Summary of Columbia Lake Stewardship Society's 2022-23 Water Quantity Monitoring Program

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January 2024

Executive Summary

2023 was the ninth year of operation for the CLSS Water Quantity Monitoring Program.

The spring of 2023 was abnormally warm and the warm weather led to an early start of the melt of the high mountain snowpack. That triggered an early rise in Dutch Creek and ultimately an unusually early rise in the level of Columbia Lake. The lake level peaked May 30, 2-4 weeks earlier than usual, and at a level 0.9 metres above its early April low, a near normal rise. Significant amounts of rain fell during May and June and served to slow the decline in lake level. By fall levels were only slightly below average despite the hot, windy conditions that prevailed during the summer months.

A concerning feature of the 2022-23 water year was near record low flows observed during March and again during late summer at the WSC station on the Columbia River at the Fairmont Highway Bridge. Water Survey of Canada operated a hydrometric station at the same location from 1948 to 1996.The 2022-23 flows fell to near or below the extreme lowest values recorded by Water Survey of Canada over that 48-year period. Southeastern BC has been in a state of drought since at least 2022 with the result that forest fires have been widespread and low ground water levels have been reported. The low flows found here are a further indication of a drought condition. The water passing the WSC station originates from two distinct drainage areas, the local Columbia Lake watershed, and the Dutch Creek watershed. The area of Dutch Creek watershed is the larger of the two and makes up about 80 percent of the combined drainage area.

Two stations, Canal Flats and Lansdowne, were discontinued in April. Both have been in operation for a few years and the flows have been shown to be consistent and predictable to the point that continued operation is likely to add little new information to the archives. The Columere Lake level station was upgraded in April with the installation of equipment integrating both water level and atmospheric pressure sensors in one unit. This station now collects real-time data, allowing the data to be accessed by remote means and will create a saving in maintenance visits and travel costs.

1. Introduction

The Columbia Lake Stewardship Society (CLSS) started water quantity monitoring activities in the Columbia Lake Watershed in 2014. This is the ninth in a series of annual reports and summarizes activities conducted during the 2022-23 water year, extending from November 1, 2022, to October 31, 2023.

The CLSS mission is "to preserve the ecological health and water supply of Columbia Lake for present and future generations …". Preserving the water supply is a significant task. It requires an understanding of how water enters and leaves the lake. Long-term records reveal that the lake rises an average of about 0.9 metres each year. That rise is important. It maintains the water quality at a healthy level, provides drinking water for residents, irrigates crops, and supports the local tourism industry. It also provides a habitat that sustains wildlife and aquatic species. The demands for water to meet such a variety of needs are growing and are in conflict.

Most of the rise is attributable to overflow from Dutch Creek as the snowpack melts and runs off each spring, but it is not the only factor affecting lake level. Water is also gained from surface runoff, precipitation, and groundwater. These gains are offset by losses to evapotranspiration, consumptive use, and outflow. The monitoring program is aimed at determining how these gains and losses influence the water supply and to help define a management strategy to accommodate the needs of those placing demands on the local water supply.

2. The Watershed

For the convenience of measurement, the outflow point of the Columbia Lake Watershed is often regarded as a point on the Columbia River at the Highway 93/95 crossing near Fairmont Hot Springs. This is a bit of an oversimplification. The area of the drainage area above that point is 881 square kilometres. The bulk, 696 square kilometres, is contained in the Dutch Creek sub-basin.

A delta has formed near the mouth of Dutch Creek. The flow of Dutch Creek over its delta is braided and subject to change. In the present channel configuration, when flow rates are low and unimpeded, the main channel flows directly across the delta to enter the Columbia River, a few tens of metres below the lake outlet. When Dutch Creek is high, the main channel overflows its banks and water spills into Columbia Lake. During this period, the flow in the outlet channel is reversed so that a substantial portion of the overflow enters the lake by this means. The main channel is continually shifting, and at times in the past flowed directly into the lake before reaching the river (see Jamieson, 2011).

Thus, for most of the year the actual outlet from the lake is not at the Highway crossing but just over three kilometres upstream. For a few days or even weeks in some years, the volume of inflow may be so great that the lake rises above its banks submerging the normal outlet and spreads northward over a portion of the delta. The point of outflow is unknown in those instances and may vary depending on the elevation achieved.

A series of small creeks enter the Columbia River downstream of the Dutch Creek junction and constitute about nine square kilometres of the entire 881 square kilometre area. The area above the usual lake outlet is 176 square kilometres. The boundaries of the watershed are shown in the inset of Figure 1.

The overall watershed contains one active glacier. There are no significant control structures though minor structures impound or divert water on some inflowing creeks on the west side of the lake.

Figure 1 – Map showing station locations. Entire watershed boundary is shown in inset. Site abbreviations are provided in Section 4.1.

3. Antecedent and Concurrent Conditions

There are no weather stations within the entire watershed having a continuous long-term climatological record. The closest station is Cranbrook Weather Station (Cranbrook A) located at the Cranbrook - Kimberley Airport, some 60 km south of Canal Flats.

The mean monthly temperatures at that location for the 2022-23 water year are shown in Figure 2. The corresponding long-term normal values based on records accumulated over the 30-year period 1980-

2010 are superimposed for comparison. Two departures from normal stand out – a cold fall and a warm spring and summer. Of these, the warm spring had significant impacts on the melting of the snowpack and the timing of the annual rise of Columbia Lake as will be shown.

There are no snow monitoring stations located in the watershed but there are a few just outside the boundaries (see Appendix B) that are deemed sufficiently close to represent the amount of water held in the local mountain snowpack. One of these is the Little Dragon avalanche monitoring station (elevation 2250 m) operated under the BC Ministry of Transport and Infrastructure's Avalanche and Weather Program. Another is the weather station on the Fairmont Hot Springs Resort Limited's ski hill (1485 m) installed in 2016 under the Cold Spring Creek Debris Flow Mitigation program. Snow depth is also measured on the Panorama Mountain Resort ski hill until the end of the ski season. So, while the measurements cease prior to the critical melt period, the available information does help to validate the accuracy of other records.

The Little Dragon station was installed in the fall of 2017 so that five seasons of measurements now exist with which to compare the 2022-23 snow season. The comparison is displayed in Figure 3. Snow accumulated at a rate comparable with previous years up until early April but instead of dropping off at that date like in past years it continued to accumulate until April 20 before falling away. At that time the unseasonal warm temperatures kicked in and initiated a melt rate that outpaced those of the previous years. By May 18 the pack had largely disappeared.

No new summer precipitation stations were added but data from the existing network is starting to give an indication of the influence of elevation on the distribution of rainfall within the Columbia Lake watershed. Accumulated rainfall amounts from the Timber Springs weather station, the Spur Lake and Canal Flats rain gauges installed in 2022, and the Fairmont Ski hill are shown in Figure 4. Accumulated amounts at the higher elevation stations were roughly twice those at the stations near lake level. The mean daily amounts over the 2013 to 2021 period, inclusive, at the Timber Springs station are shown for comparison. Surprisingly, taking into account the widespread presence of forest fires in surrounding areas, the rainfall over the local watershed exceeded the long-term average.

4. 2022-23 Activities

4.1. Stations

Two water level monitoring stations, Lansdowne, and Canal Flats (CF) were taken out of service in April. Both have operated for a number of years and their records have shown that their respective water levels follow a regular pattern so that further monitoring is unlikely to contribute little new information. All other water level monitoring stations in operation during the previous season remained in operation. Those stations were: Columere Marina (COL), Columbia River near Fairmont Hot Springs (WSC), Dutch Creek at the Highway 93/95 Bridge (DC), Columbia Lake south (ColLkS), and (Outlet) located near the lake outlet. The locations are shown in Figure 1. DC, Outlet and ColLkS only operated during the open water season. The COL and ColLkS stations measure lake level.

The Timber Springs weather station remained in operation and recorded wind speed and direction, temperature, relative humidity, and precipitation at hourly intervals.

The two HOBO tipping bucket rain gauges installed at Canal Flats and Spur Lake installed in 2022 continued to operate.

