Temperature Profiling
Within the
Trout Creek Sub-Watershed 2012

Prepared by the
Kennebecasis Watershed Restoration Committee
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A partnership project between the KWRC and Agriculture and Agri-Foods Canada

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1.0 Introduction

In 2011, temperature profiling was conducted at five locations within the Trout Creek Sub-Watershed. This was done by strategically placing five temperature data loggers in locations on three separate tributaries of the Trout Creek. These were left in the stream for a total of 84 days, taking temperature readings every fifteen minutes. This project was taken on in effort to obtain baseline data to determine fluctuations in water temperatures from the head of a system to a lower location. The data obtained from the five data loggers was organized, condensed and analyzed. These were compared to historical data as well as air temperature data. A follow up to this effort was conducted in 2012 and this report will compare the data from each site as well as compare year over year temperature profiles. In 2012 there were 6 temperature loggers placed and data was collected from each.

2.0 Data Collection and Review Process

    2.1 Installation and Data Collection

All temperature readings were taken using TidbiT v2 Temp Loggers. A three foot piece of rebar was hammered into the substrate until only 2-4 inches was exposed. Once the rebar was in place, a zip-tie was used to attach the logger to the rebar. It was ensured that they were installed low enough that they would remain submerged at all times, even during low flows.

A sampling period of 200 days was used, from April 5th to October 22nd, 2012. During this period, the loggers recorded the water temperature in the stream at half hour intervals. The data was then filtered to reflect daily mean and daily max temperatures in degrees Celsius.

The loggers were all tested before being installed into the streams and a data dump was conducted in July to insure they were still operating. This practice was to prevent a loss of a sampling year as occurred in 2011.

    2.2 Data Analysis

Once removed from the streams, the data loggers were downloaded to the computer via the Hoboware Software. Through this program we were able to quickly copy data series into corresponding tables, filter the data to attain daily means and daily maximum temperatures, and then export them into an MS Excel spreadsheet so they could be presented more aesthetically.

Each logger had more than 8000 readings thus the need to filter the data to 200 mean and 200 maximum readings. This allowed for better graphing and analysis. Further to the daily mean and max, the KWRC counted the days for each site that registered above 18*C and 20*C and flagged each of these. These temperatures are considered flag levels for various issues such as fish health problems and algal blooms.

Air temperature data was retrieved from the Environment Canada weather office website. By searching the online Climate Data Archives, daily high, low and average air temperatures for each day of water temperature profiling were obtained. These air temperatures were recorded from the Mechanic Settlement station as it was the station in closest proximity to the sampling area. Rain fall information was also collected from this same Environment Canada resource.

Graphs were generated in order to compare air and water temperatures as well as fluctuations within the streams. These can be found in later sections of the report and the complete data sets can be found in the appendix. Efforts were made to also compare temperature data from past years on each site. Using the annual mean from the same time frames for each site a chart was generated to illustrate these trends. It should be stated that, at this time, there is not enough annual data to draw any conclusions. The charts are included in the appendix however.

3.0 Description of the Study Area

3.1 Environmental Conditions

The Kennebecasis River and its tributaries meander through a collage of geological land types and anthropogenic land-uses including vast agricultural lands, industries, recreational areas and municipalities (i.e. Village of Sussex Corner, Apohaqui, Norton, Bloomfield and the towns of Sussex and Hampton). Approximately seventy-eight percent of the watershed consists of forested lands with seventeen percent consisting of agricultural and occupied lands. The Kennebecasis Watershed is the home to a variety of different activities that directly and indirectly affect water quality. Agricultural, residential and other occupied lands directly influence the water quality of the watershed through cattle grazing, riparian vegetation removal and agricultural and municipal runoff. Residential areas such as Penobsquis, Sussex, Apohaqui, Norton and Hampton as well as rural residences, dot the entire length of the Kennebecasis River and its tributaries. Industries such as a potash mine, saw mills, and fish hatcheries are littered throughout its reaches. Recreational industries including two golf courses are also found on the Kennebecasis tributaries.

The Habitat Assessment report completed by the KWRC in 1995 indicated that elevated stream temperatures were a limiting factor to the health of the Kennebecasis. Since that time the KWRC has engaged in numerous restoration projects and recent temperature profiling will help gauge the success of such efforts.

