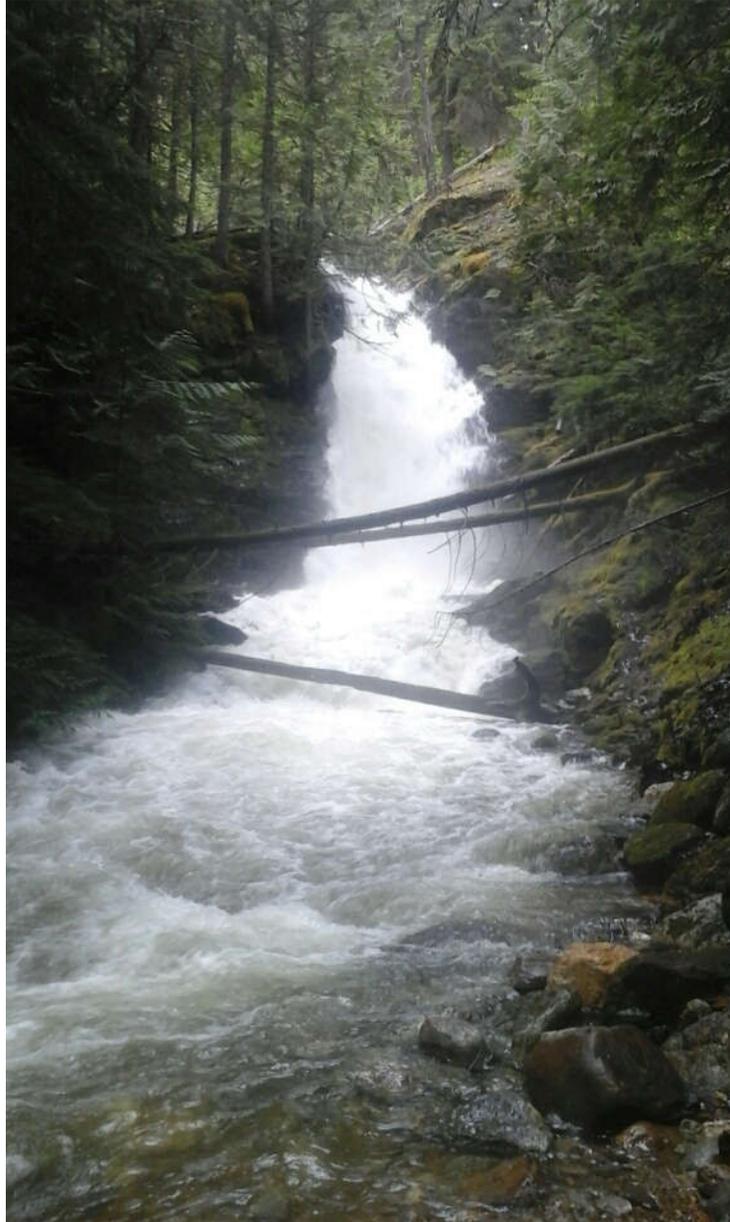


# Wolverton Creek Monitoring Report 2016 - mid 2017



*Photo Credit: Jennifer Yeow*  
Report Prepared For:

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Sept, 2017

## Wolverton Creek Summary Report for 2016 – mid 2017

### Background

The charts and information below summarize findings obtained by observation and water quality monitoring Wolverton Creek. It is not intended to be a comprehensive assessment of the creek

Members of the Wolverton Creek Water users collected data that contributed to this report. Thankyou to Judy Laret, Doug Adair and Ruth Hackett for collecting samples and looking after the water system.

The monitoring program is based on recommendations given in “Monitoring Guidelines to Evaluate the Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska” by L.H. MacDonald. Sample frequency is based on recommendations from J. Allan Issacson, Forest Hydrologist, Idaho Sate. The program relies on manual reading of in stream flow gauges, calibration of gauges by flow readings taken with a Price Current meter (RIC standard procedures). Velocity readings are taken at intervals of 6 to 12 inches across the stream. A stage discharge curve is developed and in 2016 – mid 2017 readers collected 27 samples based on the following criteria:

- Collect during and after storm events and/or heavy rain
- Collect at reduced frequency throughout the year
- Collect more samples during Spring freshet and Fall rain events
- Collect when creek water appears turbid and
- Samples are held cool and dark prior to delivery to lab

Regarding microbiological testing - between July 1st and Oct 04, 2016, 5 samples were collected aseptically by an employee of Passmore Laboratory Ltd and tested for total coliforms, thermotolerant coliforms and E.coli.

