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Haslam Lake Lang Creek Water Quality and Quantity Monitoring Program for 2010

Prepared for

Powell River Salmonid Enhancement Society

Funded by Forest Investment Accounts (FIA) and the Powell River Community Forest

March 28, 2011

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Summary

The Forest Investment Accounts (FIA) and the Powell River Community Forest provide funds to the Powell River Salmonid Enhancement Society for monitoring water quality throughout the Haslam Lang Community Watershed. This report presents 2010 data and discusses progress of the water quality monitoring program to date.

During 2010, the automated monitoring station located at the Salmon Enhancement Society Counting Station at the mouth of Lang Creek continued to record stage, rainfall, turbidity, and water and air temperature on a continuous basis. Stage, rainfall, water and air temperature data was deemed reliable with sensors working properly. As in 2009, the continuous turbidity data for 2010 was unreliable and was rejected in its entirety.

Bi-monthly, on-site sampling has been carried out by the Powell River Salmonid Enhancement Society at six strategic locations within the watershed throughout the 2010 season. This data has been collected from 1997 to present with a two year gap between 2006 and 2008 and provides an excellent historic record of variability of water quality parameters. As well as capturing water quality data at distinct point in time at a number of locations, the repeated visits of the observer to sites throughout the watershed enhanced the understanding of local sediment generation problems.

Water temperature recorders, (Hobos) have been in place in 2010 including one on Anderson Creek, Duck Lake, Blackwater Creek and at the sorting station at the mouth of Lang Creek. This continuous temperature data was of high quality and provided important insights into temperature fluctuations during the critical maximum high water temperatures of summer.

Continuous discharge data from lower Lang Creek showed similar patterns and maximum minimum flows as in previous years with peak maximum flow during the Dec 25/ 26 flood (62 cms) compared with 48 cms in 2009. Low flow appeared to be better controlled than in 2009 by better management of the weir with no discharge detected below 0.5 cms.

As a result of non-participation of the Ministry of Environment, no water samples were analyzed by laboratory in the 2010

All digital data, well beyond what can be presented here, is archived at the office of the Powell River Salmonid Enhancement Society.

Recommendations are provided to fine tune efficiency of the monitoring program. If the budget is not sufficient to install and calibrate a new turbidity meter, the existing in stream turbidity meter should be removed. While the weir at the sorting station has held up in spite of some major peak flows in 2010, smaller channel changes may have occurred and may require recalibrating, particularly at the low discharge portion of the curve.

I. INTRODUCTION

Forest Investment Accounts (FIA) and the Powell River Community Forest provided funding to the Powell River Salmon Enhancement Society in 2010 to monitor water quality within the Haslam Lang Watershed. The purpose of water quality monitoring is to

- provide information for resource management planning and decision making at the community and regional level;
- establish baseline levels in support of specific criteria/objective development and attainment reporting;
- provide information on the status, health, trends and uses of water resources;
- employ and train persons from local communities to foster interest and involvement in community watersheds.

This report presents a range of data collected during the 2010 monitoring season, comments on management significance of data and makes recommendations for ongoing monitoring.

II. BACKGROUND

The Study Area lies immediately east of Powell River. It is confined to the drainages associated with Haslam Lake and Lang Creek, comprising a total area of around 12,800 ha. Elevations range from sea level at the mouth of Lang Creek to 1103 meters on Tin Hat Mountain. Most of the area falls within the Coastal Western Hemlock Biogeoclimatic zone. Douglas fir, red cedar, western hemlock and alder are the most common tree species found. Along the highest ridges on the north east portion of the watershed, one encounters the Mountain Hemlock Biogeoclimatic Zone. Most of the watershed has either been logged or burned in the last 80 years although small isolated patches of old growth remain. A network of forest roads is maintained within the watershed. An even more extensive network of old skid trails occurs at lower elevations throughout the watersheds and these are now used extensively for recreation activities.

- Most of the watershed (excepting land immediately adjacent to Lang Creek) is comprised of crown land. Forestry for timber extraction is likely to be the major industrial use of the watersheds for the foreseeable future. Forest Development Plans have been drawn up, indicating future cutblocks and required access roads. The Ministry of Environment, Lands and Parks, (MoELP) completed the first Coastal Watershed Assessment Procedure (CWAP) in 1997. The results from this study indicated that the forest harvesting activities planned was conservative, and unlikely to influence hydrological characteristics of the watershed. Mining does not play much of a role on the area. Small rock quarries are used for the extraction of road ballast. Agriculture is restricted to a few small hobby farms along lower Lang Creek. Settlement (low density) is likewise confined to the southern strip adjacent to Lang Creek and even less so along the southern slopes of Haslam Lake. Being close to the population center of Powell River, the Haslam Lang area is popular with recreationists for riding ATVs, hiking, and non-motorized boating. Fisheries resources are substantial, particularly in the lower watershed. A large salmon population is supported along the course of Lang Creek within the lower 8 km of channel and adjacent tributaries. Major investment has been made in a fish hatchery, a counting station and an artificial spawning channel on Lang Creek. In 2000, Lang Creek was classified as a sensitive stream because of its high fisheries values. In the summer of 2000, a second Coastal Watershed Assessment Procedure (CWAP) was carried out which

supported the conclusions of the first CWAP. It also stressed that good management would be more important to the continued health of the watershed than the actual amount of watershed logged or roaded. The Community Forest, which is a major licensee, has recently conducted an assessment of its roads positioned within the watershed area which showed that the great majority of roads were being well managed. No substantial sediment sources from these roads or cutblocks had an impact on water quality at the Powell River Water intake or on Lang Creek itself. Some of the more intractable problems were often related to recreation uses.

III. METHODOLOGY

This project was instigated to provide a continuation for a monitoring program than ran between 1997 and 2001 and restarted in 2008 within the Haslam Lang Community Watershed. Between 2001 and 2006, the Powell River Salmonid Enhancement Society maintained a small water quality data collection program. The water quality data that has been collected to date provides a reliable base line documenting water quality at strategic locations within the Haslam Lang Watershed. The sites chosen for water sampling were almost the same as those developed in the original program and are located on the map on Figure 1. The sampling schedule is presented in Table 1.

