Wolverton Creek Monitoring

Report 2012

Photo Credit: Judy Laret

Report Prepared For:

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Wolverton Creek Summary Report for 2012

Background
The charts and information below summarize findings obtained by monitoring Wolverton Creek. The summary 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.

The program
The present 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 readers collect 30 to 40 samples a year based on the following criteria:

- Collect during and after storm events and/or heavy rain
- 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

The samples were tested for turbidity and conductivity. If turbidity is greater than 1NTU, total suspended solids are performed on that sample.

In late summer, 5 samples were collected by an employee of Passmore Laboratory Ltd and tested for total coliforms, thermotolerant coliforms and E.coli as recommended in Provincial Guidelines for evaluating drinking water.

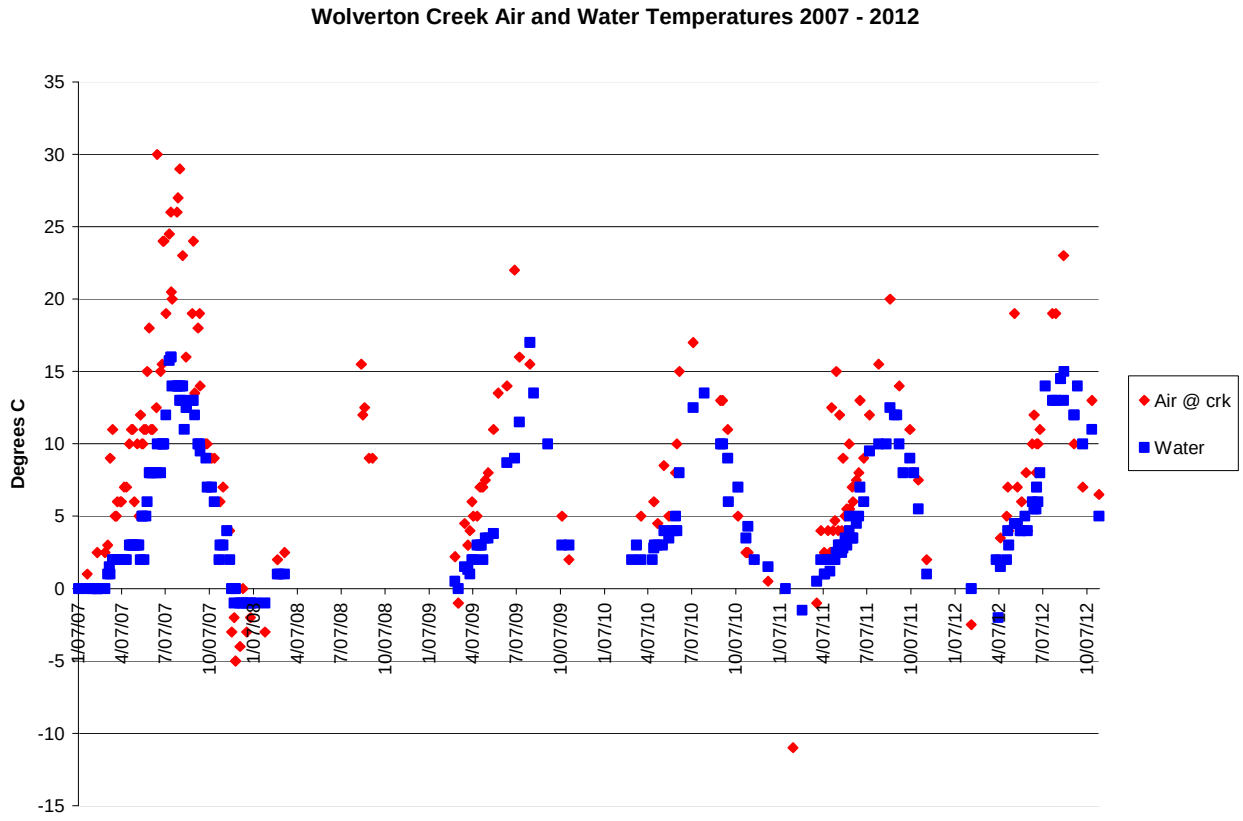
The objectives of the program are to:

