events.

A bank armoring project along Blackwater Creek, which included widening and shifting the alignment of the road, temporarily restricted access to the water samplers in Blackwater Creek in the fall. The road work also led to sediment-laden runoff from the road material entering the creek (Photos 2 to 4 in Appendix 2). The runoff did not lead to any lasting changes in measured water quality at the Blackwater Creek site, and PRSS informed Statlu that the runoff does not appear to pose immediate or critical risk to fish due to dilution in the mainstem channel.

Salinity and pH levels are related to the ratio of groundwater to surface runoff comprising stream flow. Groundwater contains dissolved solids that increase pH and salinity while rainstorms can capture air pollution that decreases pH and dilutes salinity. Past salinity and pH measurements are generally greater during the dry season when groundwater comprises a greater portion of stream flow, and lower during the wet season when precipitation runoff is greater. The 2025 salinity and pH measurements are low at the beginning of the year and begin to increase in March to April. At the end of the year, precipitation and streamflow increase resulting in decreasing pH and salinity. Most of the high salinity and pH measurements occurred from May to October, when groundwater predominantly contributed to streamflow. Overall, both pH and salinity varied throughout the year but are within the normal variability recorded from 1997 to present. The data suggests that management practices within watershed have been effective at maintaining water quality.

The 2019 and 2020 water quality reports by Statlu identified that salinity increased from 2018 to 2019 and remained elevated from 2019 to 2020. PRSS purchased a new salinity probe for the 2021 monitoring program to ensure that the increased salinity measurements were not caused by equipment error. The measured salinity in 2021 was about 10% lower than in 2020 but remained

greater than values recorded in early 2018. The salinity measurements in 2025 are similar to the previous four years which have used the new salinity probe. If the increased salinity resulted from equipment error, the salinity would have abruptly returned to early 2018 levels after the probe was replaced. The gradual increase and then decrease of salinity since 2018 indicates the trend is real and not a result of equipment error. A slow increase in salinity is also not surprising given that 2025 was the third year of drought in a row.

The 2025 data shows that water quality remains within acceptable levels within the watershed. The relatively low levels of salinity and turbidity, aside from the extreme peaks caused by anthropogenic activities, along with generally stable pH values, suggest that watershed management practices have been effective in limiting sediment production and reducing the volume of water that transports sediment and contaminants from roads and ditches directly into streams. The highest turbidity spike in the watershed is known to be caused by anthropogenic activities (truck staging) and was associated with oil seepage, which likely had unmeasured adverse effects on water quality (unmeasured because hydrocarbons are not tested for). This truck staging represents the most significant documented adverse effect on water quality in several decades. Although it was short-lived, it represents a failure of the goal in managing the watershed to protect water quality, Land managers should incorporate the lesson of this water quality measurement and ensure that truck operators do not stage next to the lakes or other sensitive water bodies in future.

The PRSS has previously noted that the sloughs are popular recreation areas and garbage can be left near the water. Water sampling for general chemistry parameters such as fecal coliform, total metals, and CaCO_3 equivalent were last completed in 2010 (Carson, 2018). Additional data collection of these parameters could quantify how human activity affects water quality and would be useful to maintain a robust baseline monitoring program.

7.0 CONCLUSION

The Powell River Salmon Society (PRSS) has monitored water quality within the Haslam Lang Community Watershed since 1997. The watershed supplies drinking water to the City of Powell River and the community of Brew Bay. It provides important habitat for salmon species, and the

PRSS operates a hatchery on Lang Creek. Maintaining water quality is important for providing healthy drinking water and maintaining clean salmon habitat.

PRSS retained Statlu Environmental Consulting Ltd. (Statlu) to analyze water quality data collected during the 2025 monitoring program and to compare the results with data from previous years. PRSS recorded water temperature, creek stage, turbidity, pH, and salinity twice per month at six locations within the watershed. The measurements were taken at Lang Creek near the Alex Dobler Salmon Centre, the outlet of Duck Lake, Anderson Creek, Blackwater Creek, Haslam Lake, and the weir at the outlet of Haslam Lake named Slough Station. The water quality monitoring program, which began in 1997, documents a long period within the watershed which is a valuable tool for establishing baseline conditions. This allows land managers to detect potential problems and implement solutions to maintain good water quality for fish and water users.