Figure 1. Location of Monitoring Stations within Haslam Lang Community Watershed

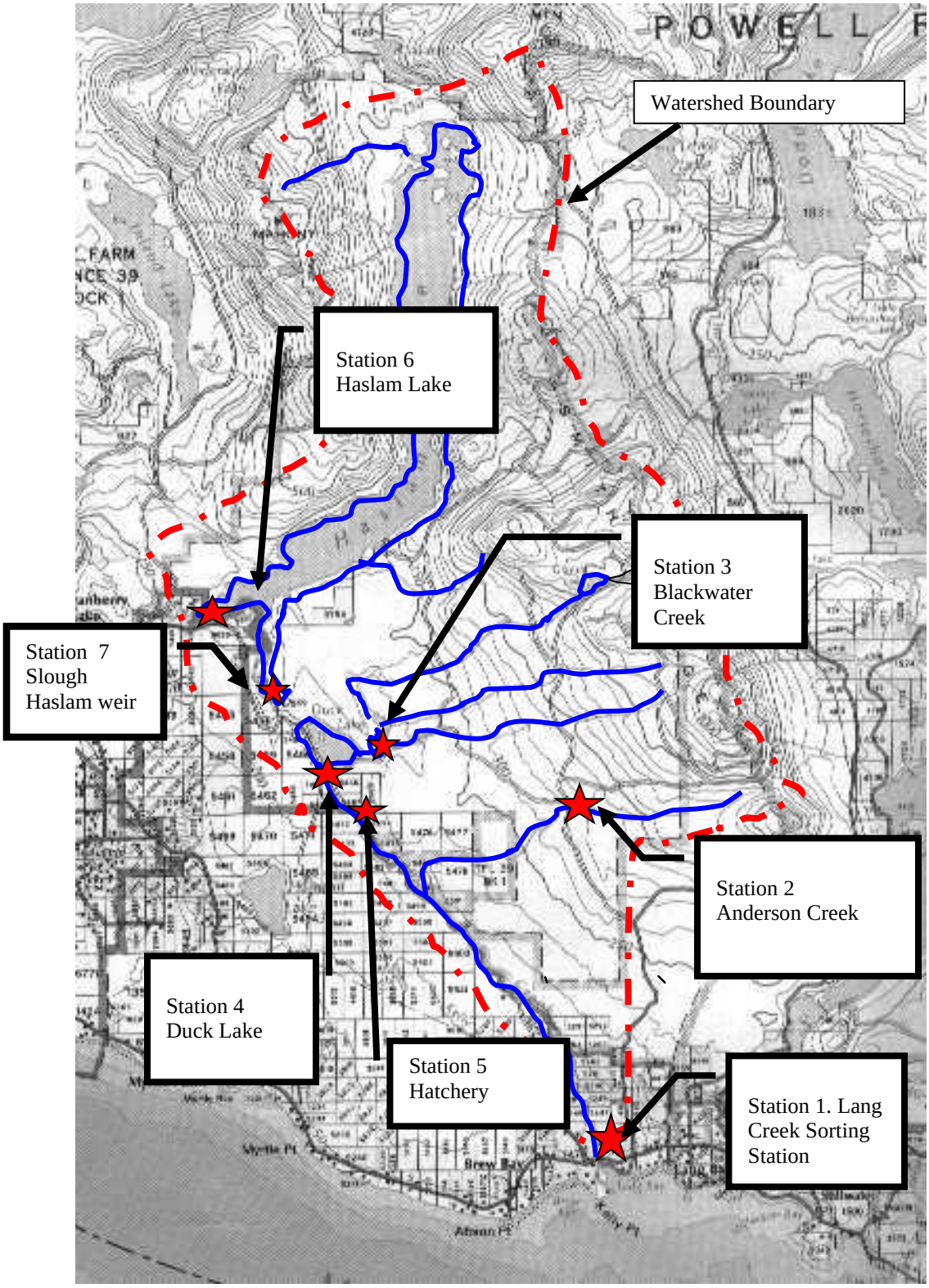


Table 1. Schedule for Monitoring Sites

Station	Sampling Interval	Sampling For
Station 1 Lang Creek Sorting Station Provincial Identification Number E220912	Continuous Bimonthly	Water temperature, stage, air temp, rainfall Turbidity Portable meter to check on continuous recorders
Station 2 Anderson Creek Provincial Identification Number (4 km upstream of E220913)	Continuous Bimonthly	Temperature by Hobo Portable meter for turbidity, pH, specific conductivity, temp and discharge
Station 3 Black Water Creek Provincial Identification Number E220914	Continuous Bimonthly	Temperature by Hobo Portable meter for turbidity, pH, specific conductivity, temp and discharge
Station 4 Outlet of Duck Lake Provincial Identification Number E220915	Bimonthly	Portable meter for turbidity, pH, specific conductivity, temp, and discharge
Station 5 Upper Lang Creek Hatchery	Continuous	Temperature by Hobo
Station 6 Haslam Lake (near intake)	Bimonthly	Portable meter for turbidity, pH, specific conductivity ,temp
Station 7 Weir on Haslam Lake (Slough)	Bimonthly	Portable meter for turbidity, pH, specific conductivity ,temp

IV. SAMPLING PROCEDURES

1. Water sampling for laboratory analyses

No laboratory analyses were conducted in 2010 by the Ministry of environment. This is considered a significant shortcoming of the monitoring program but was beyond the control of the Society.

2. Analysis using portable meters

Bi monthly analysis of water temperature, pH, turbidity and salinity were conducted using portable meters. Before sampling, the meters were calibrated with standard solutions following directions supplied by the meter manufacturers.

3. Automated samplers An automated stage, rainfall and turbidity recorder is located at the mouth of Lang Creek. (Sorting Station) Data loggers (Hobos TM) were used to record hourly water temperature on Anderson, Blackwater and on Lang Creek at the Hatchery near Duck Lake.

V. RESULTS AND DISCUSSION

Results and discussion of data collected during the course of the monitoring program are presented below. Not all data is presented here because of the sheer volume. Some water temperature data was collected at a 15 minute interval, others hourly over the whole year. All of the original digital information used to develop these figures and tables is available at the Powell River Salmon Enhancement Society office.

A. Water Quality

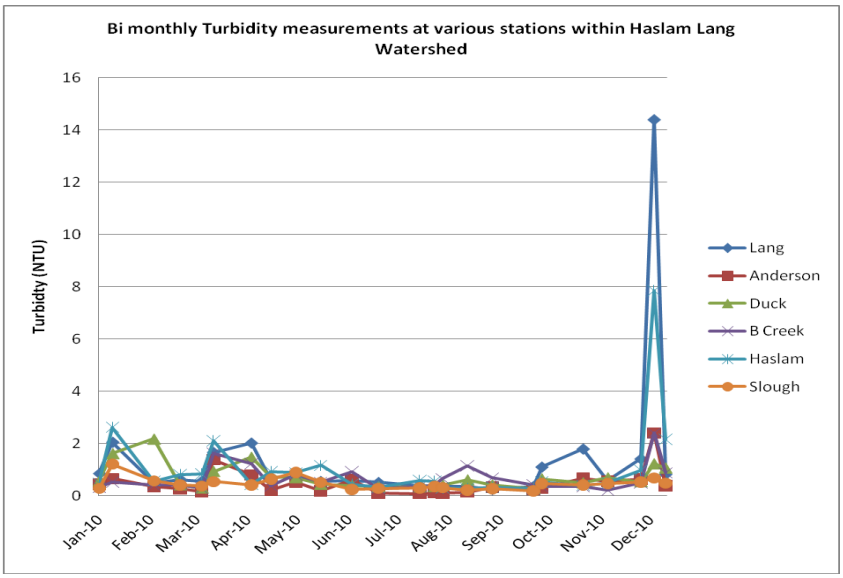
1. Laboratory Results: Water Chemistry and Biology

No laboratory analyses were conducted by the Ministry of Environment (or their equivalent) in 2010.

