

## The Backlands Coalition

*A wilderness gem in our midst*

### CB Observations Gov. Bk/Colpitt Lake

“Citizen Science” observations by Charles Bull on Electrical Conductivity & Temperatures of surface waters at 3 locations in the upper Williams Lake Watershed April-Dec 2022. Charts and comments by DP in consultation with CB.

View also Natural History/Surface and Groundwaters/**The Salt Issue**/CB Observations Gov. Bk/Colpitt Lake (on this website).



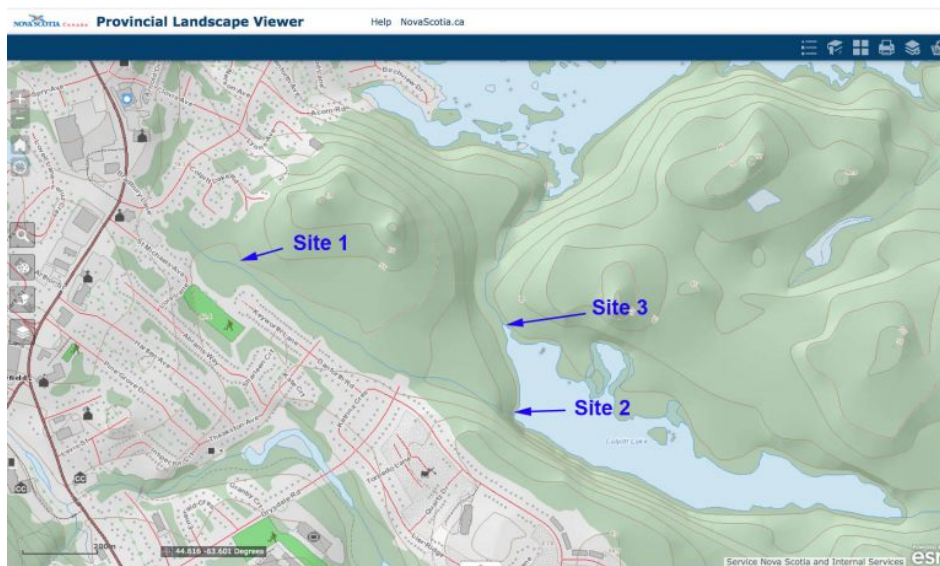
### BACKGROUND

Runoff containing road salt in the upper part of Governors Brook is the **major source of salt** entering Colpitt Lake and in turn, Williams Lake. Charles Bull volunteered to conduct observations of EC (Electrical Conductivity, a measure of the salt concentration in water) and temperature at several sites on Governors Brook & Colpitt Lake he visits during his regularly walks in the Backlands. Over time, these observations will help us to determine if salt loading is increasing (or not, or decreasing), and could provide insights into the related dynamics, sources etc.

EC and Temperature measurements were made with an **HM Digital Aquapro Water Tester AP-2**. More info on its use [here](#).

We are making the original data freely available (see bottom of this page) and we invite others to explore the data, look at relationships to weather data etc. – *Charles Bull, David Patriquin Jan 3, 2023*

### SITE LOCATIONS



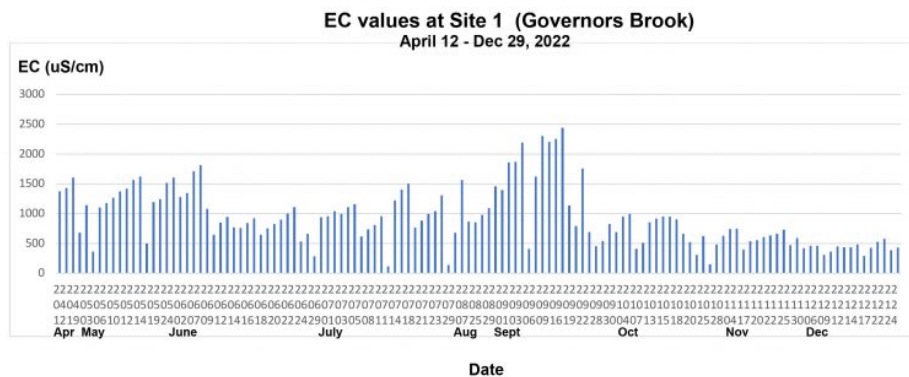
**Location of Observations in 2022.** Site 1 is towards the upper area of Governors Brook. Site 2 is at the mouth of Governors Brook on Colpitt Lake. Site 3 is at the top of the un-named stream that drains Colpitt Lake and empties

into Williams Lake.