1. **Collect water quality and flow data using a systematic sampling regime**
2. **Determine the number of days per year that parameters exceeded provincial drinking water quality guidelines as a function of discharge.**
3. **Examine trends in drinking water quality in Wolverton Creek as forest development increases within 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 km^2 in size, and Wolverton Creek is 5.47 km in length. It is a second order stream with a northeast aspect. See Google earth photo below

Temperature



As seen in the chart above, Wolverton Creek Water remains cool relative (less than 15 degrees centigrade. This means it provides a cool water input to the Slocan River where summer temperatures often rise above 20 degrees C. For this reason, it provides a cool water input into the main river. Past studies on local creeks have shown that drinking water quality stays high when water temperatures are below 10 degrees C (1).

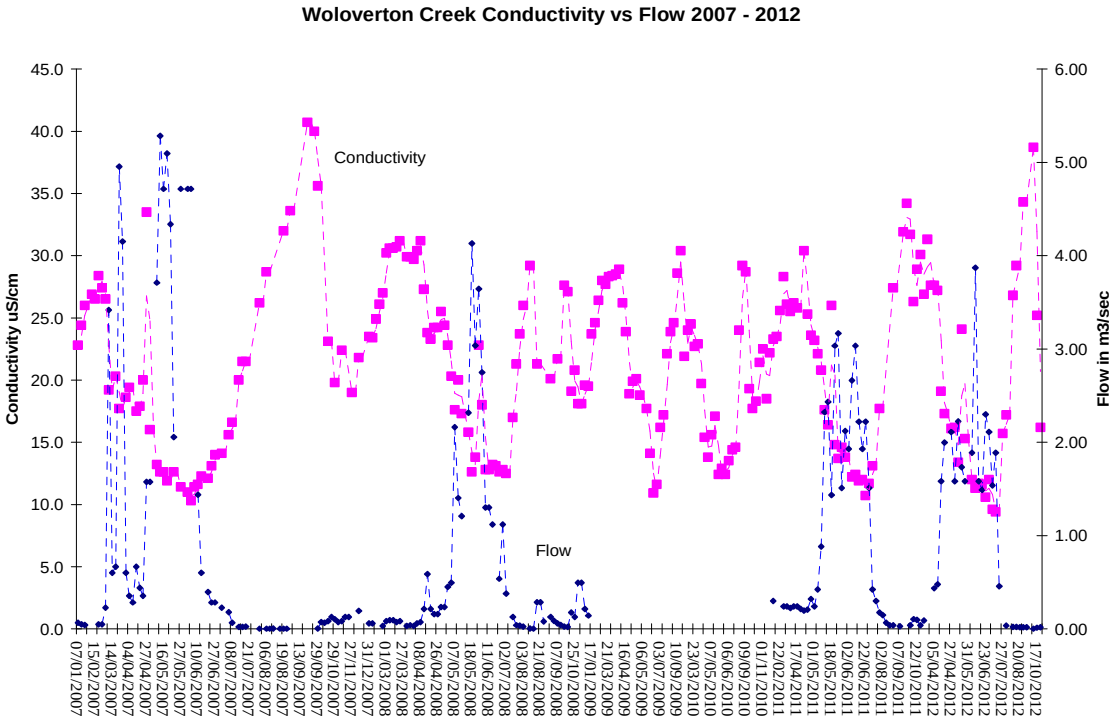
The highest temperature recorded between 2007 and 2012 for Wolverton was 17 degrees C.

The total number of readings between 2007 and 2012 were 188 and 84% were below 10 degrees centigrade.

Conductivity

Conductivity expressed as "specific conductance at 25 degrees C" is a measure of the ability of water to carry an electric charge. It is directly related to the concentration of dissolved minerals.

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. E.g. as flow in increases, dissolved minerals decrease & conductivity decreases. In Fall, when flow decreases, conductivity (and mineral content) rises. Below is the chart for conductivity vs. flow for Wolverton Creek between 2007 - 2012.