2. Turbidity measurements with portable meter

On Figure 2 all bi monthly turbidity samples collected are presented for 2010. The most obvious characteristic of all sample sites is that turbidity events are uncommon between May and September. Turbidity events, when they occur are associated with heavy precipitation, overland flow and greater discharge. Generally, turbidities at all stations are less than 1 NTU, although occasional turbidity peaks in excess of 5 (which exceeds Ministry of Health guidelines) occur on Lang Creek. In the 24 samples collected in 2010 at the Lang Creek Sorting Station, 3 samples exceeded 2 NTU and one sample exceeded 14 NTU. Elevated turbidity levels were recorded on Haslam Lake during a storm when a backhoe was installing a fence nearby. The small turbidity event on Black water Creek (1NTU) in the summer is most likely a result of dust generated on the Duck Lake FSR. These turbidity values are similar to 2009.

Figure 2. (2010 Bimonthly turbidity data)



On Figure 3 only data from the head waters and mouth of Lang Creek are presented. As in previous years, it is apparent that the turbidity events occuring at the mouth of Lang Creek were generated along the channel of the Lang Creek and its tibutaries and not upstream of Duck lake

which acts as an effective buffer. Although Black water Creek generated some turbid water, it was not transported as far as the Duck Lake outlet. The sampling location for Haslam Lake was moved back to the head of the lake near the Powell River Intake for 2010.

Figure 3 (2010 Bimonthly Turbidity Data for Duck and Lang Creek Stations)

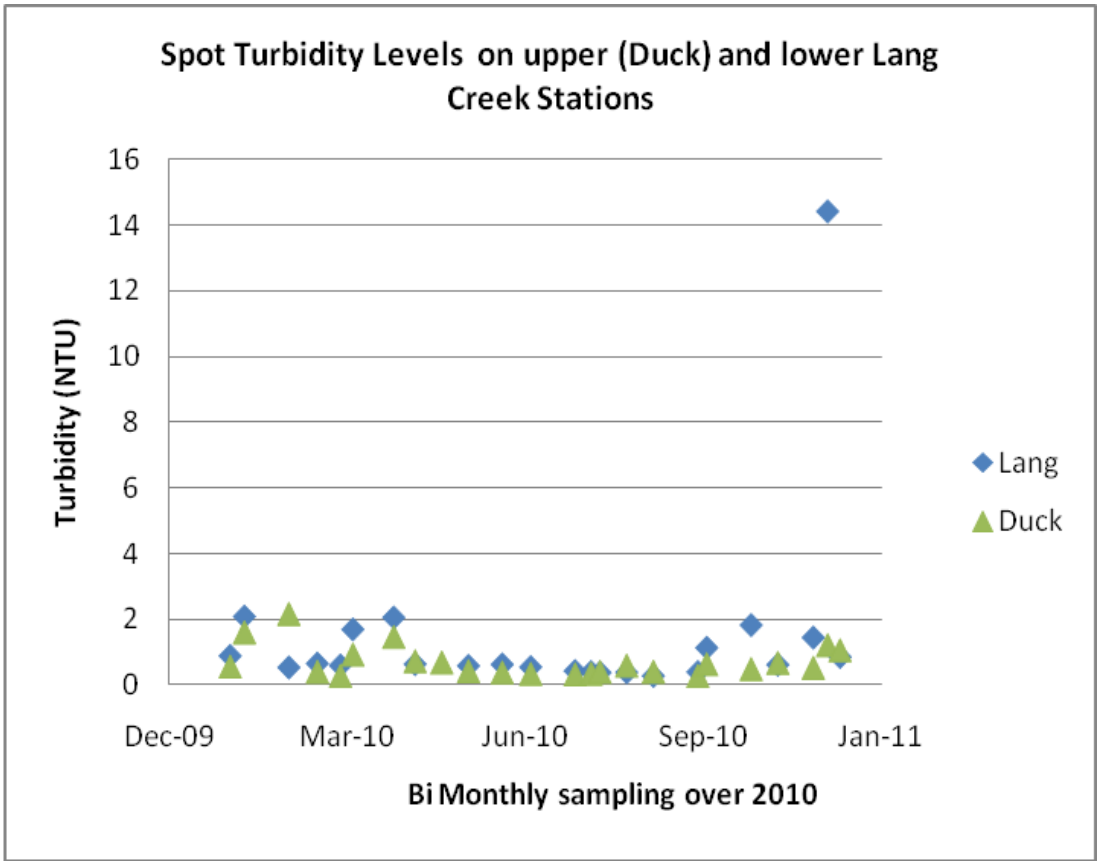
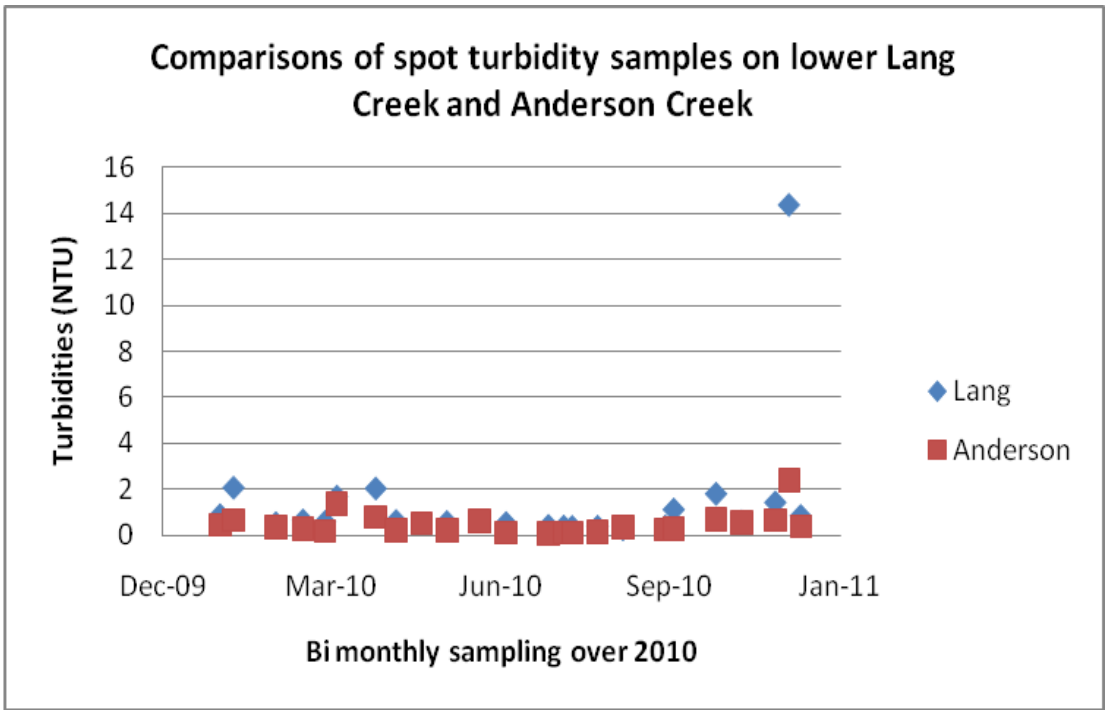


Figure 4 shows that for 2010, Anderson Creek always had a lower turbidity value that the main stem of Lang Creek. Nornal "background " levels are generally less than 1 NTU (in the 2009 data set, Anderson Creek turbidity exceeded Lang Creek turbidity once). In the two instance with a slightly elevated turbidity on Anderson Creek, Lang Creek was also experiencing higher turbidities. While all streams in direct connection with Lang Creek will immeddately contibute their full sediment load to the main stem of Lang Creek, the more usual reason for turbity peaks on Lang Creek is sediment generated within the main channel of Lang Creek itself.