The Columbia Valley Airport Society, the new managers of the Fairmont Hot Springs Airport, relocated and upgraded the airport weather station. The station broadcasts (but does not record) weather information via radio and telephone. These broadcasts were monitored at periodic intervals, the altimeter settings abstracted and converted to centimetres of water pressure to be compatible with the loggers. This provided a convenient means of verifying the accuracy of the loggers and brings to an end the need to transport the loggers to a distant location having a precision barometer.

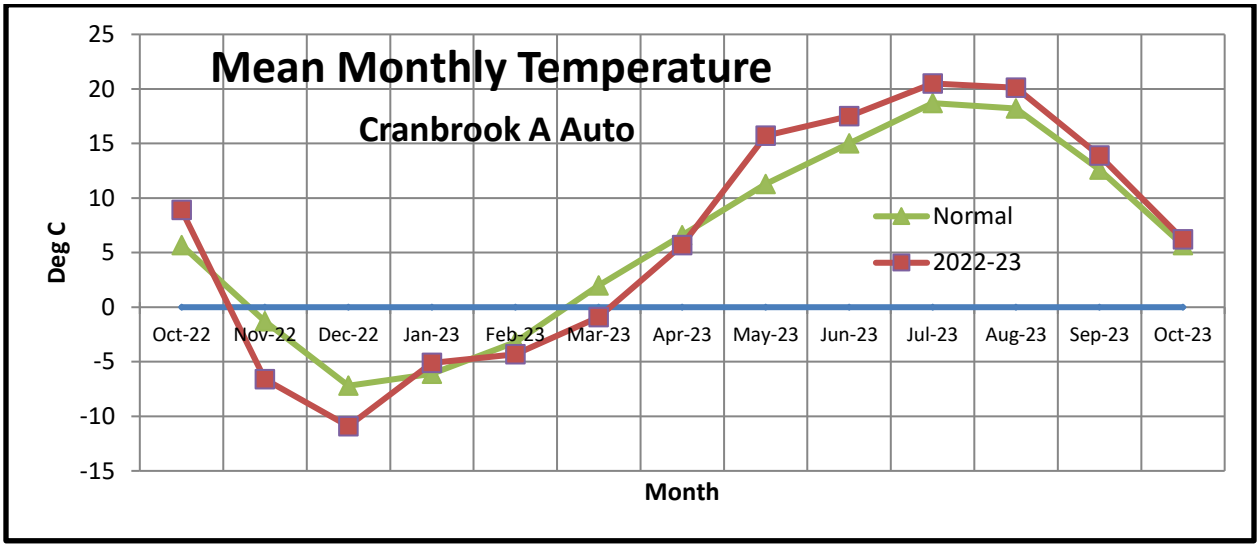

Figure 2 – Mean monthly temperatures at the Cranbrook- Kimberley Airport during the 2021-22 water year and the corresponding 1980-2010 long-term normal values.

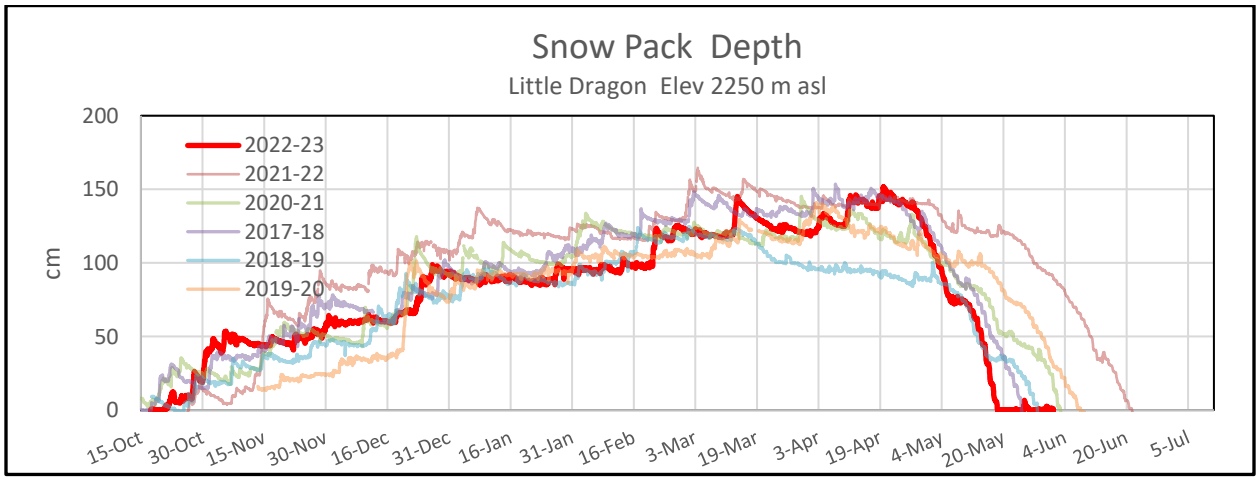

Figure 3 – Snow Depths recorded at the Ministry of Transportation and Infrastructure's Little Dragon Snow weather station located near Panorama during the 2022-23 and the previous five seasons. It is located at an elevation of 2250 metres asl.

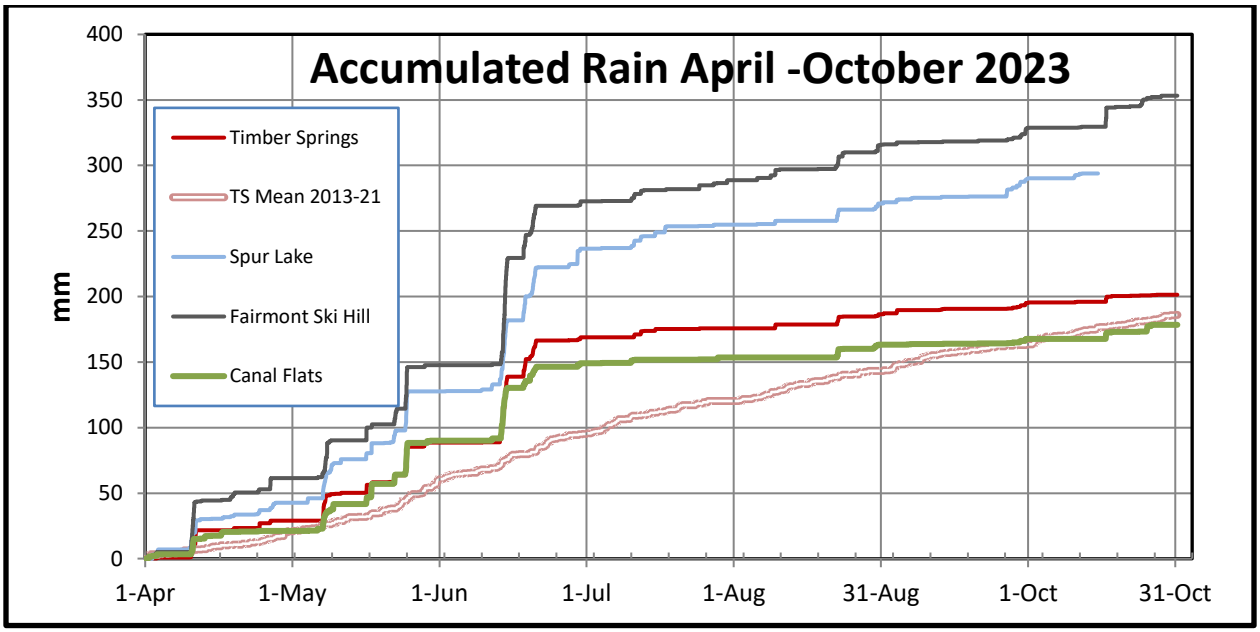

Figure 4 – Accumulated precipitation measured at Timber Springs (elevation 850 m asl), Spur Lake (1175), Fairmont Ski Hill (1480) and Canal Flats (820) during 2023. The 2013 – 2021 period average at Timber Springs is superimposed. The Spur Lake rain gauge was not accessible after October 15.