*Click on images for larger versions*

## OBSERVATIONS APRIL-DECEMBER 2022

**Figure 1. Electrical Conductivity values at Site 1 (on Governors Brook) on individual sampling days**



Each bar shows the EC value for a particular date. The dates are given for every 2nd sampling, i.e. 1,3,5 days etc.

**Comment:** Charles noted plunges in EC values immediately after heavy rains. The big drops in this figure correspond in most cases to high rainfall events recorded at Halifax International Airport – see daily precipitation data below.

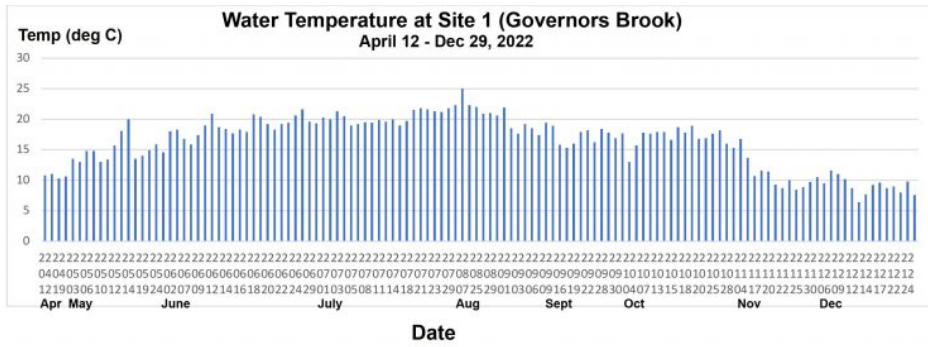
The high values in April and May likely reflect heavy road salt use over the winter.

The overall pattern- High values in April, May, early June; Peak values Sept, and Lower Values Oct-Nov-Dec is suggestive of a delayed ‘groundwater signal’ in September. Alternatively, it could be related to an influx of fertilizer salts from lawn and gardening activities in the spring and summer. Info. on the chloride and potassium levels could help to distinguish between these two hypothesized explanations for the high September values.

*Update Apr 26, 2023.* Melanie Dobson has had a look at the data and suggests the high values in Sept. and periodically earlier in the summer occur after droughty periods I think she is prob. right. In his regard, measurements of creek water levels, which we have talked about doing, would be informative

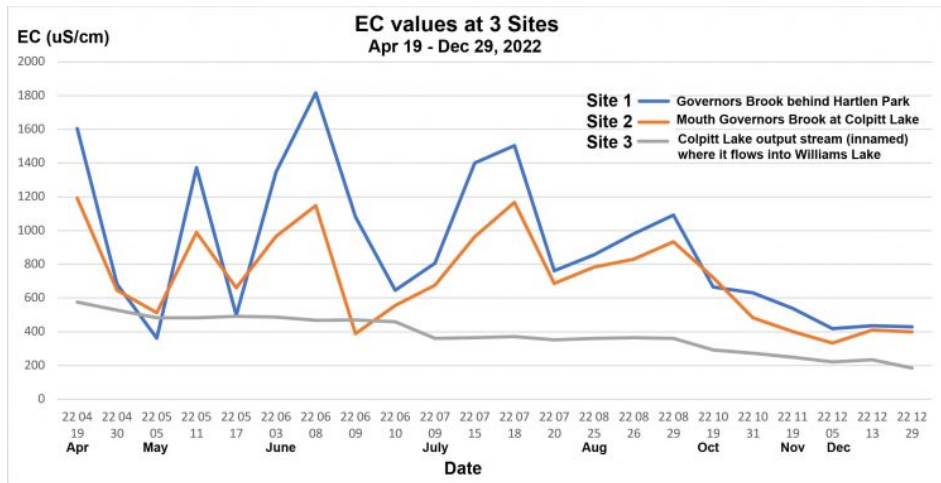
Note: This is a first blush look at the data. The EC values are those observed in the field; they are not “Specific Conductance” values (standardized to 25 degrees C). The adjusted values would not be very different from those above\*, i.e. the trends would likely be the same. \*Conductivity increases approximately 2-3% per 1°C increase in temperature (Source: Fondriest) In [another Citizen Science Project](#), EC measurements were made in the field, water samples taken and EC measured again after 24 hours at room temperature; the two observations provide some indication of how much temperature affects the values.