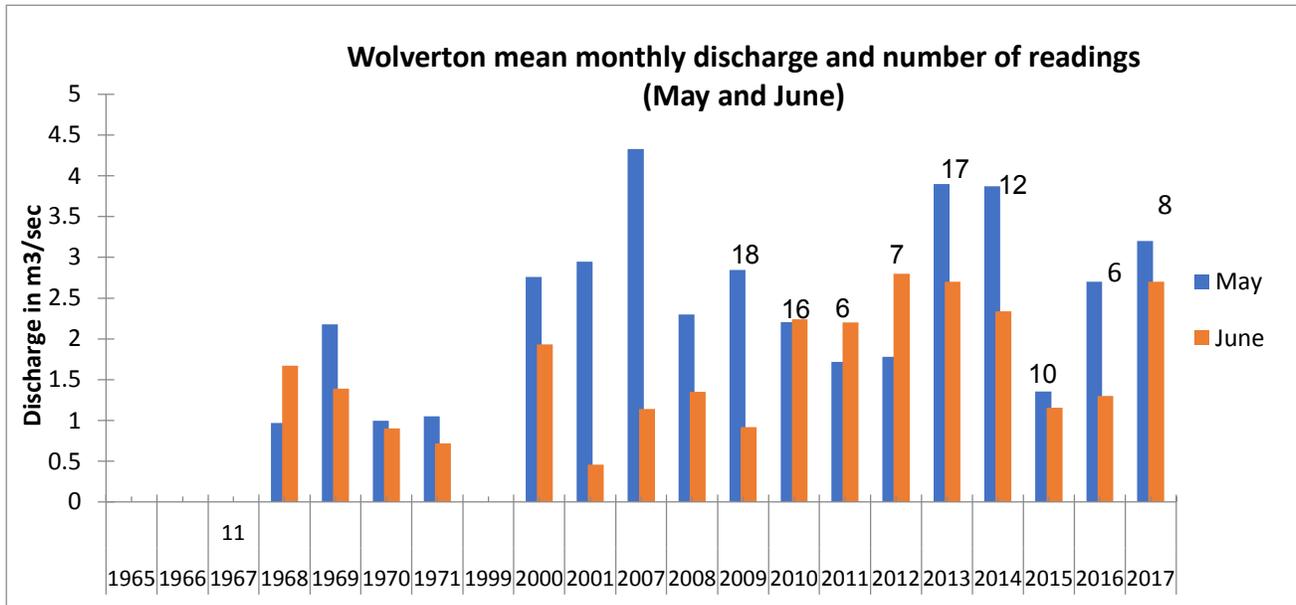
### *The objectives of the program are to:*

- 1. Collect water quality and flow data using a systematic sampling regime**
- 2. Determine the number of days per year that parameters exceed provincial drinking water quality guidelines as a function of discharge.**
- 3. Examine trends in drinking water quality in Wolverton Creek as forest conditions change in the watershed.**

### Characteristics of the Wolverton Watershed

Wolverton Creek watershed is located just north of Slocan Park, and 30 km north of Castlegar . The creek drains the Norns Range west to the Slocan River. The Wolverton Creek watershed is 15.27 square km in size, and Wolverton Creek is 5.47 km in length. It is a second order stream with a northeast aspect.