Figure 4 (2010 Bimonthy Turbidity Data for Lang andAndersn Creek)



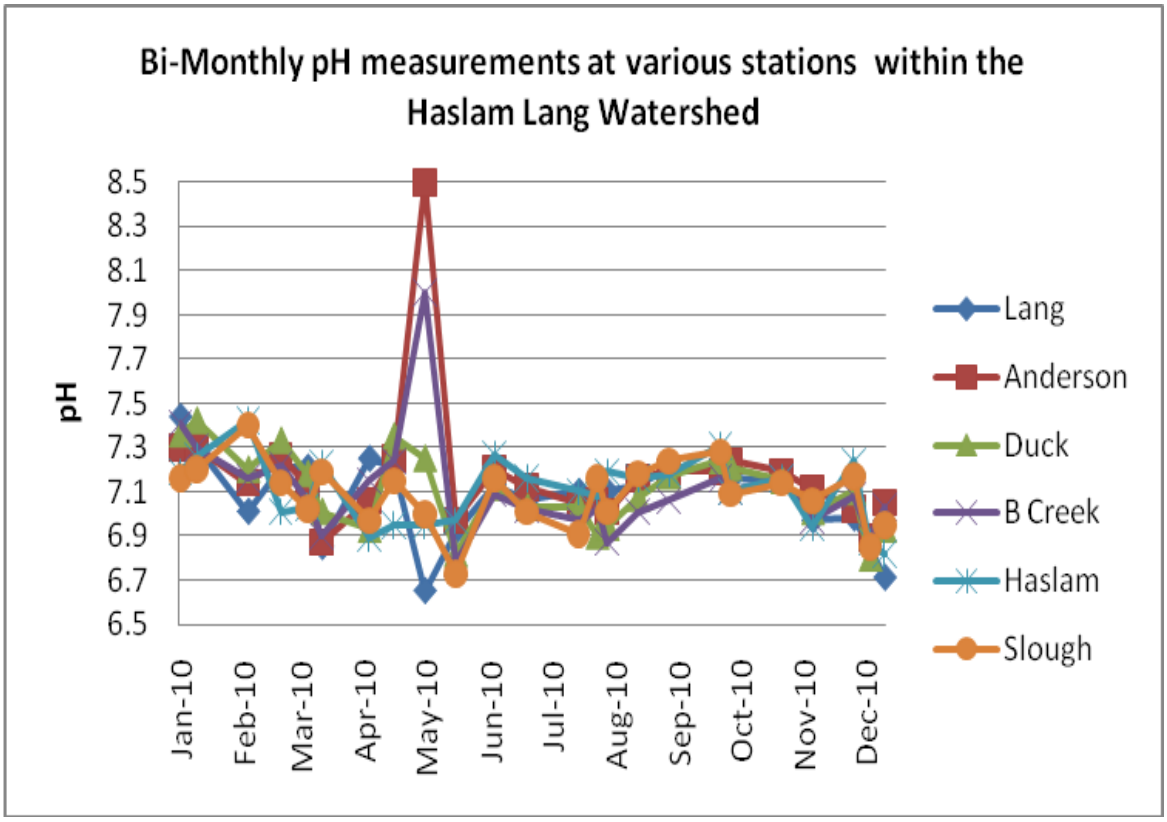
3. Continuous Turbidity Meter at Sorting Station on Lower Lang Creek

The continuous turbidity meter located on Lower Lang Creek mis-functioned and could not be calibrated. It did not provide any reliable data for 2010.

4. pH with Portable Meter

Figure 5 shows the annual variability in pH for the 6 sampling sites within the watershed. The water pH generally near neutral to slightly acid. Two anomoies show up on this data set which almost certainly a result of the limestone based surfacing material used on the Duck Lake FSR. Small particulate particles of limestone from the road surface has found its way into the stream during those sample events. These increased values of 1 pH unit are unlikely to have any measurable impact on those streams but should be considered if any change in biological activity is noted on those streams.

Figure 5 (2010 Bimonthly pH at various stations within Haslam Lang Watershed)