**Figure 2. Water temperature at Site 1 (on Governors Brook) on individual sampling days**



**Comment:** No surprises!

**Figure 3, Electrical Conductivity values at the three sites on individual sampling days**



**Comment:** The lower values at Site 2 compared to site 1 illustrate dilution of salts at site 1- which is at the edge of the settled area – as the water passes through unsettled, wild land to the mouth of Governors Brook into Colpitt Lake.

The lower still, and less erratic values at Site 3 (the top of the un-named stream that flows between Colpitt and Williams Lake) illustrate the further dilution of the Governors Brook salts by streams flowing into Colpitt Lake from unsettled, wild lands. There is some further dilution as the water flows between Colpitt Lake and Williams Lake, see figure below (from a previous study).

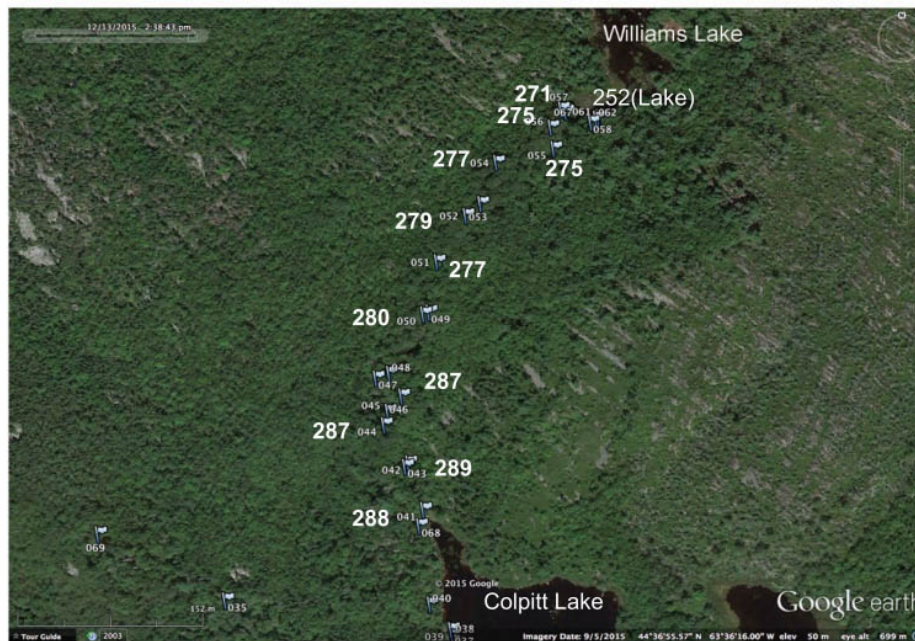


Figure 4 Specific Conductance values (uS/cm) on the stream running between Colpitt Lake and Williams Lake on Dec 13, 2015. From Fig 5 in 2016 report.

### Concluding Comments:

(i) The close-to-daily measurements (Figure 1 above) illustrate the high variation in daily values; as expected EC drops after heavy rains. This sort of variability illustrates the need to sample a stream (versus a lake) repeatedly to represent the salt level for a particular time of year, e.g. samples might be taken daily or every second day over 2 weeks. Alternatively, automated sensors (e.g., the [Levellogger® 5 LTC](#)) could be installed, but this is much more expensive. There is also some satisfaction and piquing of interest in doing a single measurement and seeing the result right away, and repeating it over time versus maintaining a data-logger instrument and later downloading the data.

(ii) The peak values in September are curious. A similar late summer/early-to-mid fall peak was observed for stream waters entering Sandy lake (Bedford), revealed in [another Citizen Science salt monitoring project](#). Water samples taken in mid spring and early fall and analyzed for major constituent ions could help to determine whether the September peak is related to fertilizer use (if so, we would expect the water to be rich in potassium & nitrate ions) or is related to a delayed input of chloride-rich road salt from groundwater (see [Kelly et al., 2019](#)); or to simple concentration associated with low rainfall – measurements of water levels at Site A in Governor's Brook would be informative.