4.2. Equipment Purchases

An agreement was reached with Living Lakes Canada to share the cost of an upgrade to the lake level monitoring station (COL) located in the Columere marina. The station was purchased in February, taken to Calgary where its performance was evaluated against an Environment and Climate Change Canada barometer, and installed in April. Water levels are recorded and distributed via a cellular network to the internet where they are available worldwide. The original equipment has been kept in operation to serve as backup.

4.3. Data Collection and Management Issues

The tipping bucket rain gauges at Canal Flats and Spur Lake locations operated without incident. Each is powered by a 3V coin type battery which must be replaced annually. The access road to the Spur Lake site is only passable from late April until about mid-October.

The battery in HOBO logger H325, located at the WSC site, weakened and ultimately failed by July 4. This was a major blow because it provided the atmospheric pressure measurements required to calculate water depth at all other sites. Considerable effort was taken to reconstruct the record using data from other loggers that had been taken out of service for the winter but remained turned on. From July 4 onward the new RX2103 system was in place and its barometer became the replacement reference for atmospheric measurements.

The Diver loggers have been in service since 2014 and are nearing the end of their life. The pressure sensor in logger Diver 1601 (BARO) failed near the end of the year following a similar failure in Diver U5972 the previous year. The temperature sensors are still operating so that they remain useful at those locations where water temperature contributes to an understanding of flow such as at the Outlet location.

The performance of the loggers is checked twice per year. The steps involved and corrective measures that were applied are outlined in Appendix A.

5. Water Temperature and Level

5.1. Winter 2022-23

The winter water temperatures recorded at five stations; COL, CF, WSC, DC and Outlet are shown in Figure 5. The logger at the Dutch Creek station operated only a few days at the beginning of the winter season before being removed due to the threat of frost damage. The mean daily air temperatures recorded at Timber Springs are superimposed for comparison and show that the local area was subject to an outbreak of very cold air just prior to Christmas. Lesser outbreaks followed near January 30 and February 24.

The water levels recorded at the same stations plus Lansdowne are shown in Figure 6. Freezing of the intake pipe at the WSC site during periods of cold weather in the past does not seem to have been an issue during 2022-23. The record is continuous and without significant deviations. It is therefore judged to be an accurate reflection of water levels including those very low levels recorded during late February and March.

5.2 Open Water Season 2023

5.2.1 Water Temperature

The water temperatures recorded during the open water season at the COL, WSC, Dutch Creek, and Outlet stations are shown in Figure 7. In previous years the Outlet temperatures indicated the direction of flow in the lake outlet channel. That pattern seems to have been repeated in 2023. From May 1 until May 24 the water temperatures were near those of Dutch Creek inferring flow into the lake. May 24 to June 3 was a transitioning period during which the temperatures fluctuated between those of Dutch Creek and the lake. After June 3 water temperatures comparable to those in the lake predominated indicating that the flow was fully out of the lake.

Air temperatures recorded at Timber Springs are superimposed for reference.

5.2.2 Water Level

The recorded water levels at the Dutch Creek, Outlet, WSC and COL stations are shown in Figure 8. The levels represent the depth of water above a local reference and bear no relationship to any known elevation standard.

The lake peaked on May 30 at a level about 93 cm above its late-April low. Dutch Creek, which is largely responsible for the rise, rose rapidly in early May reaching a preliminary crest May 6 before falling and then again rising rapidly to its highest level on May 18, twelve days earlier than the date of the lake crest.

Hourly rainfall amounts are superimposed.

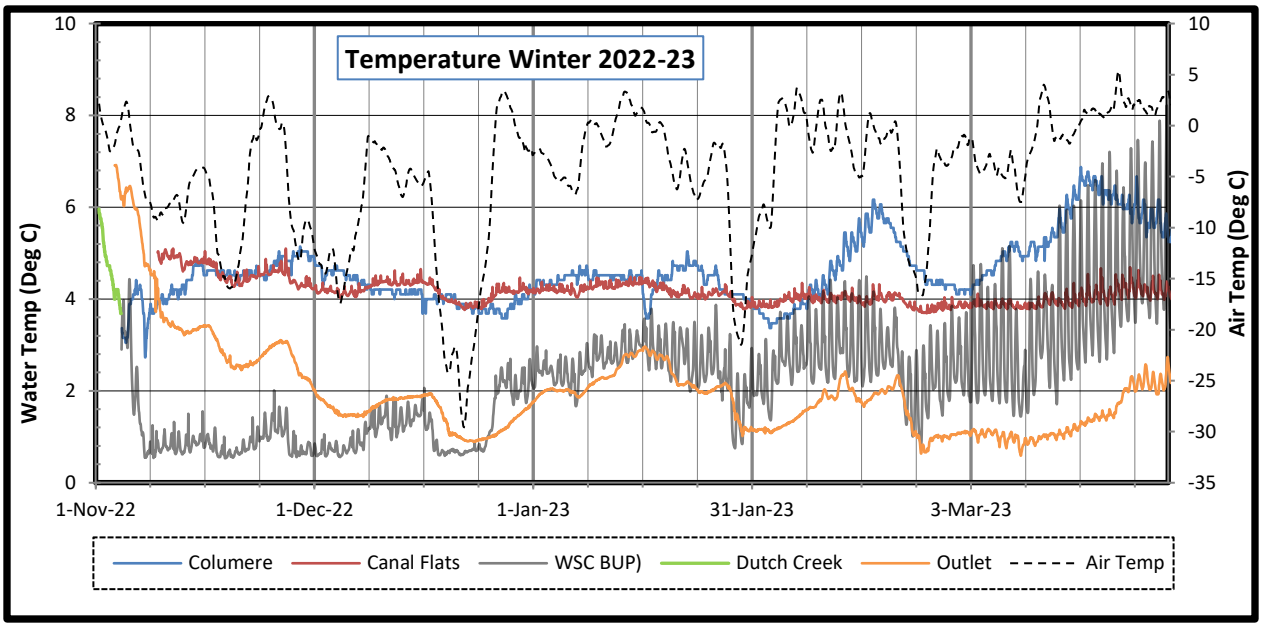

Figure 5 – Winter water temperatures. Air temperatures recorded at Timber Springs are superimposed.

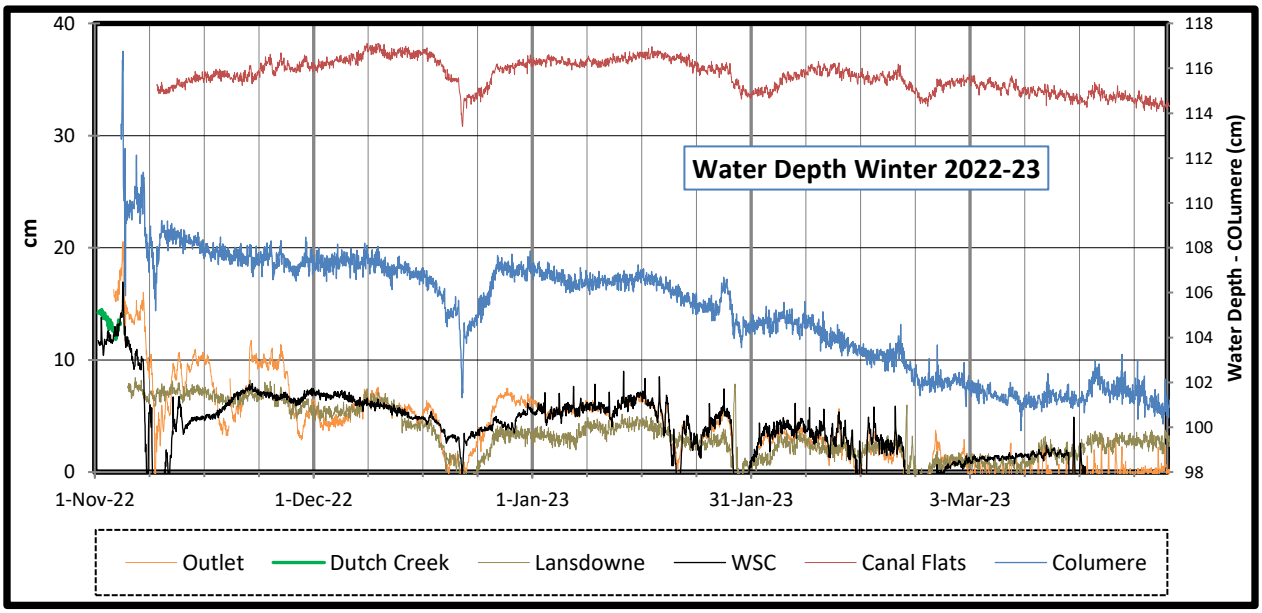

Figure 6 – Winter water depths recorded by loggers. Water levels were particularly low during late February and March at the WSC and Outlet stations.