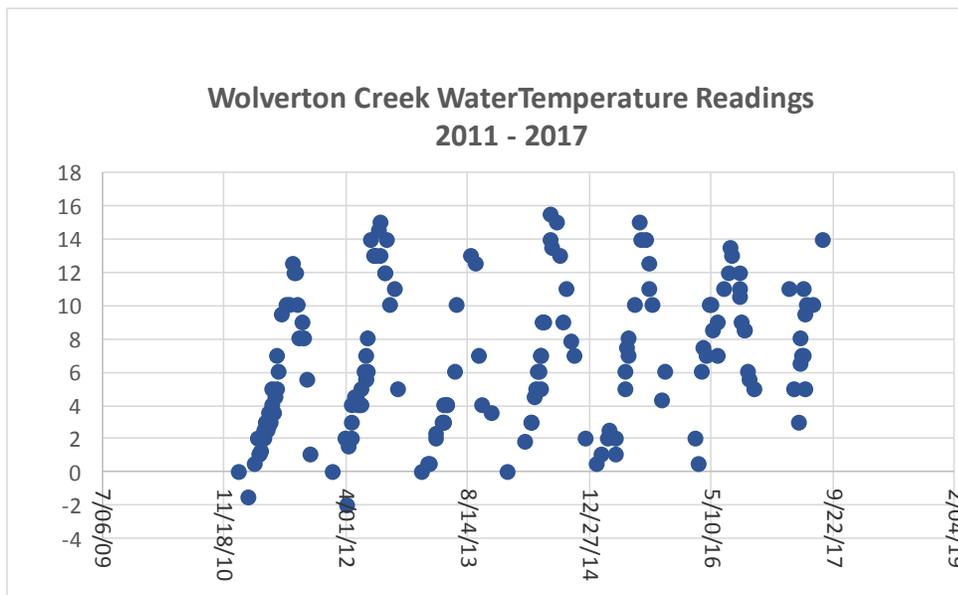
**Flow**



\* Number above bars indicates number of readings taken during May and June combined.

Historically, Wolverton Creek experiences high flow in May. The creek was monitored by Water Survey Canada between 1965 and 1971. The current program has been monitoring flow for 13 non consecutive years. Years 2002 - 2006 were not monitored. May and June for years 2016 and 2017 appear within normal range compared to 2000 – 2015 and high when compared with 1968 through 1971.