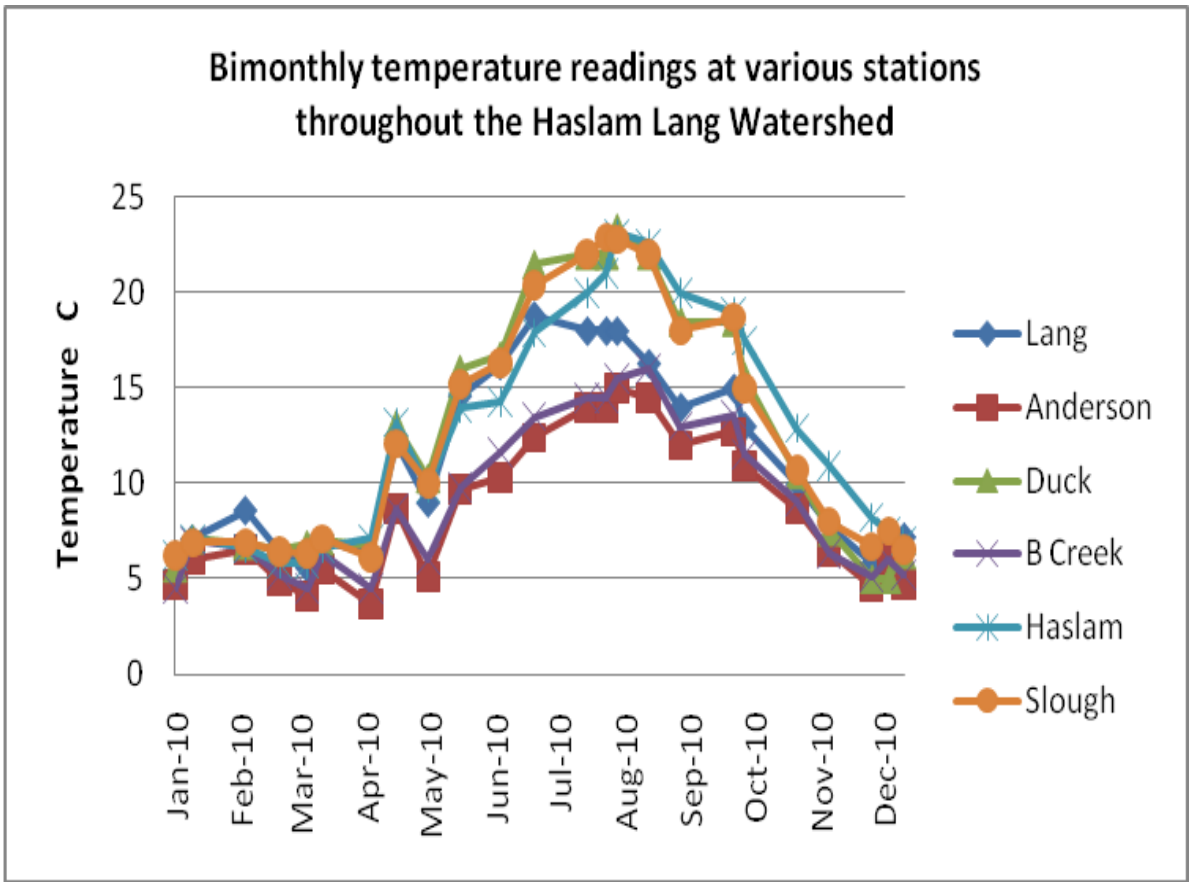


B. Water Temperature Monitoring Results

1. Bimonthly Manual collection from 6 sites within the watershed

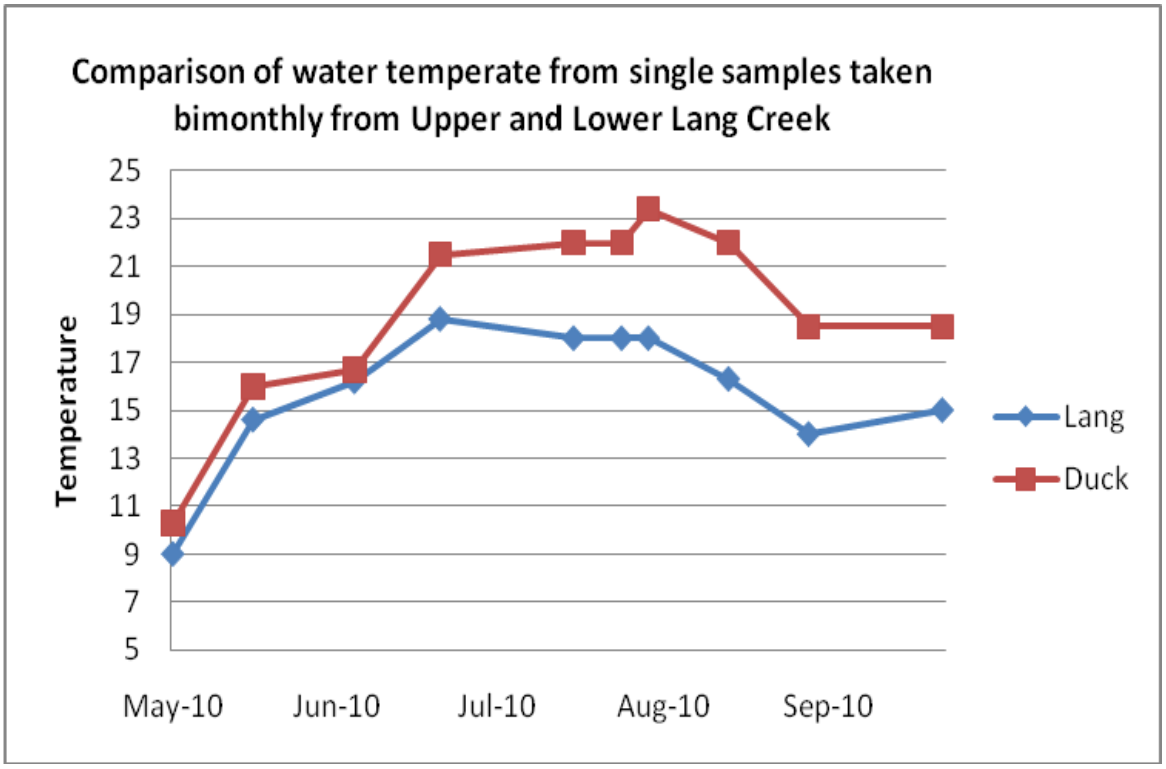
Figure 6 shows the range of, and variability between the major sampling sites over 2010. Highest summer temperatures (>22 ° C) are recorded at the surface of lakes, (Haslam, Slough, Duck) lowest summer temperatures from small streams under forest cover (Anderson and Blackwater Creek) and intermediate summer temperatures on streams where warmer lake water is cooled as it flows through forested riparian zone (Lang).

Figure 6 (2010 Bimonthly Water Temperature at Sampled Stations)



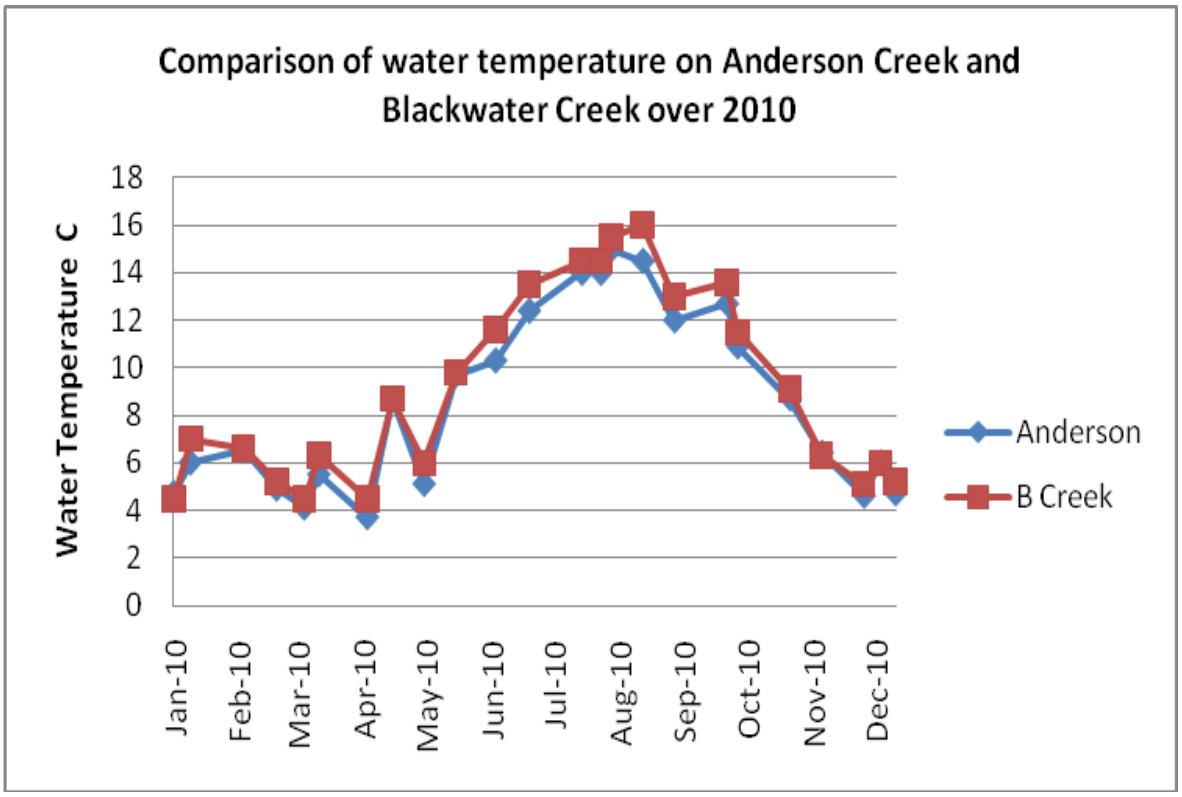
On Figure 7 the cooling effect of Lang Creek water passing from its outlet on Duck Lake to the mouth at the sorting station is portrayed. During the hottest period in the summer, Lang Creek can be cooled as much as 4 degrees centigrade along its passage between Duck lake and the mouth. Evapotranspiration and direct shading from riparian vegetation likely influence this cooling effect as well as additions of much cooler water from Anderson Creek and two other unnamed creeks east of Anderson Creek and ground water seeping directly into the channel. Previous reports have stressed the importance of these small streams as cool water havens for salmonids during otherwise high water temperatures.