3.2 Trout Creek Sub-Watershed

The land use in this sub-watershed is broken down as follows:

- 84% Forestry
- 11% Agriculture

- 4% Occupied
- 1% Water/Wetland

The hills around the headwaters of Trout Creek are over 350m (1150'). The valleys are often steep sided and many rock outcrops can easily be seen driving up the watershed. Trout Creek might easily be considered the most dramatic watershed within the Kennebecasis system. In its 29.1km length it drops from approximately 360m to just under 15m. There are 6 key tributaries to the Trout Creek sub-watershed.

Table 1.0: Lengths of major tributaries to the Trout Creek sub-watershed.

#	Name of Tributary	approx. length (km)
1	Main stem Trout Creek	29.1
2	Cedar Camp Brook	15.5
3	Shannon Brook	5.0
4	Parlee Brook	13.0
5	Mill Brook	7.6
6	Parson's Brook	8.0
7	Ward's Creek	19.1

3.3 Site Selections

The sites selected for the 2012 temperature profile study included an upper and lower site for three stream systems. These sites replicated the sites completed in 2011 so that we could build upon the data collected through that effort. One exception to this was the Upper Trout Creek site to do a poor performing data logger in 2011 we have no data for that year at that site.

3.3.1 *Ward's Creek Tributary*
The upper site on this tributary is located just upstream of Route 111 near the junction of Route 111 and Ward's Creek Road. The small tributary recently underwent a restoration project below the upper site and the lower site, located just above the agricultural fording site and approximately 670m below the upper site, will indicate the temperature variation between healthy and restored sites.

3.3.2 *Shannon Brook*
Shannon Brook is a smaller tributary to Trout Creek that has received little attention in the past. In an effort to gain more information on this stream the KWRC placed two hobos, approximately 730m apart, along its lower reaches. It is felt that this small stream is crucial to maintaining colder temperatures in the Trout Creek system as it is spring fed and has a relatively healthy riparian zone.

3.3.3 *Trout Creek*
The upper site on Trout Creek is below both Parlee Brook and Cedar Camp Brook, both of which are large, cold water tributaries. To determine the impacts of the various land use changes the lower site was placed in the center of down town Sussex. It is expected that the variation between these two sites will be large and it is hoped that over time this variation and mean temperatures will decrease as our restoration sites mature.

MAP 1: Temperature hobo locations on Ward's Creek with WC-Temp 1 being the upper site and WC-Temp 2 being the lower site. Green lines indicate section of stream with riparian restoration work and the red ovals are fording sites.

MAP 2: Temperature hobo placements on Shannon Brook. The green line indicates riparian restoration work sites.
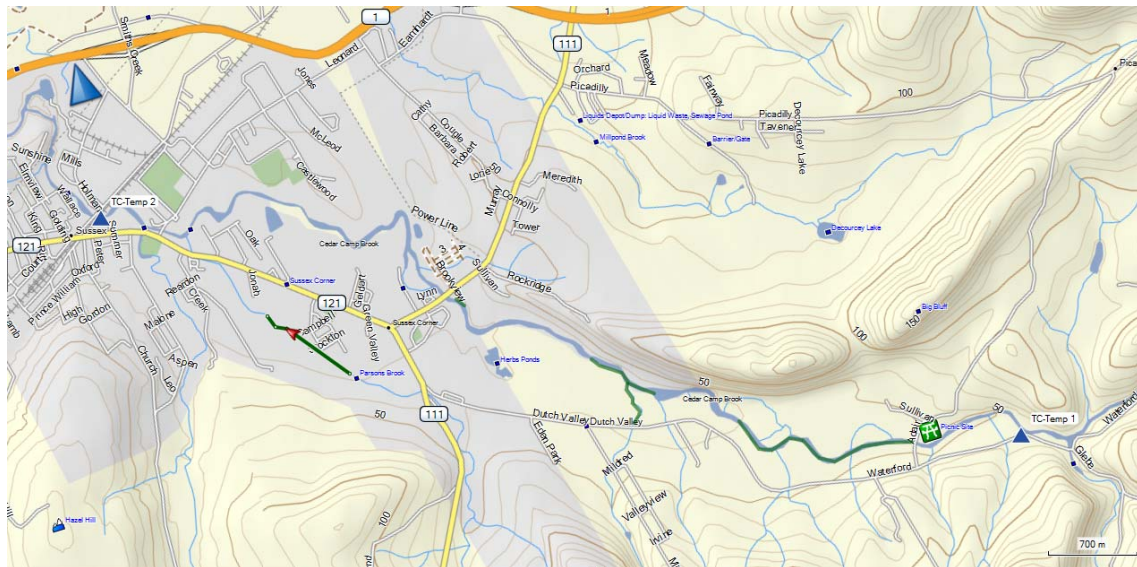
MAP 3: Temperature hobo locations on Trout Creek, TC-Temp 1 is about 500m below the confluence of Parlee Brook, while TC-Temp 2 is just above the CN Rail bridge in downtown Sussex. The green lines indicate past riparian restoration efforts.