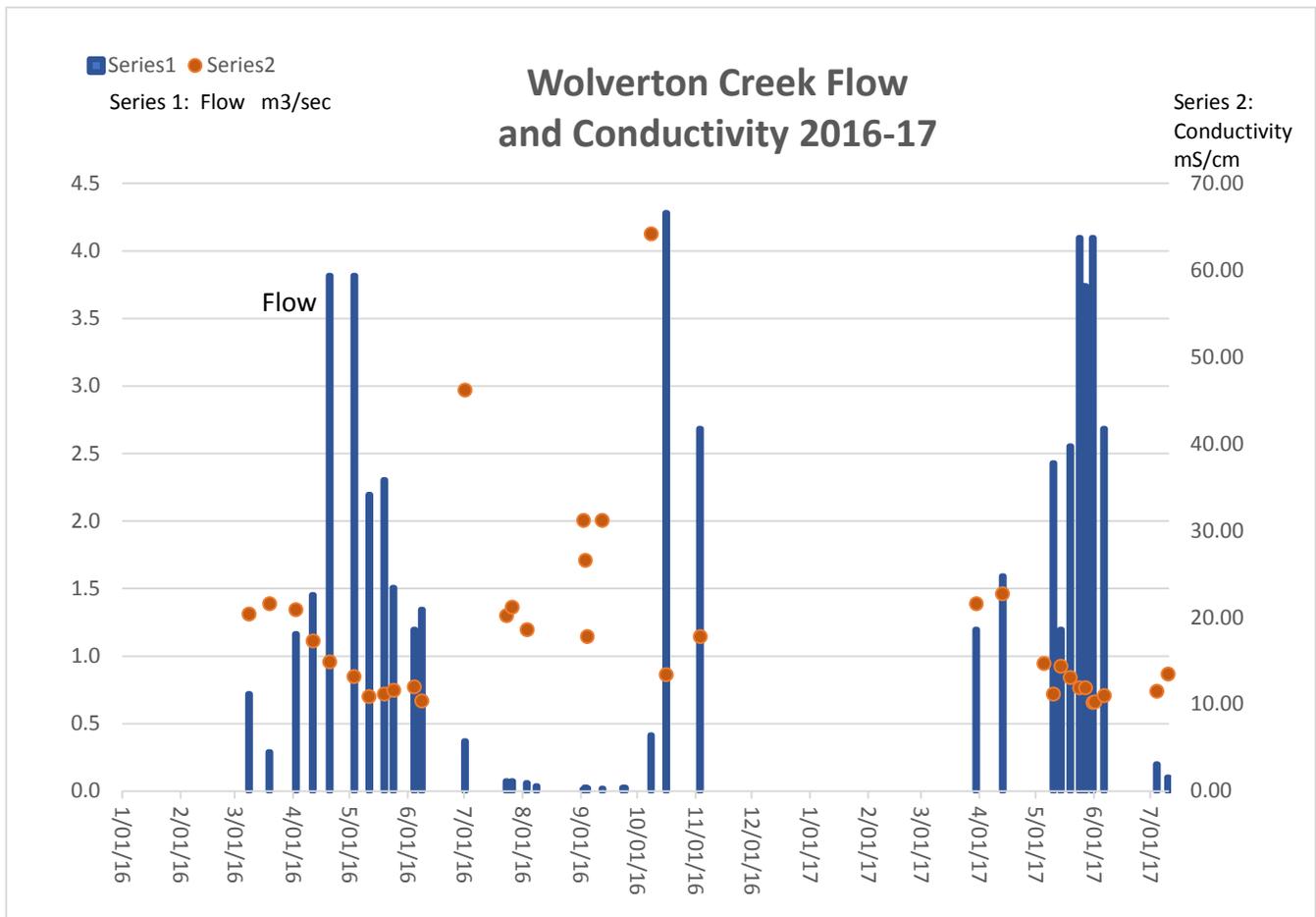
**Temperature**



The chart above shows Wolverton Creek Water remains relatively cool (less than 15 degrees centigrade) for most of the year. In 2016, 14 of the 23 readings were less than 10C and in 2017, 10 of the 12 readings were less than 10C. As seen in the chart, there appears to be a trend towards warmer water temperatures earlier in the year.

### Conductivity and Flow

Conductivity is expressed as "specific conductance or microseimens per cm at 25 degrees C". It is a measure of the ability of water to carry an electric charge and is directly related to the concentration of dissolved ions. E.g. as the total dissolved substances in the water increases, the conductivity of the water also increases. There is usually an inverse relation between conductivity and flow. For example, as flow increases, dissolved minerals decrease & conductivity decrease. Conductivity can also vary when disturbance occurs as in Aug, 2016. A fire on the north slope of the watershed resulted in fluctuations in conductivity and possibly flow. An exceptionally high Fall flow may reflect to the effects of fire. See chart and table below.



### Historic Conductivity and Flow

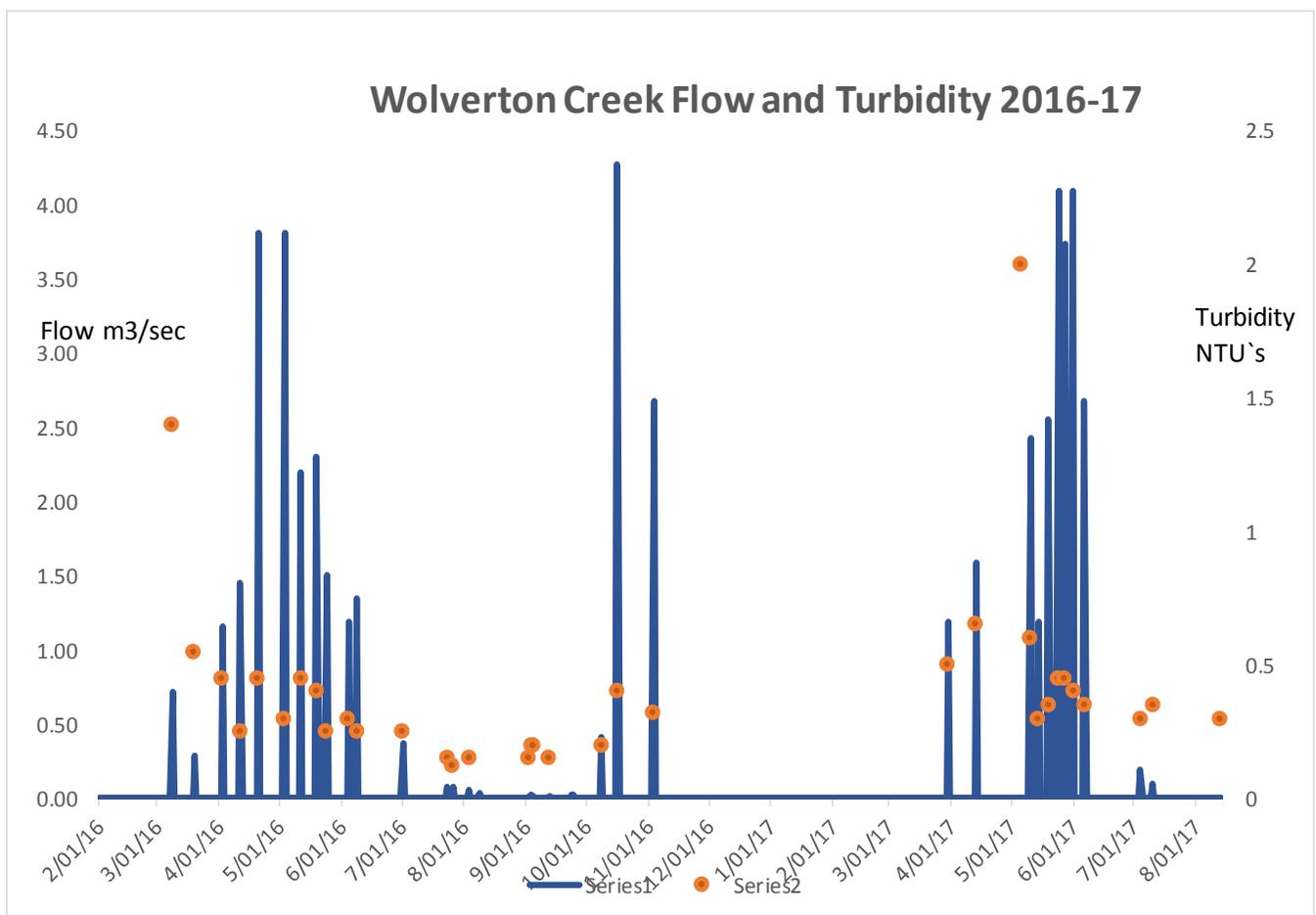
Year	Minimum Flow and date occurred (m3/sec)	Maximum Flow and date occurred (m3/sec)	Minimum Conductivity and date occurred (uS/cm)	Maximum Conductivity and date occurred (uS/cm)
2013	0.006 (8/25)	6.64 (5/22)	8.8 (6/09)	33.5 (9/18)
2014	0.002 (9/23)	5.29 (5/23)	11.2 (5/28)	62.3 (7/18)
2015	0.024 (9/9)	2.42 (6/03)	12.5 (5/25)	48 (7/09)
2016	0.024 (9/23)	4.3 (10/16)	10.4 (6/8)	64.2 (10/8)