Figure 7 (2010 Bimonthly Water Temperature for Upper and Lower Lang Creek)



On Figure 8 water temperature data for Anderson and Black water Creek is compared. Anderson Creek is always slightly higher than Black water creek. This small difference is probably a combination of the location of the sampling site for Anderson Creek being slightly higher up in the watershed and the stream source itself being at a higher elevation.

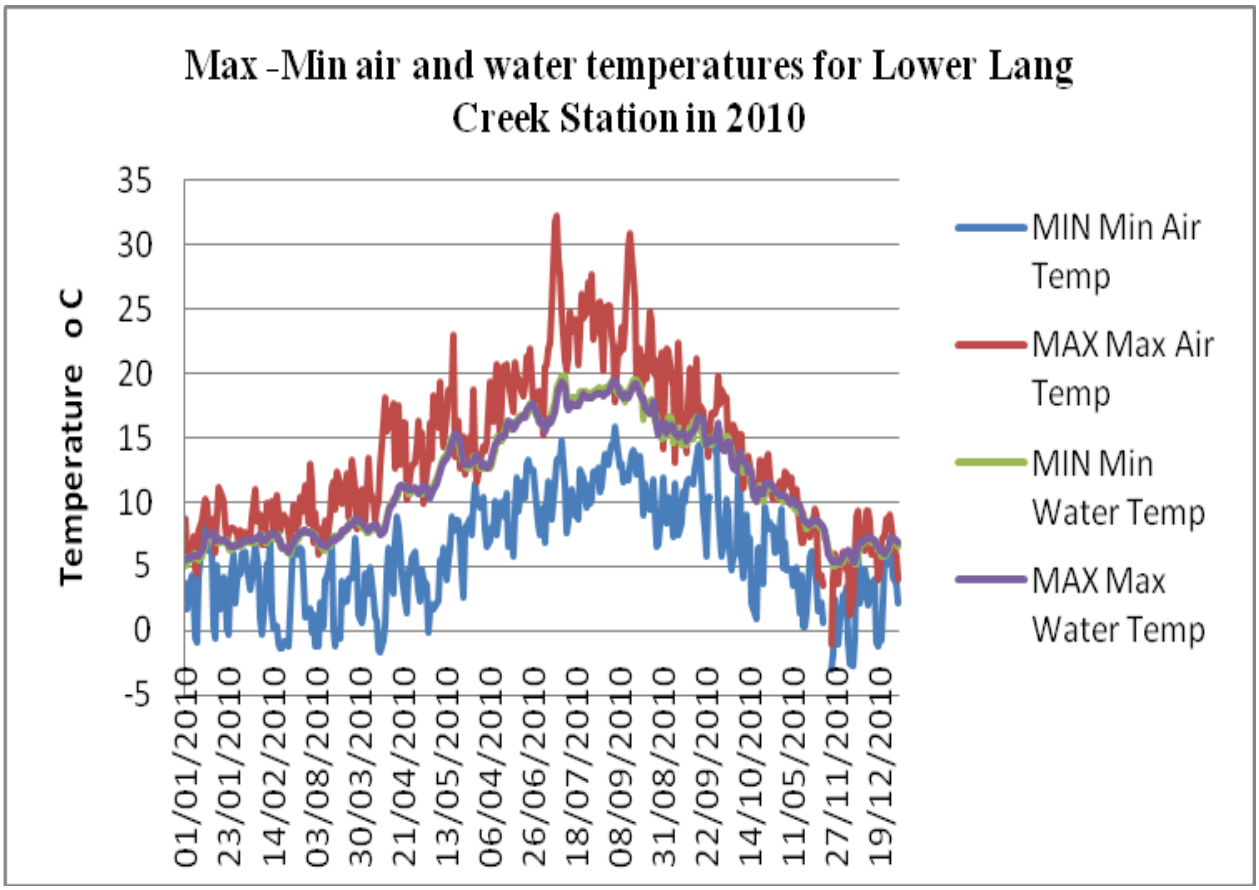
Figure 8 (2010 comparing Bimonthly Water Temperature on Anderson and Blackwater Creek)



2. Continuous Temperature data from Lower Lang Creek (Sorting Station)

Figure 9 provides daily minimum and maximum air and water temperatures collected from the Sorting Station on lower Lang Creek over 2010. Air temperatures peaked at over 32 ° C in midsummer whereas water temperatures did not exceed 20 ° C at any point throughout the year. Diurnal variation in air temperature occasionally exceeds 20 ° C whereas the diurnal fluctuation in water temperature really exceeds 2 ° C.

Figure 9. 2010 Max Min Air and Water Temperatures for Lower Lang Creek



On Figure 10, water and air temperature data is provided for the warmest four day period of the year. Diurnal fluctuations in air temperature were over 17 ° C whereas diurnal fluctuations in water temperatures were always less than 2 ° C . The warmest lower Lang Creek water temperature recorded in 2010 was just under 20 ° C (which is considered to the be the upper threshold for coho salmon). As shown in Figure 11, daily peak water temperatures exceed 23 ° C for 3 consecutive days in the summer of 2009.

Figure 10 (15 minute interval collection of air and water temperature between August 13 and 16, 2010 for lower Lang Creek).