5.2.3 Comparison with Previous Seasons

As a result of the abnormally warm spring, the 2023 lake water level graph shown in Figure 9 is skewed leftward when compared to those of the 2014 to 2022 seasons, inclusive, with one exception. The graph of 2018 is similar in terms of timing, rate of rise and crest date though not crest elevation. In both years the crest occurred 2-4 weeks earlier than in most previous seasons. The lake level was on track to recede faster than in most previous seasons, and would have done so, had runoff from a period of rain during mid-June not intervened.

6. Local Water Exchanges

6.1 Rating Curves

Owing to a lack of volunteers, it was only possible to conduct one high water flow measurement on the Columbia River at the WSC site. As a result, the hoped for objective of refining the accuracy of the WSC rating curve noted in last year's report was not met.

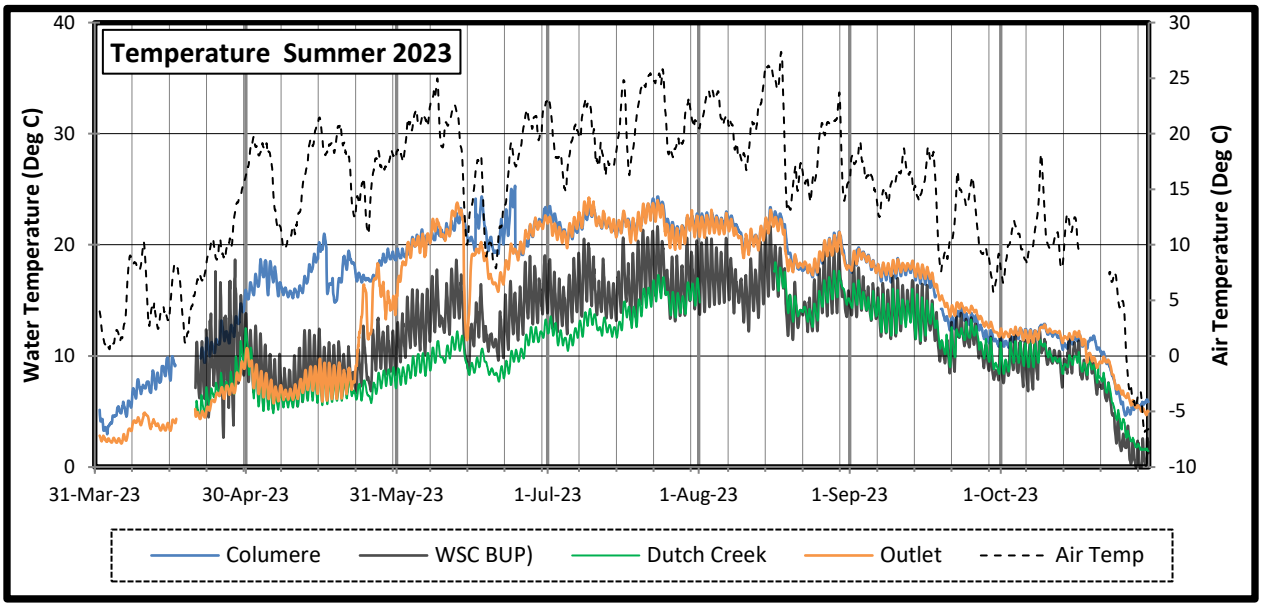

Figure 7 – 2023 water temperatures. Air temperatures at Timber Springs are superimposed.

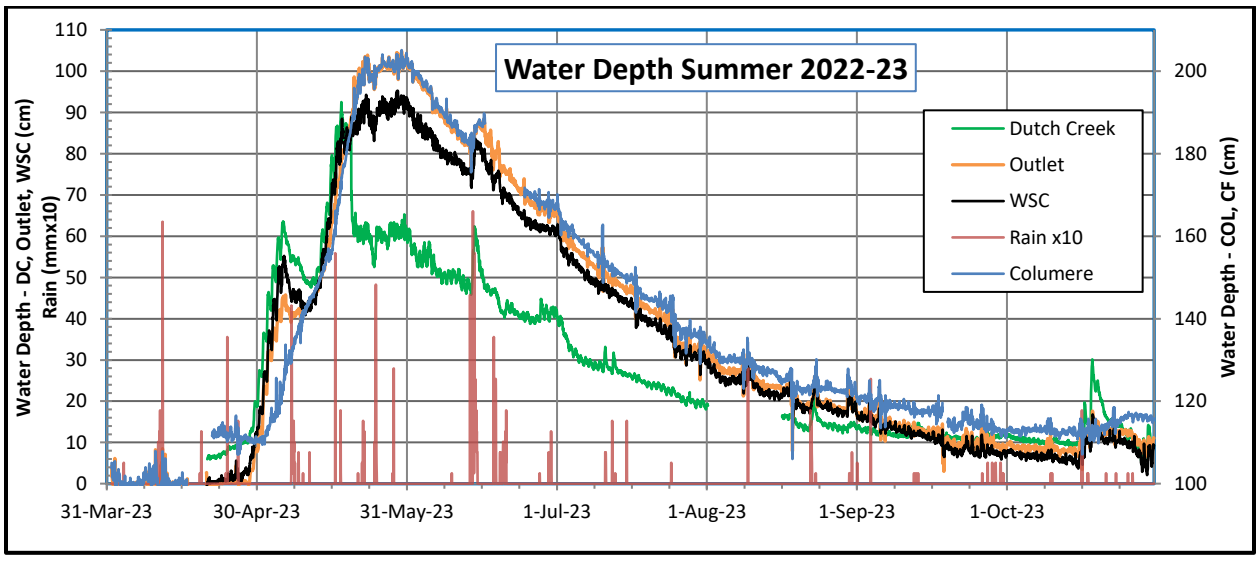

Figure 8 – Hourly water depths in cm. Depths are as recorded by loggers and do not relate to a common reference level. Hourly rainfall amounts are in tenths of millimetres.

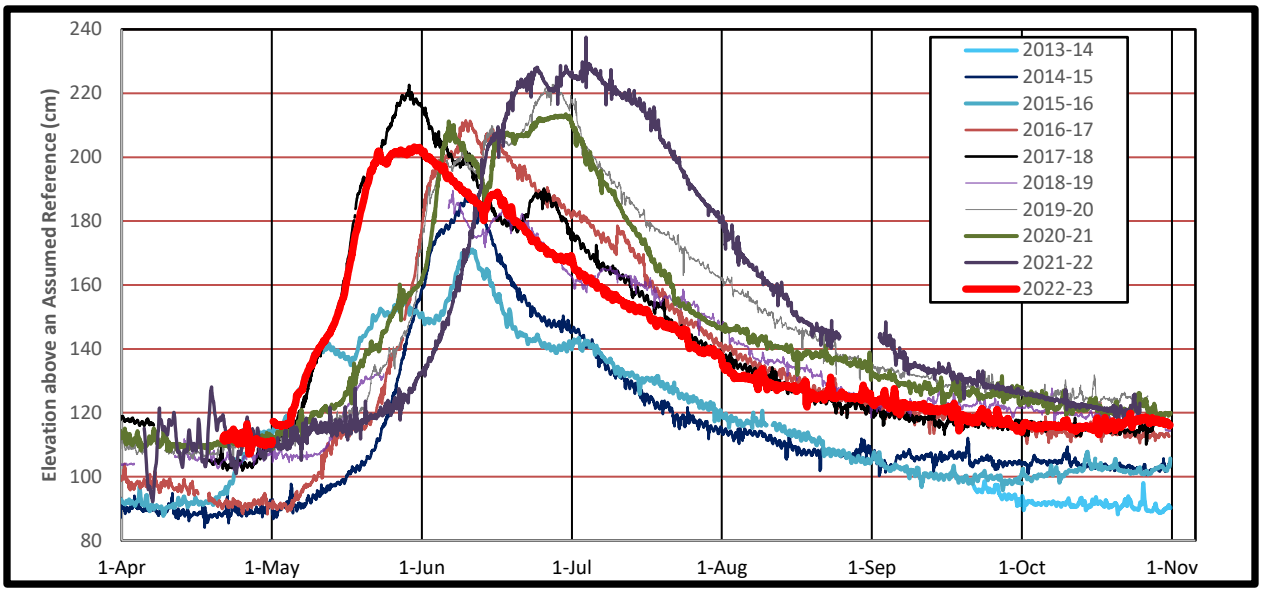

Figure 9 – 2023 Columbia Lake water levels compared with water levels recorded during the 2014 to 2022 open water seasons.