### Turbidity

Turbidity is a "measure of the relative clarity of water. It is caused by colloidal matter, such as clay, silt, finely divided organic and inorganic matter, plankton and other microscopic organisms suspended in the water. It is not a direct measure of suspended particles in the water. Rather, turbidity measures of the scattering effect that particles have on light.

The most important health-related effect of turbidity is related to particles ability to shield microorganisms from disinfection. Turbidity has been shown to be correlated with the contamination of water by *Giardia* and *Cryptosporidium*. Hence, turbidity serves to estimate the risk of contamination by these pathogens. Ministry Guideline limits for Turbidity in drinking water are 1NTU. NTU's refers to "nephelometric turbidity units" and is a scale developed for this test. The protocol for this program is to measure suspended sediment on samples over 0.5NTU.

Generally, Wolverton has very low turbidity. In 2016, twenty two samples were collected and only one was over 1NTU. In 2017 to date all samples were less than 1 NTU.



**Turbidity Chart**

Wolverton Creek Year	Highest Turbidity Reading	%Samples greater than 0.5NTU	Number of Samples
2016	1.4	95	21
2017	2	92	12 to date (9/9)

**Coliform Bacteria**

Coliforms refer to a group of bacteria that have been tested for over 90 years as indicators of human infection. Their presence is used to indicate that other pathogenic organisms of fecal origin may be present. These may include other bacteria, viruses, protozoa (giardia, cryptosporidium) and multicellular parasites. There are no Provincial guideline limits for total coliforms in untreated drinking water but thermotolerant (fecal) coliforms and E. coli are not permitted.

The counts in 2016 were slightly higher than seen in 2015. One sample (July 1) was taken after rain. Elevated counts are a reminder of the fact that Wolverton, like other creeks, is at risk for contamination - especially during summer.

**Coliform Bacteria Test Results for 2016. Taken at the gauge site**

Date	Fecal Coliforms CFU/100ml	E.coli CFU/100ml
7/13/2015	1	1
8/20/2015	0	0
8/30/2015	0	0
9/04/2015	1	1
9/09/2015	1	1
9/17/2015	1	1
9/23/2015	0	0
7/1/2016	28	8
8/14/2016	0	0
9/2/2016	1	2
9/24/2016	0	2
10/4/2016	1	2

CFU = colony forming units

**References**

- Wolverton Creek Monitoring Summary Report 2015, Jennifer Yeow, Passmore Laboratory Ltd.
- Wolverton Creek Hydrogeomorphic Assessment December 5, 2006, Apex Geoscience Consultants Ltd.
- Water Survey Canada’s website: <http://scitech.pyr.ec.gc.ca/waterweb>
- Water quality guidelines from the Provincial Govt’s website:  
[http://www.env.gov.bc.ca/wat/wq/BCguidelines/approv\\_wq\\_guide/approved.html#1](http://www.env.gov.bc.ca/wat/wq/BCguidelines/approv_wq_guide/approved.html#1)
- Monitoring Guidelines to Evaluate the Effects of Forestry Activities on Streams in the Pacific Northwest & Alaska  
L.H McDonald EPA 910/9-91-001