This cyclic pattern can be seen for years 2007 through 2012. (Note: flow was not calculated for years 2009 and 2010). The high flow for year 2012 was seen on June 5th, 2012 when water levels rose to 3.87m3/sec and corresponding conductivity dropped to 11.3 uS/cm. After this time, conductivity levels rose for a short time (see chart above) and began dropping to a low of 9.4 on July 1st. They then rose extremely fast.

By the end of September, water levels had dropped to 0.003m3/sec. In fact, the water level was below the gauge and metering occurred below the waterfall and above the gauge. Conductivity readings rose to 38.7uS/cm. This is close to those seen in 2007, when Fall flow was also very low.

These readings illustrate the extreme nature of Wolverton creek's flow regime e.g. rapid increase and drops in flow and conductivity.

Conductivity and Flow cont.

Year	Minimum Conductivity and date occurred (uS/cm)	Maximum Conductivity and date occurred (uS/cm)
2007	10.3 6/03	40.7 9/17
2008	12.5 7/02	31.2 3/18
2009	10.9 5/30	30.4 10/10
2010	12.4 5/20	29.2 9/05
2011	10.7 6/22	34.2 9/20
2012	9.4 7/01	38.7 9/28

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 suspended in the water. Rather, turbidity measures of the scattering effect that such particles have on light.

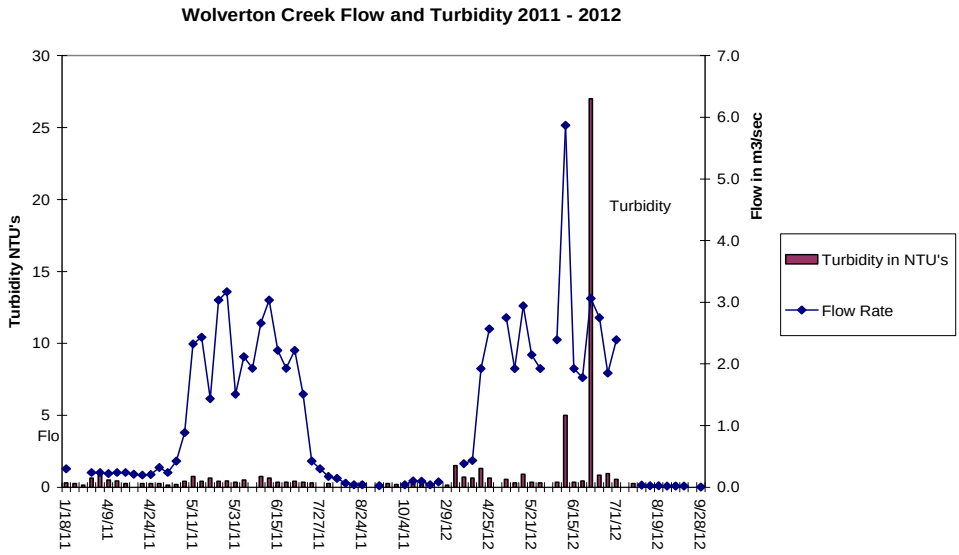
The most important health-related effect of turbidity is its ability to shield microorganisms from disinfection. Turbidity has been shown to be correlated with the contamination of water by *Giardia* and *Cryptosporidium*. Hence, turbidity serves as a measure for indicating the risk of contamination by these pathogens. Ministry Guidelines for Turbidity in drinking water are 1NTU. NTU's stands for "nephelometric turbidity units" and is a scale developed for this test.

Our protocol for this program is to measure suspended sediment on samples over 0.5NTU. In 2012, 50% of samples exceeded this criteria.

In Wolverton for 2012 - 6 of the 28 readings, or 21% of the samples were over 1 NTU. One sample on June 23rd read 27 NTU's.

This was the highest reading we've seen in over 5 years. The chart below shows readings for 2011 - 2012. Note the high turbidity that follows and increase in flow.

In addition, using a criteria of less than 0.25NTU's, as representing very clean water, only 25% of samples met this criteria. See table below.