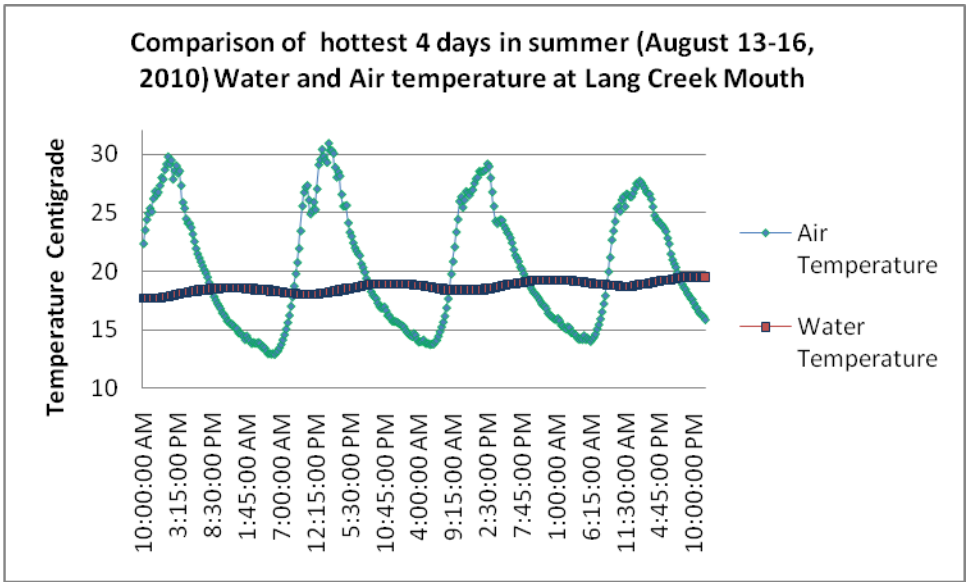
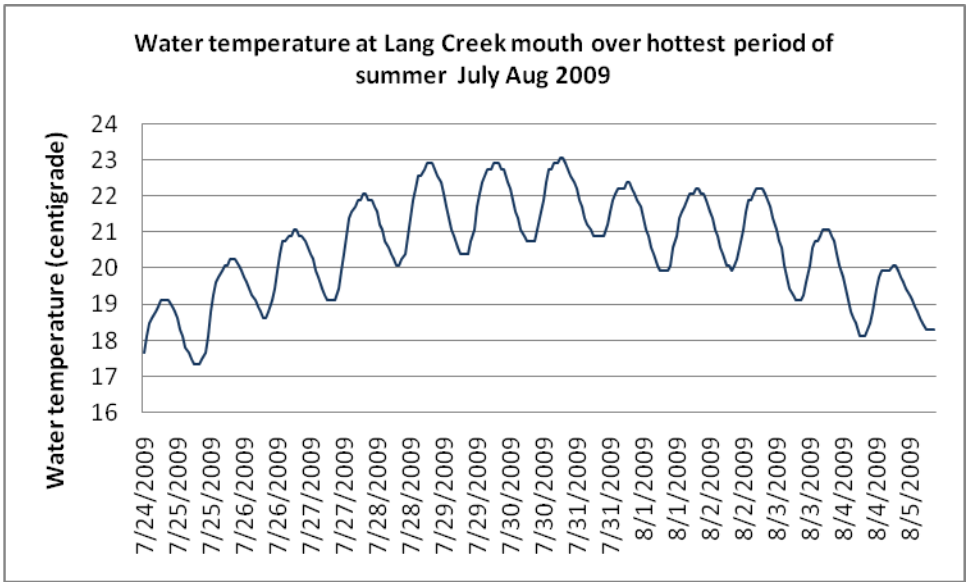