(iii) The values for the three sites shown in Figure 3 illustrate the progressive dilution of salts that were present in Governors Brook at Site 1- near to settled areas – as the stream goes through wild (unsettled land) and enters Colpitt Lake at Site 2; and then the further dilution that occurs between the mouth of Governors Brook and the top (Site 3) of the un-named stream that goes from Colpitt Lake to Williams Lake. As shown from the 2015 data in Fig 4, the salt in Colpitt lake water is further diluted as it moves down the corridor to Williams Lake.

(iv) Governors Brook is likely the only significant source of road salt going into Colpitt Lake (see [2016 Report](#).); salt entering the lake from Governors Brook is diluted by surface and ground waters coming from wild lands

around Colpitt Lake as well as precipitation over the lake. The Site 3 values are much less variable day to day than the stream values reflecting the ‘buffering’ by the large volume of lake water.

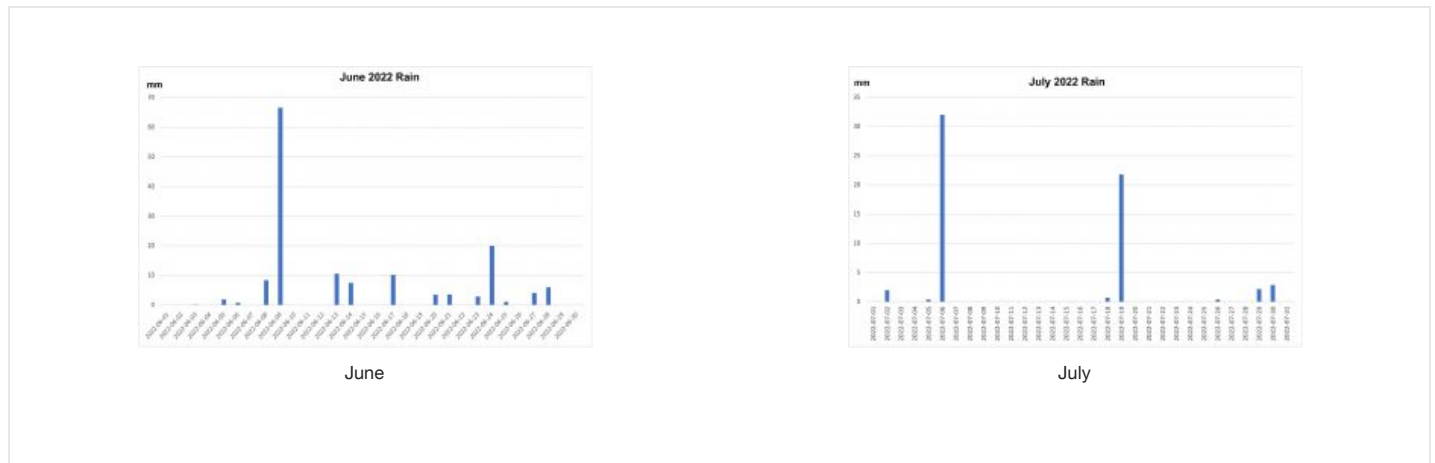
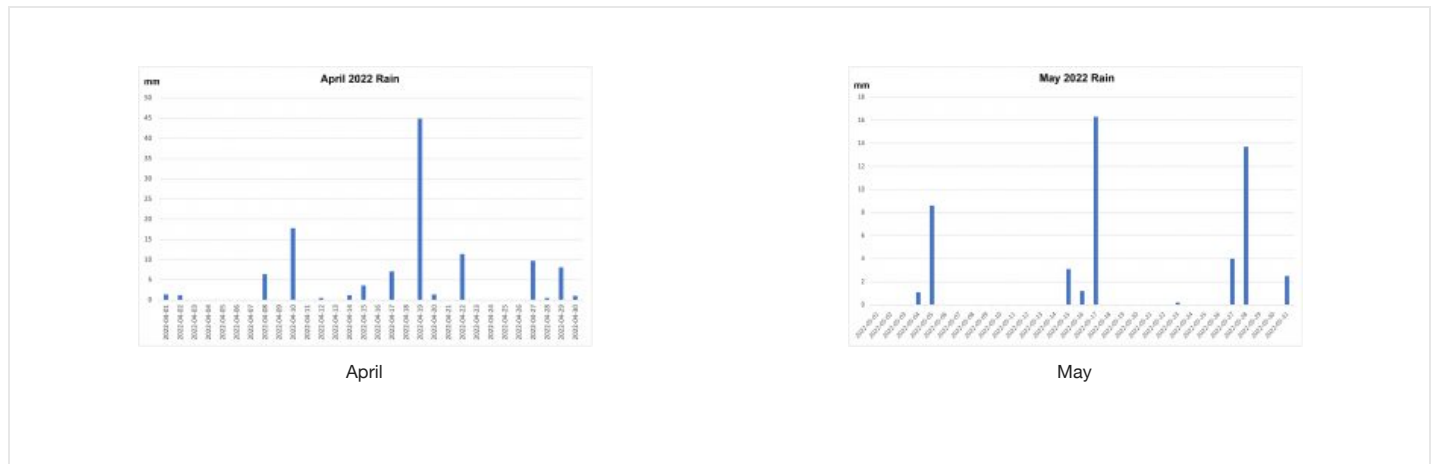
**Some questions:**