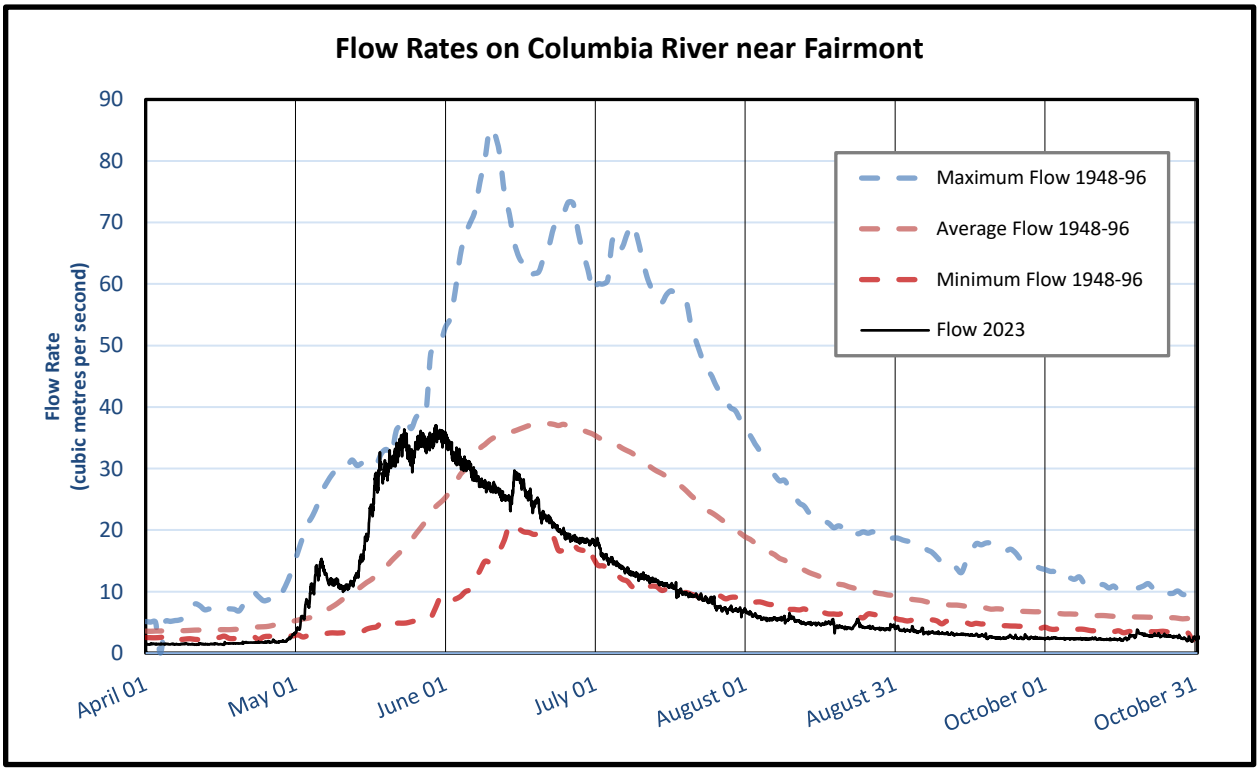

Figure 10 – 2023 flow rates at the WSC station superimposed on the mean daily maximum, average and minimum flow rates computed at the same location by Water Survey of Canada. The data sets are not directly comparable because the CLSS reference level is 30 cm above the Water Survey of Canada level. The difference when measured at the end of the intake pipe is 1.94 cubic metres per second based on the Water Survey of Canada rating curve of 1996.

Better success was had with low flow measurements. Two measurements were made on the Columbia River at the Outlet station and one each on Dutch Creek and on the Columbia River at the WSC site.

6.2 Water Balance

No progress was made in improving estimates of the lake water balance.

7. Columbia River Flows

Water Survey of Canada, Environment Canada operated a hydrometric station on the Columbia River just upstream of the highway bridge near Fairmont Hot Springs during the 48-year period, 1948-1996. The CLSS reactivated this station in 2014 using different measuring equipment but retaining the same intake pipe. It is now operated and referred to as the WSC station. However, the flow measurements are not directly comparable. The problem arises with the reference levels used to measure the elevation of the water surface. The CLSS reference level is at the end of the intake pipe whereas Water Survey of Canada set its reference level at 30 centimetres below the end of the intake. Since the rating curves are elevation dependent, it means that the same flow rate will appear at different elevations on the respective elevation scales. A flow rate of 1.94 cubic metres per second will be recorded at 0 cm on the CLSS scale and at 30 cm on the Water Survey of Canada scale. The difference will vary according to the elevation but for low water levels the addition of 1.94 cubic metres per second to the CLSS flow rate provides a rough approximation of the Water Survey of Canada flow rate.

Water Survey of Canada calculated the maximum, minimum and median daily flow rates for each of the 48 daily values on record for each day of the year corresponding to its reference level. The respective values for the open water season are shown in Figure 10. Superimposed are the unaltered CLSS flow rates recorded during the open water season in 2023. During late winter, the 2023 flows had dropped to near the record long term lows and remained so well into April. Following the spring runoff, the flows again declined and by late July were again near record lows where they remained until October.

According to the Canadian Drought Monitor, much of BC including the East Kootenays has experienced drought conditions since mid-2022. This means that the precipitation, soil moisture, and streamflow are below normal levels. The impacts of drought are apparent. There have been widespread forest fires. Living Lakes Canada has found ground water levels in some of its wells to be among the lowest on record. (see Pioneer, September 2023). The results shown here are a further reflection of the existence of drought conditions.

Water passing the WSC station originates in two drainage areas, the local Columbia Lake watershed and the Dutch Creek watershed. The area of Dutch Creek watershed is the larger of the two and makes up about 80 percent of the combined drainage area.

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9.Acknowledgements

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Living Lakes Canada
Columere Marina
Fairmont Hot Springs Resort Ltd.
Panorama Mountain Resort
Village of Canal Flats
Columbia Ridge Community Association
Columere Park Community Association
Spirits Reach Strata
BC Lake Stewardship Society
Nature Conservancy of Canada
Fairmont Creek Debris Flow Mitigation Project
All donors whose contribution made the purchase of monitoring equipment possible.

Appendix A

Appendix A - Accuracy of Measurements

The integrity of an analysis depends on accurate measurements. The following describes the steps taken to evaluate equipment performance and to minimize error.

A1 -Water Level

Water information is collected using data loggers. The loggers measure pressure and temperature and record them in internal memory. The loggers are programmed to record every hour on the hour. Loggers from two different manufacturers, Van Essen (Diver) and Onset (HOBO), are in use.

All loggers are non-vented. This means that the sensor measures the pressure exerted by the column of water above the logger plus that of the atmosphere. The atmospheric pressure must be removed to obtain the pressure exerted by the water alone. Once removed, the water depth can be calculated from the water pressure (a water density of 1 was assumed). Atmospheric pressure is measured using a separate logger mounted at lake level. Most stations are located at lake level (808.5 metres asl) so that an elevation adjustment is not required. Exceptions are the Dutch Creek station, which is twenty-four metres above lake level, and the Lansdowne station, roughly forty metres above lake level. Two and four cm water is added to their respective pressures to bring them into alignment.