4.0 Findings

For each site there were a total of 200 daily mean temperatures calculated. The mean temperatures were derived from the readings taken a half hour apart from April 5th to October 22nd 2012. The daily high was also used to help draw further comparisons for each site.

Annual comparisons and trends are important as well. This is especially true for the Ward's Creek sites. Comparisons of the annual average stream and air temperatures from July to October 2011 and from the same period in 2012 was created to look at trends

from an annual perspective. Over time this perspective will allow us to determine the effectiveness of our restoration efforts on Ward's Creek.

4.1 Ward's Creek –Un-named Tributary

This first order stream showed alarming results when calculating the variation from the upper site to the lower site. On numerous occasions the variation in temperature was greater than 2*C. It was also surprising to see how often the lower temperature logger reached a daily average of greater than 18*C (35times) and topped 20*C 8 times through the 200 days sampled in 2012. There is only 2 years of sampling data for this site and the warmer air temperatures in 2012 resulted in slightly higher water temperatures as would be expected.

Table 2: Ward's Creek Temperature Profile overview

Upper Wards Max: Temp, °C	Lower Wards Max Temp, °C	Upper Wards Avg: Temp, °C	Lower Wards Avg. Temp, °C
38dys> 18*C	77dys> 18*C	17dys> 18*C	35dys> 18*C
6dys> 20*C	58dys> 20*C		8dys> 20*C

The complete data tables for Ward's Creek can be found in Appendix.

4.2 Shannon Brook

This spring fed system is the smallest of the main tributaries to Trout Creek. In 2011 a habitat assessment indicated that the stream does suffer from degraded riparian zones and previous electrofishing exercises indicated a healthy brook trout population in the stream. The overall temperature profile results from 2012 showed only 5 days where the average temperature, on the lower site, reached greater than 18*C. The variation between the two sites only rose above 1*C difference on two consecutive days. This indicates that the stream is relatively healthy and thus efforts should be made to maintain riparian buffering here.

Table 3: Shannon Brook Temperature Profile Overview

Upper Shannon Max: Temp, °C	Lower Shannon Max: Temp, °C	Upper Shannon Avg: Temp, °C	Lower Shannon Avg: Temp, °C
30dys> 18*C	45dys> 18*C	1dys> 18*C	5dys> 18*C
5dys> 20*C	13dys> 20*C		

The tabular results for the temperature loggers placed on Shannon Brook can be found in Appendix. The annual comparison here is vague as we only have two years of data collected for this location.

4.3 Trout Creek

The greatest distance apart and the largest system being studied through 2012, it was expected these loggers would show the greatest variation. Through this sample season the upper site continually provided colder temperatures than the lower site. On 42 of the

200 sample days the variation was greater than 2*C, with one day having a variation greater than 3*C. It should be noted that there appears to be no reason why the variation jumped to greater than 3*C on June 18th. The maximum air temperature was not significant (19*C) and there was little precipitation (0.07cm) to impact the readings. There may be some point source pollution risks between the two loggers that may be responsible for the high variation. The other alarming trend was the number of days that saw a maximum water temperature reach greater than 20*C, 40 on the upper site and 66 on the lower site. This means that fish are not likely to be present in this section of river during the warmer summer months.