The watershed received 14% less precipitation in 2025 than the previous year, and 12% less than the 30-year average from 1981 to 2010. The first half of the year was drier than normal, aside from short wetter periods in March and May respectively, which resulted in relatively low stage and discharge measurements during the warmer months. The minimum biweekly Lang Creek stage measurement of 0.28 m was recorded on September 11, which is 0.01 m lower than the minimum recorded in 2024.

The average biweekly water sampling temperatures in 2025 were warmer than 2024. Duck Lake had the highest recorded temperature this year at 26.3°C, which is 1.3°C warmer than the 2024 maximum which was also recorded at Duck Lake. The maximum water temperature from continuous measurements on Lang Creek in 2025 was 0.4°C lower than the 2024 maximum.

Turbidity, pH, and salinity generally varied within the normal and acceptable range for 2025, besides four high turbidity measurements on Duck Lake and Haslam Lake. The average turbidity measurements were higher than 2024 at all stations except for Slough station, which was 10% lower. The maximum turbidity on Duck Lake (90.3 NTU) is higher than any turbidity level recorded across all six sites over the past 28 years on record, and the other elevated turbidity levels on Duck Lake and Haslam Lake are significantly higher than the maximum values recorded within the past five years. Average pH measurements were all slightly lower (more acidic) than the measurements

from 2024. Average salinity at all six stations recorded 10% to 12% higher than average salinities in 2024 and maximum values ranged from a 20% decrease at Blackwater Creek to a 21% increase at Anderson Creek in comparison to 2024 maximum readings.

While 2025 had improved drought conditions from the previous two years, it was still the third year in a row of drought, and this has implications for water quality and hydrologic activity within the watershed. Extended drought can increase the duration of low flows and the residence time of base flow, i.e., the time it takes for groundwater to discharge into surface streams. This can affect water quality by increasing the salinity of water within the watershed, which was observed in Blackwater Creek and Anderson Creek in 2025.

This water quality data suggests that forest management strategies intended to protect water quality within the watershed are generally successful, although turbidity recordings at Lang Creek and Duck Lake showed an instance of unacceptably high turbidity. Industrial truck staging near Duck Lake and oil runoff, likely associated with the truck staging, showed poor management that had short-term but significant effects on water quality. Land managers should ensure that similar events do not occur in the future.

8.0 LIMITATIONS

The recommendations provided in this report are based on observations made by Statlu and are supported by information Statlu gathered. Observations are inherently imprecise. Conditions other than those indicated above may exist on the site. If such conditions are observed or if additional information becomes available, Statlu should be contacted so that this report may be reviewed and amended accordingly.

This report was prepared considering circumstances applying specifically to Powell River Salmon Society and the forestry organizations which provide funding for the water quality sampling. It is intended only for internal use by the client for the purposes for which it was commissioned and for use by government agencies regulating the specific activities to which it pertains. It is not reasonable for other parties to rely on the observations or conclusions contained herein.

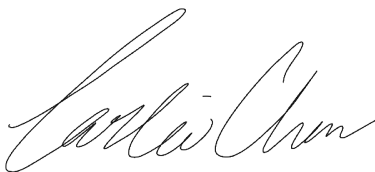
Statlu prepared the report in a manner consistent with current provincial standards and on par or better than the level of care normally exercised by Professional Geoscientists and Professional Agrologists currently practicing in the area under similar conditions and budgetary constraints. Statlu offers no other warranties, either expressed or implied.

9.0 CLOSURE

Please contact me should you have any questions or if you require further clarification.