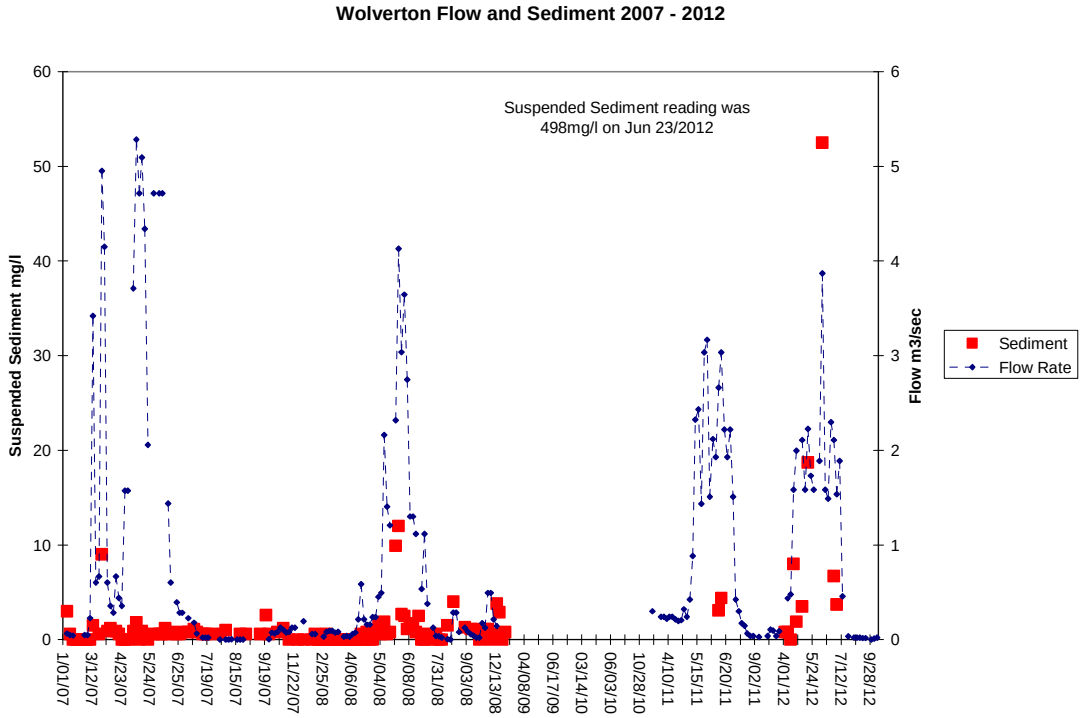
Turbidity Chart

Wolverton Creek Year	Highest Turbidity Reading	%Samples greater than 0.5NTU	% Samples less than 0.25NTU	Number of Samples
2007	2.1	10	50	40
2008	1.4	24	32	53
2009	1.6	22	55	27
2010	1.2	13	50	24
2011	0.95	22	40	35
2012	27	50	25	28

Sediment/Suspended Solids

Sediment or "suspended solids" is a gravimetric measurement of fine sediment. Historically, Wolverton creek suspended solids readings do not have a strong correlation with turbidity.

Sediment is a critical measurement when evaluating stream water and watershed health because it relates to channel morphology and integrity. E.g. high suspended solids cause channels to become unstable. Readings for Wolverton in 2012 were exceptionally high and, as seen in the chart and table below, the high readings were seen fairly early in the year



Suspended Solids Chart

Year	Wolverton Creek Readings Date of occurrence and suspended solids readings over 3 mg/l					
2007	1/07 3.0					
2008	8/21 4.0					
2011	6/6 3.1	6/08 4.4				
2012	4/23 8.0	4/27 3.5	5/15 18.7	6/05 52.5	6/23 498	6/27 3.7