Table 3: Trout Creek Temperature Profile Overview

Max: Upper Trout Temp, °C	Avg: Upper Trout Temp, °C	Max: Lower Trout Temp, °C	Avg: Lower Trout Temp, °C
66dys > 18*C (33%)	25dys > 18*C (12.5%)	86dys> 18*C (43%)	64dys> 18*C (32%)
40dys > 20*C	1dys > 20*C	66dys> 20*C	22dys> 20*C

The tabular results for Trout Creek can be found in Appendix.

We now have data for this section for 1995, 2000, 2011, and 2012. Even with four years of data there are no significant trends showing on this large stream. Of note is the fact that despite rising air temperatures over those years, water temperatures are either non-trending or trending in the opposite direction.

5.0 Discussion

Stream temperatures are crucial in maintaining habitat connectivity and maintaining good water quality. As water temperatures rise the risk of other problems becomes more elevated. The KWRC hopes that as more stream temperature data is collected they can show a direct link between their riparian zone restoration work and water temperature profiles. It is hoped that over time at the Ward's Creek site that a decrease in the water temperature variation between the upper and lower sites will be realized. This will indicated that riparian restoration work completed on this site in 2009, as the vegetation matures, is effective. It is hoped to that as more work is completed on Trout Creek that a similar trend will begin to appear.

Monitoring daily temperatures is also an excellent way to identify spikes and thus point source pollution issues. The daily temperatures also show the impacts of rain and run-off events when looked at more closely. Comparing annual means will help look at the impacts of the changing climate on our rivers and aid in directing where our restoration efforts need to be directed.

APPENDIX A

2012 Raw Stream Temperature Data

Shannon Brook Data

Upper Shannon Max: Temp, °C	Lower Shannon Max: Temp, °C	Upper Shannon Avg: Temp, °C	Lower Shannon Avg: Temp, °C	Avg Air Temp *C	Mean Variation
4.506	4.558	3.544	3.507	2.4	0.037
5.975	6.331	3.405	3.437	2.2	-0.032
5.872	6.179	3.792	3.85	3.2	-0.058
3.089	3.168	1.326	1.312	-0.2	0.014
5.179	5.128	3.303	3.172	5.3	0.131
6.281	6.458	4.127	4.123	5.1	0.004
7.72	8.07	4.688	4.716	6.7	-0.028
5.924	6	4.887	4.917	5.7	-0.03
7.167	7.368	4.944	4.98	3.8	-0.036
8.02	8.444	5.067	5.131	5.1	-0.064
8.742	9.262	5.708	5.841	7.6	-0.133
11.321	12.098	7.713	8.023	11.4	-0.31
11.832	12.703	9.237	9.755	12.5	-0.518
9.731	10.418	7.514	7.995	8.8	-0.481
9.583	10.418	6.28	6.643	5.7	-0.363
10.394	11.175	6.961	7.319	7.3	-0.358
9.805	10.443	7.677	8.057	9.2	-0.38
8.494	8.941	6.402	6.63	5.7	-0.228
8.593	8.668	5.787	5.854	8	-0.067
9.78	9.952	8.638	8.894	10	-0.256
7.368	7.569	6.544	6.695	6.9	-0.151
7.995	8.319	6.569	6.728	6.2	-0.159
7.594	7.82	6.532	6.68	5.9	-0.148
6.408	6.611	5.236	5.309	3.1	-0.073
7.569	7.845	5.147	5.218	3.9	-0.071
6.255	6.357	4.85	4.912	3.6	-0.062
7.945	8.17	5.586	5.66	3.6	-0.074
7.519	7.745	6.2	6.368	5	-0.168
10.394	10.956	6.864	7.098	7.6	-0.234
9.163	9.706	6.767	7.023	7.8	-0.256
8.12	8.394	7.21	7.478	9.7	-0.268
9.04	9.361	7.336	7.62	7	-0.284
11.078	11.71	7.097	7.399	7.5	-0.302
10.565	11.053	7.308	7.621	6.7	-0.313
8.543	8.916	7.537	7.845	8.8	-0.308
10.883	11.127	9.411	9.638	10.7	-0.227
11.54	12.171	9.102	9.518	9.7	-0.416
8.767	9.188	7.483	7.849	6.1	-0.366
7.87	8.12	6.731	6.929	6.8	-0.198
11.759	12.292	8.681	9.044	13.2	-0.363
10.663	11.175	9.1	9.585	13.6	-0.485
10.761	11.248	9.634	10.063	12.4	-0.429
10.81	11.346	9.394	9.858	10.3	-0.464
12.122	12.775	8.542	8.941	8.6	-0.399
13.209	13.978	9.698	10.203	13.7	-0.505
13.618	14.314	10.053	10.636	16.5	-0.583