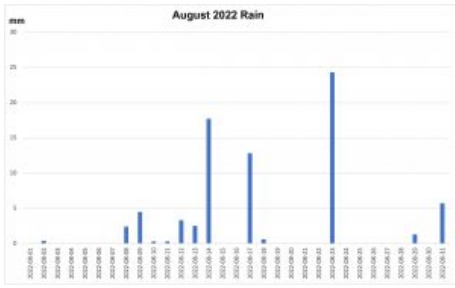
- **Has salt content been increasing over time to date?** There are some historical data available to help us address this question. See [The Salt Issue](#): Reports related directly to Watersheds associated with the Backlands.
- **Are salt levels increasing into the future?** Continued monitoring as conducted by C.B. would help us to answer this question!
- **How are current salt loadings affecting Colpitt and Williams Lakes?** We really need limnological profiles (temperature, EC, and oxygen) at the deepest points in each of Colpitt Lake and Williams Lake in the spring, summer and fall (winter would would also be nice) over several years to determine whether salt is accumulating in deeper layers and possibly inhibiting normal spring and fall turnover; also to assess oxygen levels. See [A DRAFT Report On the State of Sandy Lake, the Historical Trends and its Future Trajectory](#) for further discussion of the salt issue in relation to a local lake with salt values similar to those in Colpitt Lake and Williams Lake.

**RAINFALL AT HALIFAX INTERNATIONAL AIRPORT Apr-Dec 2022**

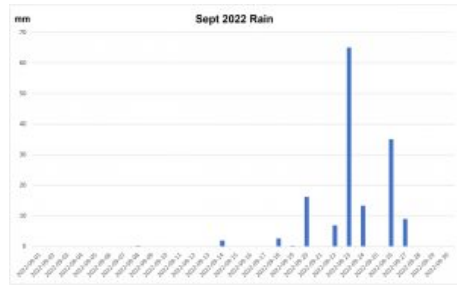
Source: [Environment and Climate Change Canada](#)