Logger H325 has been the logger used to measure atmospheric pressure and was mounted in the stilling well at the WSC site (elevation 809.0 metres asl. It also served as the standard for evaluating the performance of all other loggers. Its performance was regularly evaluated against a known standard. During late 2022 its battery began to weaken making it difficult to download stored data with the result that some of the recovered data was deemed to be in error and had to be reconstructed from other loggers taken out of service for the winter period. Those periods of reconstructed data were: Dec 15 to Mar 19, Apr 20 to 28, and May 8 to 26. During the early spring of 2023 the CLSS began evaluating a newly purchased HOBOlink RX2103 hydrometric station that integrates the atmospheric and total pressure sensors into one unit. Its barometric sensor accuracy was verified against an Environment Climate and Change Canada barometer during early April. The results are shown in Figure A1. It was installed in the Columere marina on April 26 and after a period of testing and adjustment, was put into operation on July 4. Beginning at that date, it replaced H325 as the source of atmospheric pressure as well as the standard for verifying other loggers.

During the summer of 2023 the management of Fairmont Hot Springs Airport (CYCZ) moved its decommissioned weather station to a new location, installed a new processor and put it back into operation. The new station does not record but altimeter settings can be obtained by phone. A routine was established to phone the station at periodic intervals, collect the altimeter setting and convert it to pressure in centimetres of water. The converted values now serve as a standard for evaluating the performance of the RX2103 barometer and thereby avoid the need to move equipment to the location of precision barometer in the future.

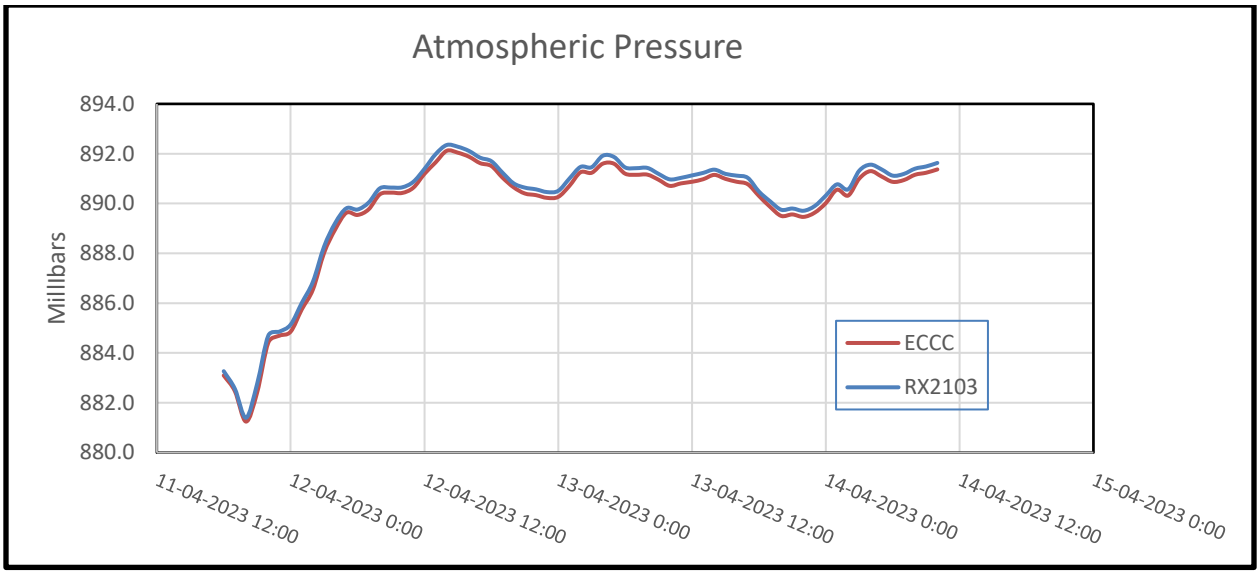


Figure A1 – Deviation of atmospheric pressure measured by barometric sensor on HOBOLink RX2103 from Environment and Climate Change Canada (ECCC) barometer. Deviation was 1.1 mb (1.12 cm of H2O)

All loggers are taken out of service twice during the year, at the beginning and at the end of the open water season and collocated for a period of a few days. The pressures recorded during those periods are shown in Figures A2 and A3. The pressure sensors are seldom in agreement thereby necessitating an offset adjustment. The mean offsets from H325 were calculated and are shown in Table A1 (Nov-22 and Apr-23 only) and from the RX-2103 barometer (Nov-23). The offsets were applied to the six-month period following the comparison tests.

No correction was made for the effects of temperature on water density or on logger performance.

The locations at which the loggers were deployed are shown in Table A2.

A2- Water Temperature

Beginning and end-of-season comparisons of the temperature sensors were made in a similar fashion. The records are displayed in Figures A3 and A4, respectively. The exposure of the loggers to sunlight was not well controlled, especially during the Nov-23 run causing some to record slightly warmer temperatures than others. Otherwise, good agreement is shown.

A3- Other

Other steps were taken to ensure the integrity of the data. Manual measurements of water level were taken at each location periodically during the season to verify the accuracy of the recorded pressure measurements. The stilling wells and intake pipes at each of the stream sites were periodically back flushed.

The current meter was calibrated by the manufacturer prior to purchase and has not been further calibrated.

Table A1 – Measured Offsets from H325 during Comparison trials

Nov-22			Apr-23			Nov-23		
Logger	**cm H2O**	**Diff fm H325**	**Logger**	**cm H2O**	**Diff fm H325**	**Logger**	**cm H2O**	**Diff from RX2103**
H325	932.8	0	H325	930	0	RX2103[1]	931.0	0.0
1459	941.7	8.9	1459	lost		1459	lost	
1366	928.9	-3.9	1366	926.4	-3.6	1366[2]	N/E	
BARO	928.7	-4.1	BARO	916.7	-13.3	BARO	Temp	only
U5972	U/S		U5972	U/S		U5972[2,3]	N/E	
AV083	933.3	0.5	AV083	930.2	0.2	AV083	931.4	0.4
H012	933.5	0.7	H012	930.8	0.8	H012	932.1	1.1
H013	934.7	1.9	H013	933.3	3.3	H013	934.3	3.3
H326	932	-0.8	H326	929.1	-0.9	H326	928.5	-2.5
H109	925.5	-4.4	H109	925.8	-4.2	H109	928.8	-2.2
H691	935.8	3	H691	932.5	2.5	H691	935.2	4.2
			RX2103		0.0[4]			

[1] RX2103 atmospheric pressure sensor replaced H325, RX2103 water sensor not evaluated.

[2] Loggers 1366 and 5972 both located at Outlet and were not removed for evaluation.

[2,3] Pressure sensor in Loggers 5972 and BARO failed in 2022 and 2023 respectively and were only used to measure temperature thereafter, BARO also known as 1601.

[4] Based on the overlap period May 26 to July 4.