14.385	15.27	10.844	11.516	14.8	-0.672
12.05	12.727	10.151	10.788	15.2	-0.637
11.175	11.807	10.088	10.726	15.2	-0.638
13.497	14.29	9.961	10.512	15	-0.551
14.218	15.008	10.771	11.378	12.5	-0.607
14.337	15.079	11.62	12.34	11.5	-0.72
13.185	14.026	10.413	11.116	11.8	-0.703
11.516	12.243	9.727	10.386	13.2	-0.659
8.494	9.188	7.869	8.377	7.9	-0.508
9.731	10.051	8.288	8.619	10.6	-0.331
10.761	10.98	9.312	9.722	13.8	-0.41
12.654	13.305	10.225	10.74	12.4	-0.515
11.686	12.147	9.581	10.056	13.5	-0.475
11.662	12.171	10.124	10.638	10.4	-0.514
9.361	9.952	8.833	9.302	7.5	-0.469
8.891	9.213	8.263	8.619	6.1	-0.356
9.04	9.312	8.243	8.544	6.2	-0.301
11.71	12.219	9.282	9.618	10.3	-0.336
13.93	14.361	10.114	10.466	14.4	-0.352
11.029	11.54	9.957	10.492	11.2	-0.535
10.516	10.956	9.904	10.366	9.7	-0.462
13.81	14.625	10.936	11.421	13.3	-0.485
14.745	15.438	11.371	11.922	14.3	-0.551
14.481	15.175	11.747	12.341	14.5	-0.594
13.906	14.457	11.93	12.619	14.2	-0.689
14.984	15.557	11.941	12.517	12.8	-0.576
14.074	14.888	11.985	12.671	12.5	-0.686
14.912	15.7	11.503	12.165	12.7	-0.662
13.978	15.055	11.281	11.942	13.2	-0.661
15.008	15.772	11.717	12.338	13	-0.621
16.844	17.772	13.606	14.414	19.3	-0.808
17.082	17.701	14.139	14.82	18.4	-0.681
15.247	15.819	13.612	14.487	17.4	-0.875
13.594	14.505	12.792	13.47	12.3	-0.678
12.606	13.305	11.98	12.608	13.5	-0.628
14.984	15.748	12.858	13.429	17.4	-0.571
14.074	14.385	13.276	13.758	14.8	-0.482
15.39	15.843	13.387	13.844	15.5	-0.457
14.218	15.223	13.067	13.646	16	-0.579
16.725	17.32	13.595	14.177	17.9	-0.582
18.01	18.937	15.017	15.724	21	-0.707
17.677	18.604	14.911	15.714	20.9	-0.803
17.034	18.033	14.623	15.555	19.1	-0.932
17.249	18.247	14.314	15.248	20.2	-0.934
16.058	16.987	13.999	14.93	19.1	-0.931
14.409	15.199	13.799	14.551	17.2	-0.752
14.84	15.581	13.729	14.516	18.9	-0.787
16.701	17.605	14.477	15.29	21.1	-0.813
16.701	17.653	14.488	15.298	17.4	-0.81
16.272	17.082	14.02	14.791	16.9	-0.771