*Click on individual images for larger versions*

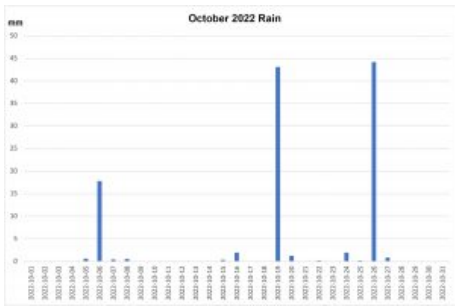




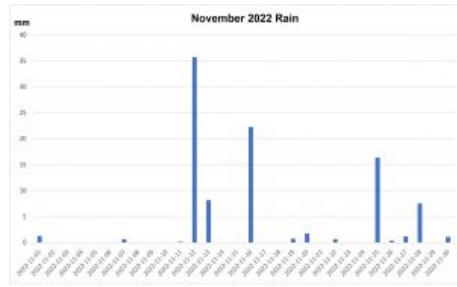
August



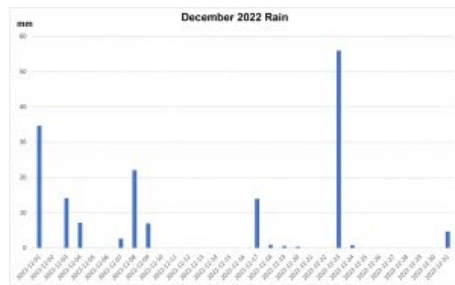
September



October



November



December



Charles Bull sampling water at Site 1, Nov 30, 2022



Sampling at Site 1 Nov 30, 2022 – Readings

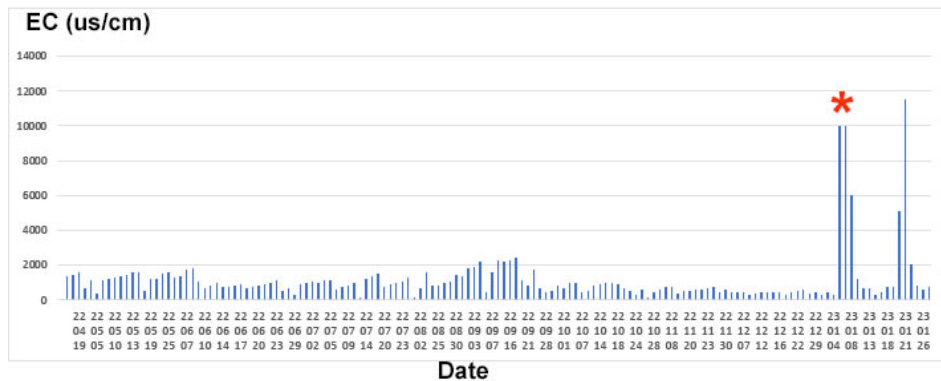


Sampling at Site 1 Nov 30, 2022: Recording the readings

**ORIGINAL DATA APR-DEC 2022**

- [CBullWaterData22-04-12to22-12-29.docx](#)
- [CBullWaterData22-04-12to22-12-29.pdf](#)
- [CBullWaterData22-04-12to22-12-29.xlsx](#)
- [WeatherDataEnvClimChgCanada.csv](#)

**JANUARY 2023**



EC Values for January 2023 at Site 1 (Governors Brook)

**Comment** On Jan 5 and Jan 7, the EC meter maxed out at “>9,999”; these are the values below the red asterisk in the chart above. The value shown for Jan 8 in that chart is 5000 uS/cm – a simple guess (no observation taken). The next very high value (>9,999) was on Jan 21. On that occasion, C.B. followed a procedure I had suggested if he encountered another >9,999 value to get an estimate of the actual value – see [Procedure](#); the



estimated value was 11,497 uS/cm. Full strength seawater is about 50,000 uS/cm. So the water on these high EC days was the equivalent of about 20% seawater. The Canadian Water Quality Guidelines for the Protection of Aquatic Life for chloride are 120 mg CL/L for Long term Exposure and 640 mg CL/L for short term exposure; the equivalent EC values are 474 and 2414 uS/cm respectively ([source](#)). So on those days when EC exceeded 9,999 uS/cm, the chloride values were likely at least 5 x the critical value for short term exposure. [CB's data](#), although limited, suggest there was a lot of dilution before that water entered Colpitt Lake (Site 2), and more so before the water began its way to Williams Lake (Site 3).

### January 2023 data

- [Water Data 23 01.docx](#) | [As PDF](#)
- [CBullWaterData22-04-12to23-01-27.xlsx](#)

### February, 2023 data

[Water Data 23 02.docx](#) | [As PDF](#)

### March, 2023

#### [BullMarch2023WaterData](#)

On Mar 1, the water in Governor's Brook had an EC value of 20,105 uS/cm, equivalent to about 40% of full strength seawater!

### April 2023

[BullWaterData23Apr2023.pdf](#)

[CBullWaterData22-04-12to23-04-28.xlsx](#)

Page posted by David P Jan 2, 2023

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**The Backlands Coalition**

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