Yours truly,

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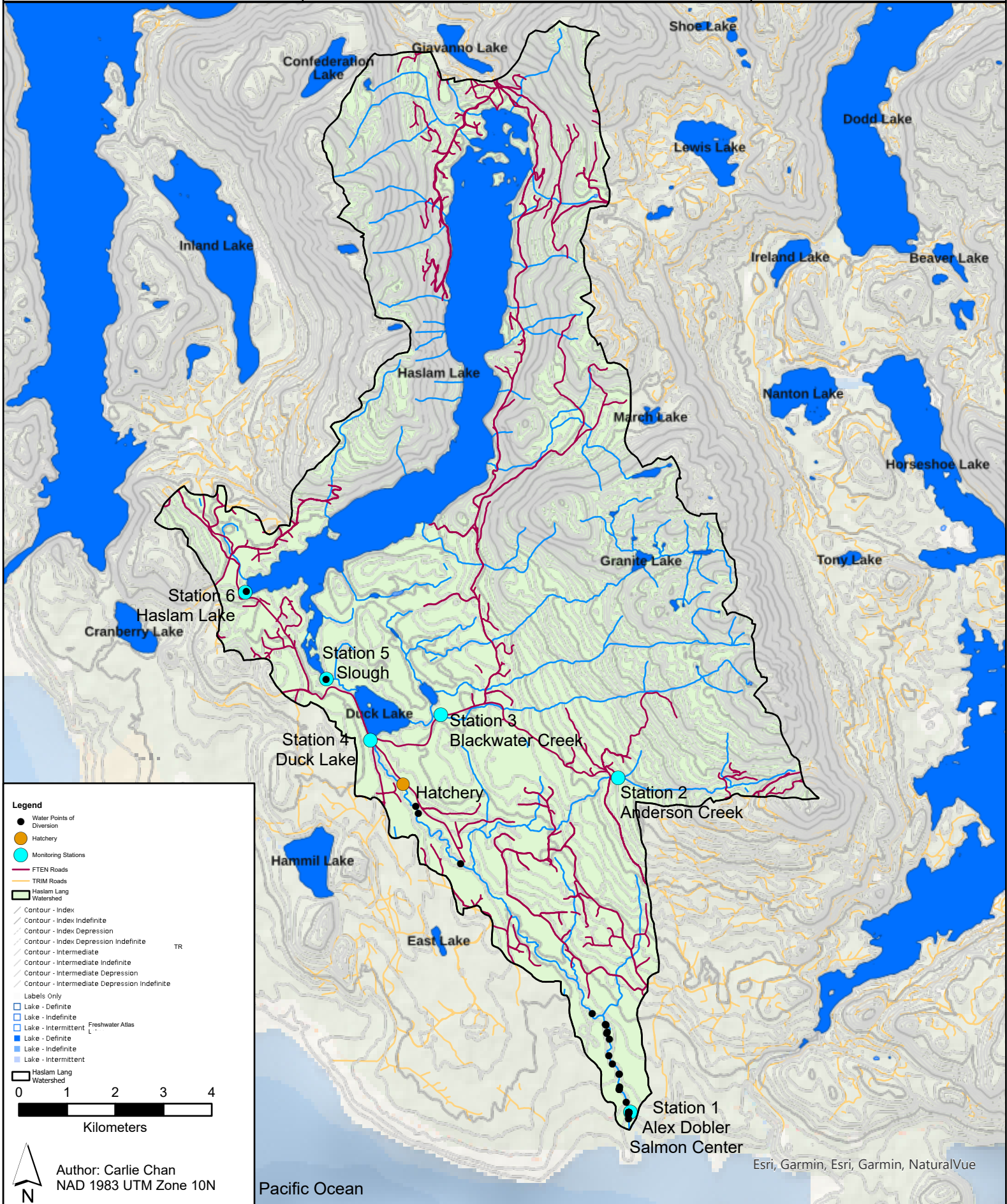
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CH/JMS/DB/js

Permit to Practice No: 1000170

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Legend

- Water Points of Diversion
- Hatchery
- Monitoring Stations
- FTEN Roads
- TRIM Roads
- ▭ Haslam Lang Watershed
- Contour - Index
- Contour - Index Indefinite
- Contour - Index Depression
- Contour - Index Depression Indefinite
- Contour - Intermediate
- Contour - Intermediate Indefinite
- Contour - Intermediate Depression
- Contour - Intermediate Depression Indefinite
- Labels Only
- ▭ Lake - Definite
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- ▭ Haslam Lang Watershed

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Kilometers

Author: Carlie Chan
NAD 1983 UTM Zone 10N

APPENDIX 2: PHOTOS



Photo 1: Oil runoff down the Duck Lake boat launch.



Photo 2: Blackwater Creek bank armouring and road shifting work.



Photo 3: Visible sedimentation entering Blackwater Creek from road runoff during construction.



Photo 4: Sedimentation in the Blackwater Creek system resulting from the bank armouring and road work.