16.534	17.51	13.524	14.246	18.2	-0.722
16.868	17.819	13.87	14.613	18.6	-0.743
18.295	19.151	14.794	15.574	20.1	-0.78
18.01	19.032	15.307	16.187	21.7	-0.88
18.033	19.032	15.893	16.84	20.7	-0.947
19.008	20.15	16.324	17.278	19.7	-0.954
17.772	18.699	15.874	16.876	18.8	-1.002
17.415	18.461	15.611	16.641	20.5	-1.03
18.461	19.27	16.402	17.273	20	-0.871
17.748	18.747	15.394	16.184	15.8	-0.79
16.106	16.939	14.082	14.858	15.2	-0.776
17.011	18.129	13.807	14.572	18.4	-0.765
17.986	18.818	14.721	15.395	18.9	-0.674
19.365	20.222	16.269	16.948	19.5	-0.679
15.652	16.63	15.056	15.742	16	-0.686
17.011	18.343	15.13	15.827	17	-0.697
17.558	18.485	14.616	15.29	18.7	-0.674
16.558	17.439	15.078	15.901	19.6	-0.823
17.415	18.129	15.076	15.865	20.4	-0.789
15.557	16.272	14.536	15.359	17.8	-0.823
18.01	18.771	15.304	16.016	19.3	-0.712
19.555	20.436	16.116	16.8	20.5	-0.684
15.676	16.63	14.71	15.356	15.5	-0.646
16.106	16.749	14.772	15.49	17.4	-0.718
19.151	19.865	16.3	16.937	20.9	-0.637
19.27	20.388	16.743	17.585	22	-0.842
20.293	21.079	17.334	18.04	21.7	-0.706
20.531	21.127	18.969	19.502	21.7	-0.533
20.507	20.865	17.458	18.204	20.6	-0.746
20.507	20.817	16.723	17.445	21.2	-0.722
20.174	20.793	16.948	17.737	21.3	-0.789
19.651	20.055	17.072	17.964	21.2	-0.892
16.749	17.986	16.079	16.967	17.5	-0.888
18.58	19.175	16.757	17.516	20.3	-0.759
19.508	20.103	17.566	18.282	19.5	-0.716
19.318	20.103	17.069	17.85	20.7	-0.781
19.841	20.746	17.366	18.166	21.2	-0.8
17.986	18.414	16.532	17.282	19.5	-0.75
18.176	19.08	16.549	17.389	19.7	-0.84
18.319	18.675	16.315	17.04	19.9	-0.725
17.106	17.724	16.149	16.972	18	-0.823
18.39	19.008	16.197	17.019	19.9	-0.822
17.843	18.771	15.733	16.45	19.5	-0.717
18.057	18.557	15.071	15.654	18.4	-0.583
18.438	18.818	15.058	15.565	19.5	-0.507
18.057	18.889	15.535	16.241	18	-0.706
17.605	18.2	14.261	14.911	18.5	-0.65
18.129	18.675	14.838	15.343	19.4	-0.505
19.318	19.865	16.02	16.59	20.6	-0.57
17.891	18.129	16.242	16.808	16.2	-0.566