Table A2 – Logger Deployment During 2021-2022 Water Year

U5972	U5972 - Nov 4-- Apr 16 at WSC, Apr 20 to Oct 31 at Outlet (no pressure)
1459	No longer in service
1366	Outlet Nov 3, 2022, to Oct 31, 2023,
BARO (1601)	Nov 3 to Apr 16 - COL, Apr 20 to Nov 6 - WSC (Pressure sensor failed Oct 30)
H109	Lansdowne Nov 5 to Apr 16, Cabin Apr 20 - July24, WSC Atmospheric July 24 - Oct 21
H326	Columere – Lake Level – Nov 2021 to Oct 31, 2023
H325	WSC atmospheric until July 4 and then battery failed, Data from Dec 20 to Mar 19 suspect
H012	WSC – Nov 2022 to Oct 31, 2023,
H013	Dutch Creek Nov 1-4, 2022, Atmospheric pressure Woodshed Nov 9 to April 16. Dutch Creek Apr 20 to Oct 31, 2023
H691	Cabin Nov 9 to Mar 21, COL Lk S May 8 to Oct 21

AV083	Water level Canal Flats to April 16, Cabin April to May 8, Barometric pressure at Canal Flats May to Oct 21

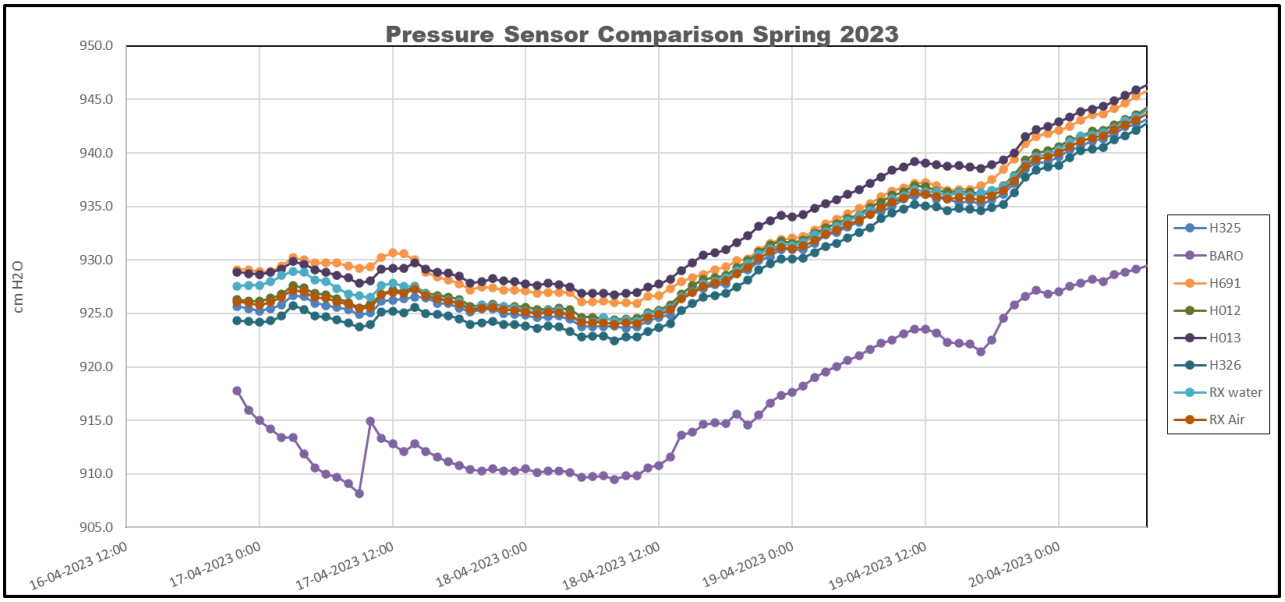


Figure A2 – Pressure readings from all loggers in relation to H325 at mid-water year.

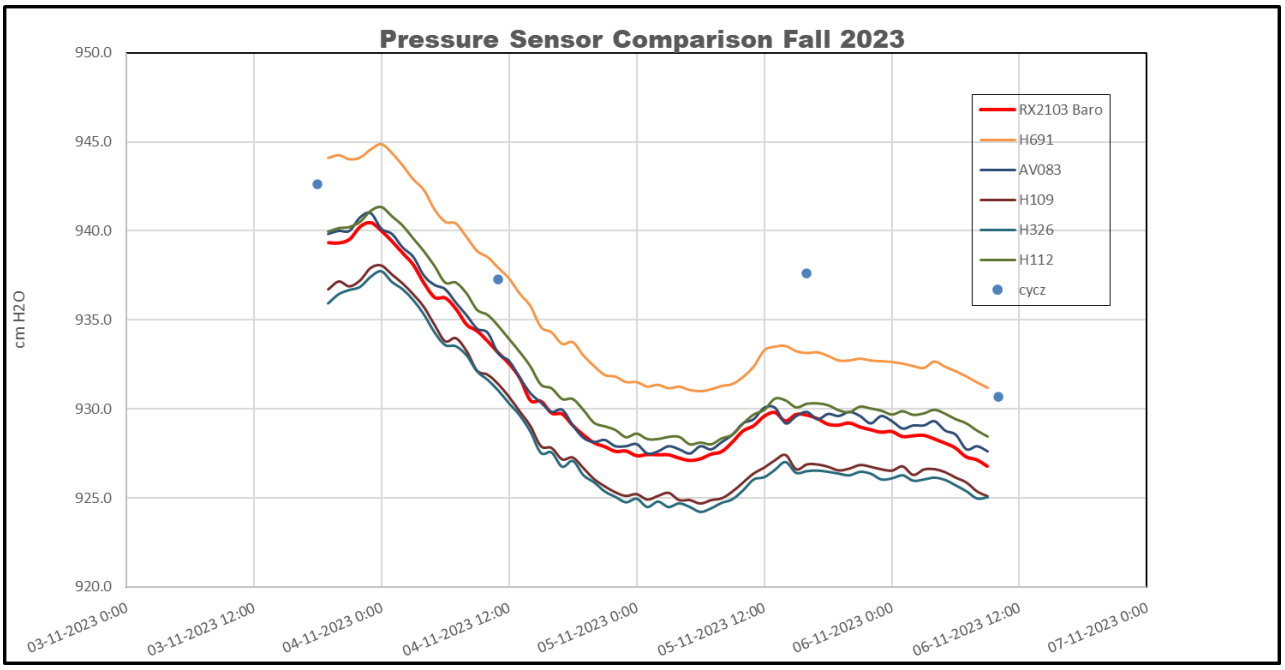


Figure A3 – Pressure readings from all loggers at end of water year. RX2103 was not collocated. It remained in operation at the Columere marina at a level about 40 metres below the collocated loggers. Its pressure was adjusted to the level of the test site by subtracting 5.5 cm H2O. CYCZ is also located

near the lake level. The spot pressures shown have not been adjusted to correct for the elevation difference.

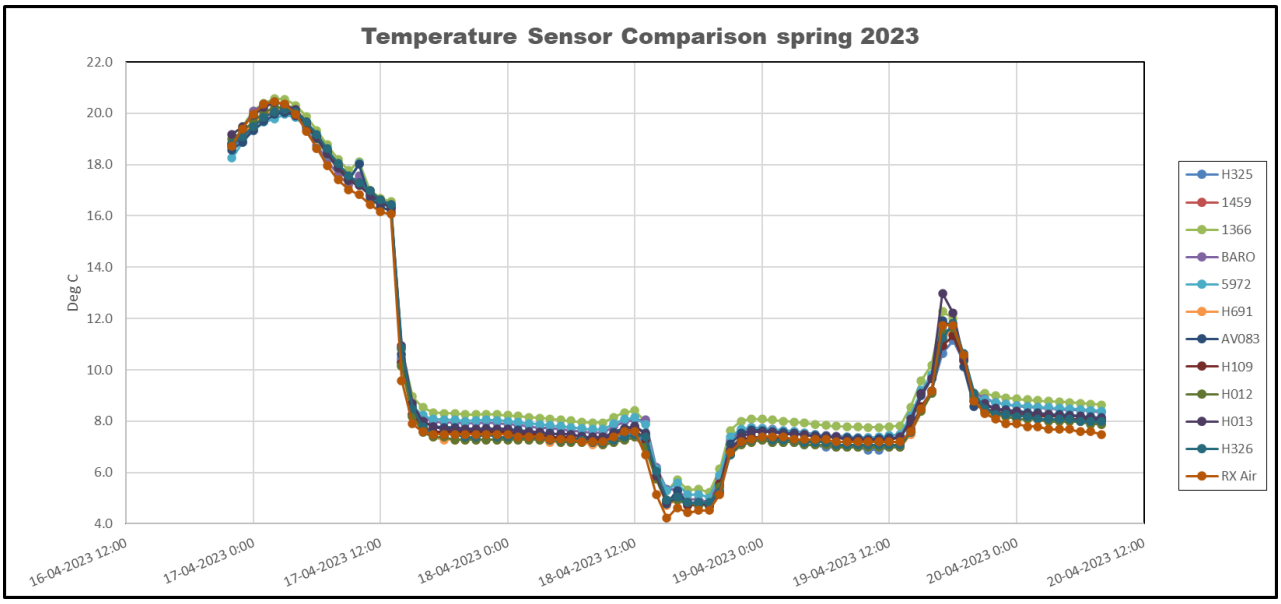


Figure A4 – Temperature readings in relation to H325 at midwater year.