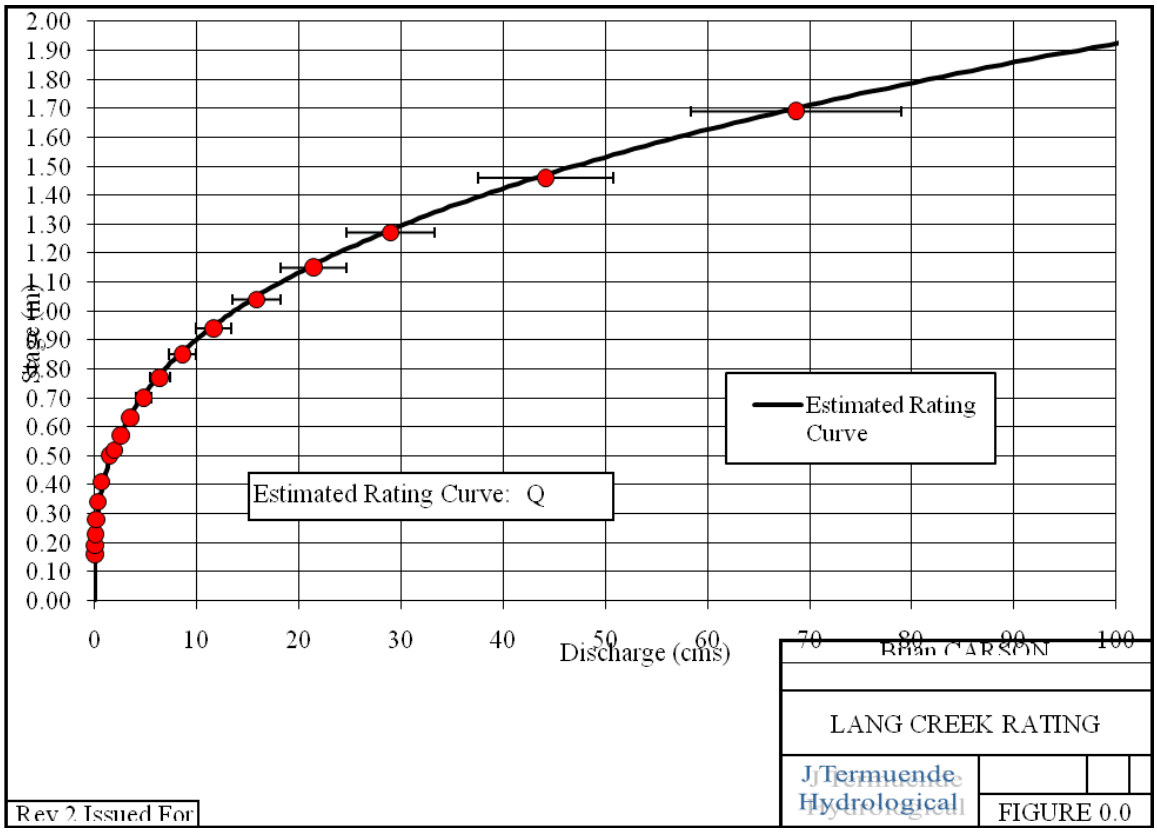
Figure 11



D. Discharge of Lang Creek over 2010 Season

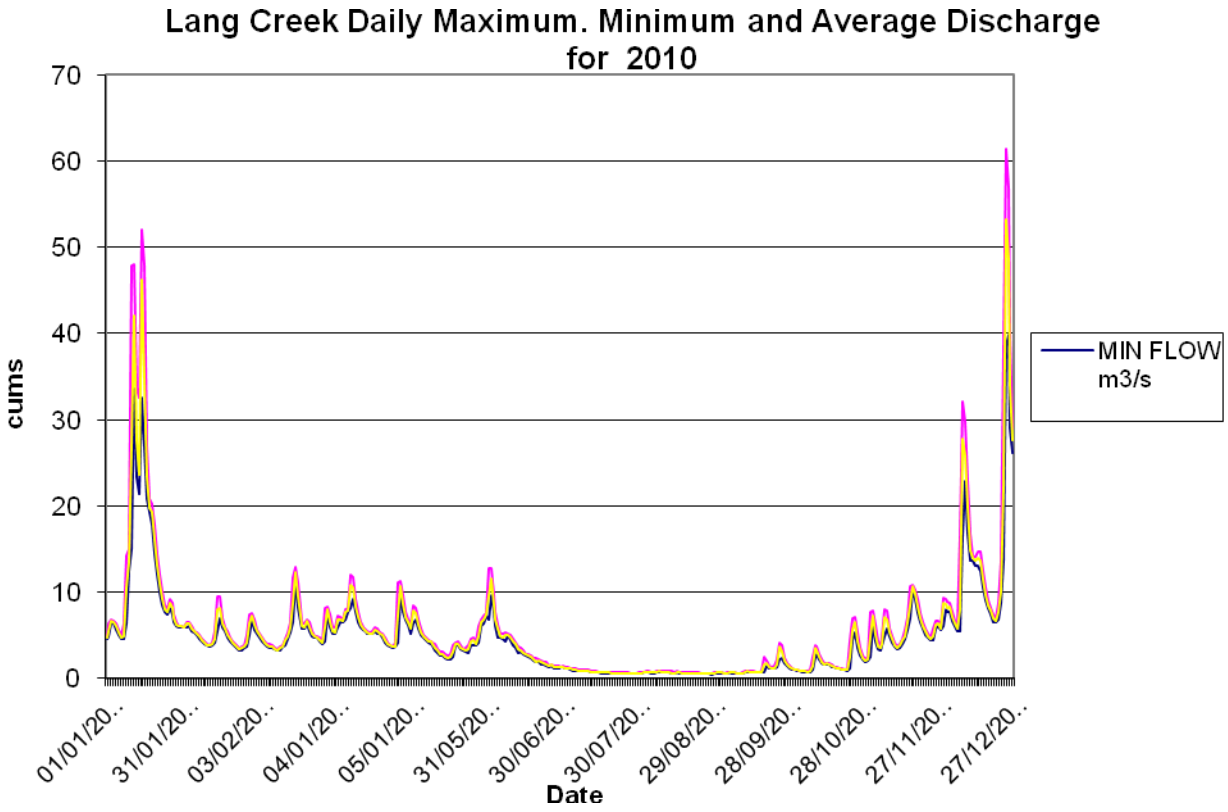
The original stage discharge curve developed for Lang Creek is presented on Figure 12. It is assumed that the configuration of the channel bed has not changed drastically since this original curve was constructed and higher flows should be relatively good. However, there may need to be some fine tuning at the low flow stages where small changes in the channel configuration resulting from winter storm flow can result in proportionally larger changes in the stage-discharge curve at flows below 1cms.

Figure 12. Stage Discharge Curve for Lower Lang Creek



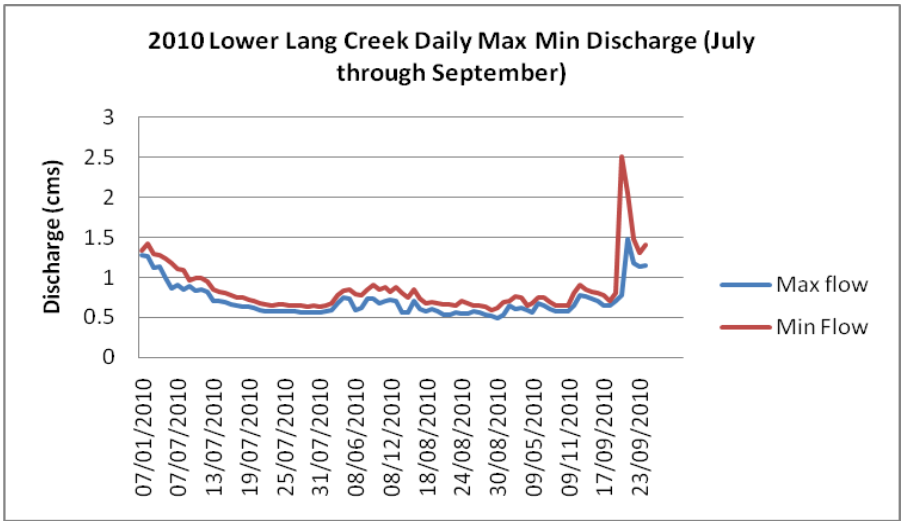
On Figure 13 the hydrograph showing daily max- min discharge over 2010. This hydrograph is similar to 2009

Figure13



On Figure 14 the critical low flow period July 1 through September 10, 2009 on lower Lang Creek is presented. For over 60 days flows were under 1 cms. Because exceptional low flows have a profound effect on resident salmonids and salmon returning to spawn, it is important that this data is a precise as possible when managing summer discharge from the Haslam weir.

Figure 14



VI. CONCLUSIONS AND RCOMMENDATIONS FOR THE 2010 SAMPLING YEAR

The 2010 season was successful at collecting high quality data and the Powell River Salmon Enhancement Society should be commended for a job well done as a volunteer organization. The data collected in 2010 supports a general conclusion that water quality is not significantly impacted by its various users at this time.

Opportunities to upgrade management of the monitoring network include:

1. The bimonthly sampling conducted at 6 stations throughout the watershed continues to provide an important record of water quality and its variability throughout the year. An equally important role is getting personnel into the field to observe the effects of roads and road use on water quality. These activities are and should remain central to the water quality monitoring within the Haslam Lake, Lang Creek Watershed
2. The Powell River Salmonid Enhancement Society has expressed concerns that they are noticing significantly reduced field visits by Ministry personnel responsible for maintaining fish habitat and water quality in the Haslam Lang Watershed. It is understood that there have been major structural changes within the government services and it is hoped that the society's concerns are dealt with in the coming year.
3. The Society should re-build stage discharge curve for low flows at the Lang Creek Sorting Station (i.e. with flows less than 1 m^3/sec). This is a relatively easy process and can be done by a non specialist. Once properly calibrated, it would be useful and interesting to compare discharge measured at the Powell River Weir on Haslam Lake with that measured at the Sorting Station at the mouth of Lang Creek. Precise data will be crucial when discussing management of the weir with Powell River District.
4. Given the general lack of funds, it is recommended that the continuous turbidity probe at the Sorting Station on Lang Creek be decommissioned.
5. Laboratory analysis of water samples should be restarted to capture at least 2 characteristic hydrological events at the 5 sampling sites. Most important events to be targeted for sampling include summer low flow and winter peak flow at the selected stations.