15.867	16.249	13.948	14.4	13.4	-0.452
17.32	17.677	14.509	15.012	18.3	-0.503
18.39	**18.699**	16.062	16.506	20	-0.444
16.606	17.082	15.087	15.58	13.9	-0.493
15.199	15.27	12.923	13.443	13.7	-0.52
16.272	16.439	13.797	14.246	15	-0.449
16.582	16.844	13.748	14.18	18	-0.432
14.433	15.055	13.924	14.25	12.4	-0.326
14.098	14.409	13.651	13.994	13.7	-0.343
14.721	15.27	13.711	14.172	16.2	-0.461
15.819	16.106	13.934	14.426	17.1	-0.492
16.392	16.796	15.395	15.84	16.5	-0.445
14.936	15.199	14.059	14.486	13.4	-0.427
13.834	14.337	12.312	12.85	13	-0.538
13.137	13.666	10.911	11.379	15.2	-0.468
14.29	14.864	11.806	12.312	15.8	-0.506
14.601	15.247	12.219	12.795	16.8	-0.576
15.127	15.629	13.14	13.665	13.5	-0.525
12.847	13.497	11.011	11.553	9.6	-0.542
12.074	12.485	9.686	10.087	12.2	-0.401
12.968	13.209	10.392	10.706	13.1	-0.314
15.414	15.533	13.414	13.639	12.1	-0.225
12.268	12.751	10.962	11.294	9.2	-0.332
12.485	12.751	11.667	12.052	13.7	-0.385
14.984	15.247	13.777	14.023	18.3	-0.246
15.27	15.605	14.218	14.658	13.6	-0.44
12.025	12.558	10.553	10.978	11.5	-0.425
11.492	11.953	9.506	9.795	10.7	-0.289
12.098	12.437	11.087	11.399	13	-0.312
12.147	12.727	11.386	11.847	8.9	-0.461
10.1	10.541	8.38	8.689	9	-0.309
11.297	11.394	9.57	9.715	11.7	-0.145
13.522	13.786	12.288	12.482	14.4	-0.194
13.401	13.666	12.223	12.562	11.2	-0.339
11.832	12.364	10.458	10.867	13.8	-0.409
11.492	11.953	9.944	10.312	14.1	-0.368
10.541	10.883	9.151	9.427	11.6	-0.276
10.565	10.883	10.098	10.421	10.4	-0.323
11.565	11.929	10.769	11.093	11.6	-0.324
11.662	11.929	10.482	10.817	9.4	-0.335
10.369	10.663	9.48	9.792	5	-0.312
8.965	9.163	7.437	7.643	5.5	-0.206
10.026	10.198	8.561	8.678	9.6	-0.117
10.858	10.956	9.538	9.77	7.6	-0.232
8.419	8.494	7.344	7.44	2.1	-0.096
7.091	7.192	6.238	6.27	0.5	-0.032
7.745	7.77	6.362	6.302	3.9	0.06
11.224	11.419	9.358	9.45	12.2	-0.092
11.516	11.807	10.745	11.059	8.4	-0.314
9.015	9.361	7.852	8.046	4.6	-0.194

8.22	8.319	6.744	6.806	6.7	-0.062
8.866	9.04	7.437	7.451	10.1	-0.014
12.05	12.171	10.578	10.685	13.2	-0.107
11.662	11.88	10.522	10.844	10.8	-0.322
15.017	**15.483**	**13.194**	**13.684**	**14.911**	

30dys> 18*C	45dys> 18*C	1dys> 18*C	5dys> 18*C
5dys> 20*C	13dys> 20*C		
15%	22.50%	0.50%	2.50%

WARD'S CREEK DATA

Upper Wards Max: Temp, °C	Lower Wards Max Temp, °C	Upper Wards Avg: Temp, °C	Lower Wards Avg. Temp, °C	Avg Air Temp *C	Rainfall Amt (cm)	Variation
4.089	4.376	2.804	2.807	2.4	0	-0.003
5.668	7.066	2.735	3.098	2.2	0	-0.363
5.591	6.408	3.267	3.465	3.2	0.05	-0.198
2.557	2.557	0.49	0.635	-0.2	1.09	-0.145
4.089	4.921	2.148	2.362	5.3	0.23	-0.214
5.591	6.611	3.39	3.726	5.1	0	-0.336
7.494	8.792	4.311	4.615	6.7	0	-0.304
5.334	5.898	4.186	4.333	5.7	0.1	-0.147
6.788	8.02	4.235	4.483	3.8	0	-0.248
7.87	8.99	4.64	4.964	5.1	0	-0.324
8.99	9.977	5.454	5.731	7.6	0	-0.277
12.001	13.497	8.018	8.637	11.4	0	-0.619
12.871	14.314	9.877	10.662	12.5	0	-0.785
10.296	11.71	8.056	8.677	8.8	0	-0.621
9.977	11.224	6.521	7.009	5.7	0	-0.488
10.956	11.904	7.304	7.775	7.3	0	-0.471
10.858	11.953	8.258	8.683	9.2	0.74	-0.425
9.238	9.731	6.571	6.823	5.7	2.23	-0.252
8.618	8.693	5.652	5.711	8	4.43	-0.059
9.213	9.188	8.292	8.502	10	3.91	-0.21
7.167	7.469	6.167	6.314	6.9	0	-0.147
8.419	9.163	6.46	6.706	6.2	0	-0.246
7.594	7.945	6.389	6.532	5.9	0.24	-0.143
6.255	6.661	4.821	4.893	3.1	0	-0.072
7.82	8.593	4.881	5.069	3.9	0	-0.188
6.153	6.484	4.385	4.515	3.6	0	-0.13
7.97	8.419	5.316	5.464	3.6	0	-0.148
7.82	8.369	6.213	6.437	5	0	-0.224
11.248	12.534	7.223	7.652	7.6	0	-0.429
9.805	10.59	7.333	7.651	7.8	0	-0.318
8.866	9.46	7.841	8.16	9.7	0.02	-0.319
10.247	11.346	8.037	8.426	7	0	-0.389
12.074	13.666	7.863	8.447	7.5	0	-0.584
11.394	12.775	8.203	8.632	6.7	0.12	-0.429
9.854	10.394	8.407	8.749	8.8	2.24	-0.342