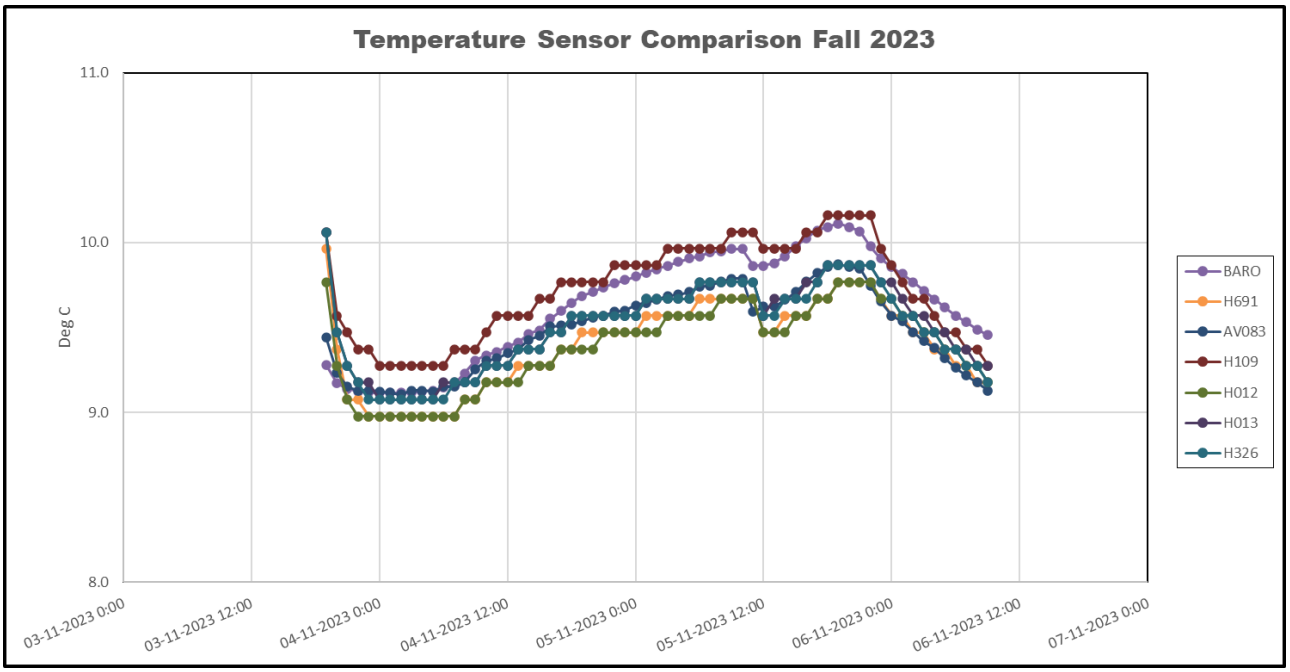
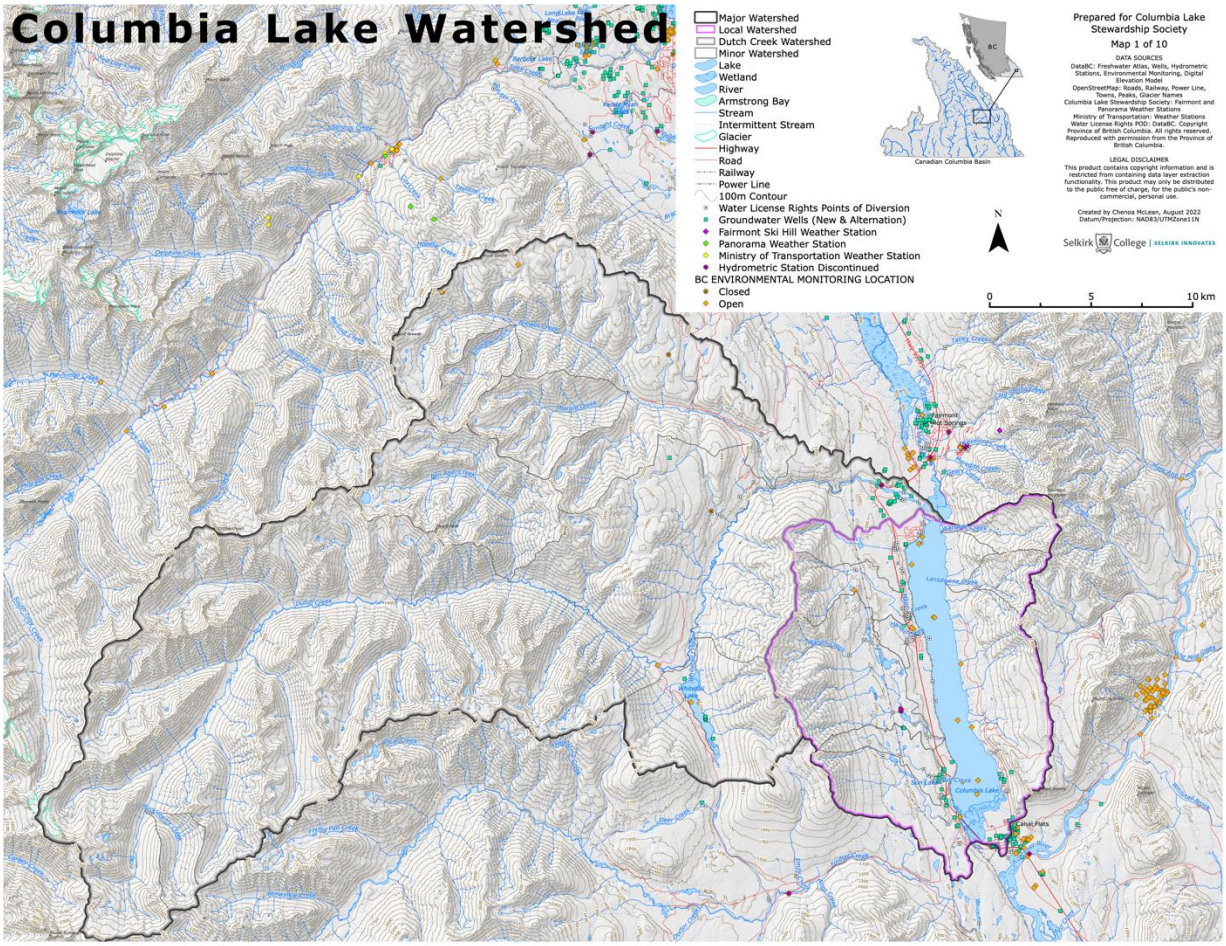


Figure A5 – Comparison of temperature readings at the end of the water year.

APPENDIX B


Columbia Lake Watershed
Major Watershed
Local Watershed
Dutch Creek Watershed
Minor Watershed
Lake
Wetland
River
Armstrong Bay
Stream
Intermittent Stream
Glacier
Highway
Road
Railway
Power Line
100m Contour
Water License Rights Points of Diversion
Groundwater Wells (New & Alternation)
Fairmont Ski Hill Weather Station
Panorama Weather Station
Ministry of Transportation Weather Station
Hydrometric Station Discontinued
BC ENVIRONMENTAL MONITORING LOCATION
Closed
Open
Canadian Columbia Basin
N
0
5
10 km
Prepared for Columbia Lake Stewardship Society
Map 1 of 10
DATA SOURCES
DataBC: Freshwater Atlas, Wells, Hydrometric Stations, Environmental Monitoring, Digital Elevation Model
OpenStreetMap: Roads, Railway, Power Line, Towns, Peaks, Glacier Names
Columbia Lake Stewardship Society: Fairmont and Panorama Weather Stations
Ministry of Transportation: Weather Stations
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