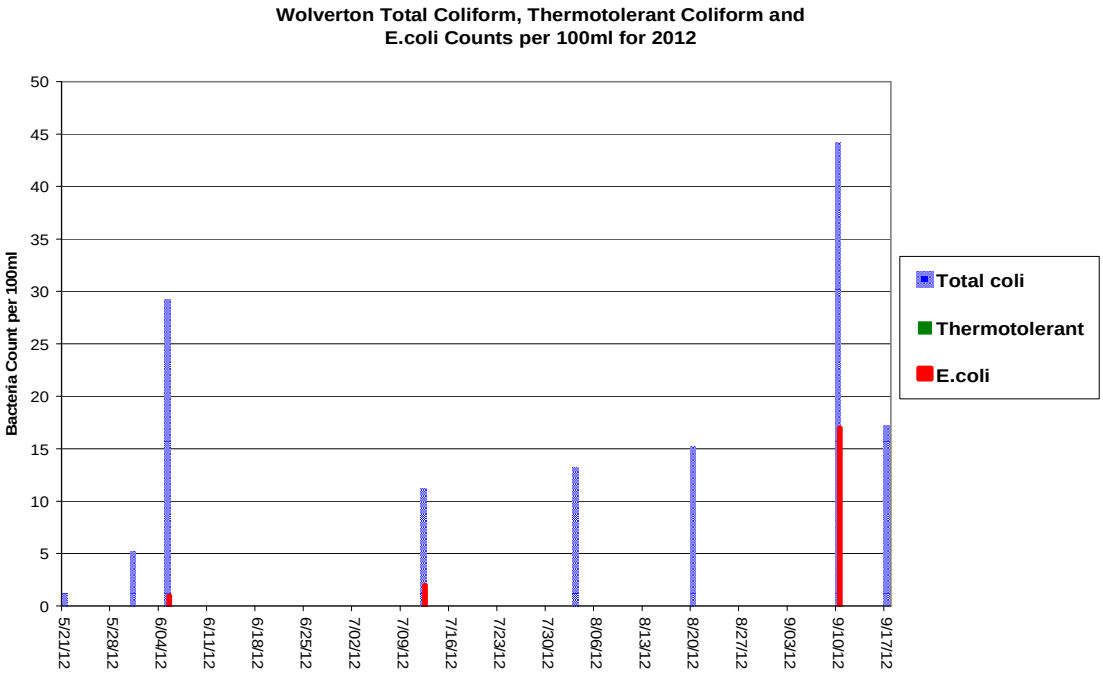
Coliform Bacteria

Coliform refers 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 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 coliforms and E.coli are not permitted.

Normally, 5 samples are tested over 30 days. However, because of the extreme flow and in the interest of catching spring run-off event, nine sample were collected between April 26th and September 17th.

Unlike 2011, when total counts rose above 200, no extremely high total coliform counts were seen in 2012. Three sample did have thermotolerant and E.coli but only 1 sample taken September 10th had a significant count for E.coli. Note: these counts are not necessarily the same as you would see from samples taken at peoples taps.

Regarding these tests, Wolverton Creek water quality continues to be very good.



Coliform Bacteria

Date Sample Collected	Total Coliforms/100ml	Thermotolerant/100ml	E.coli /100ml
April 26, 2012	5	0	1
May 21, 2012	1	0	0
May 31, 2012	5	0	0
June 05, 2012	29	1	1
July 12, 2012	11	1	2
August 03, 2012	13	0	0
August 20, 2012	15	0	0
September 10, 2012	44	10	17
September 17, 2012	17	0	0

References

1. Wolverton Creek Monitoring Summary Report 2010 - 2011, Jennifer Yeow, Passmore Laboratory Ltd.

2. Wolverton Creek Hydrogeomorphic Assessment December 5, 2006, Apex Geoscience Consultants Ltd.

3. Water Survey Canada's website: http://scitech.pyr.ec.gc.ca/waterweb

4. Water quality guidelines from the Provincial Govt's website: http://www.env.gov.bc.ca/wat/wq/BCguidelines/approv_wq_guide/approved.html#1

5. Monitoring Guidelines to Evaluate the Effects of Forestry Activities on Streams in the Pacific Northwest & Alaska L.H McDonald EPA 910/9-91-001