11.175	11.151	9.707	9.917	10.7	2.79	-0.21
11.248	12.461	8.93	9.455	9.7	0	-0.525
8.568	9.139	7.534	7.834	6.1	0	-0.3
8.095	8.444	6.928	7.087	6.8	0	-0.159
12.558	13.522	9.258	9.751	13.2	0	-0.493
12.074	13.112	10.196	10.741	13.6	0.02	-0.545
11.467	11.929	10.443	10.855	12.4	2.14	-0.412
11.565	12.534	10.07	10.607	10.3	0	-0.537
12.727	13.954	9.203	9.754	8.6	0	-0.551
13.978	15.366	10.572	11.188	13.7	0	-0.616
14.481	16.082	11.344	12.097	16.5	0	-0.753
15.342	16.844	12.159	12.96	14.8	0	-0.801
13.594	14.792	11.847	12.572	15.2	0	-0.725
12.775	13.786	11.821	12.48	15.2	0	-0.659
14.266	15.7	11.201	11.907	15	0	-0.706
14.697	16.439	12.108	12.987	12.5	0.03	-0.879
15.27	17.201	13.108	13.988	11.5	0.03	-0.88
13.858	15.724	11.915	12.796	11.8	0	-0.881
12.751	14.481	11.45	12.195	13.2	0	-0.745
10.565	10.712	9.107	9.427	7.9	0.92	-0.32
10.075	10.932	8.946	9.366	10.6	0.05	-0.42
11.516	12.727	10.346	11	13.8	0.13	-0.654
13.137	15.485	11.297	12.323	12.4	0	-1.026
12.63	14.314	10.985	11.807	13.5	0.12	-0.822
12.05	13.594	11.358	12.06	10.4	0	-0.702
10.712	10.834	9.861	10.191	7.5	0.03	-0.33
9.312	10.1	8.883	9.246	6.1	0.19	-0.363
9.238	10.026	8.65	9.003	6.2	0.65	-0.353
11.565	13.522	9.563	10.435	10.3	0.09	-0.872
13.57	16.296	10.997	12.22	14.4	0	-1.223
11.734	13.522	11.032	11.706	11.2	0.66	-0.674
11.856	13.57	11.226	11.925	9.7	0.22	-0.699
14.074	17.748	11.862	13.3	13.3	0.08	-1.438
15.103	18.652	12.721	14.27	14.3	0	-1.549
14.888	18.366	12.955	14.351	14.5	0	-1.396
14.888	18.176	13.596	14.838	14.2	0.09	-1.242
15.414	18.937	13.423	14.958	12.8	0	-1.535
14.505	17.534	13.128	14.499	12.5	0	-1.371
14.84	19.056	12.623	14.355	12.7	0	-1.732
15.151	19.508	12.798	14.652	13.2	0.07	-1.854
15.008	19.127	12.933	14.782	13	0	-1.849
17.582	22.321	14.683	16.966	19.3	0	-2.283
17.368	21.509	15.363	17.372	18.4	0.06	-2.009
16.677	19.579	15.499	16.827	17.4	0.07	-1.328
15.509	16.392	14.549	15.204	12.3	2.36	-0.655
14.074	15.461	13.604	14.371	13.5	1.23	-0.767
16.511	19.627	14.511	16.107	17.4	0.03	-1.596
16.249	15.939	14.625	15.116	14.8	5.99	-0.491
15.509	17.629	14.24	15.031	15.5	0.84	-0.791
15.461	16.725	14.132	14.942	16	0.17	-0.81

16.939	19.841	14.889	16.159	17.9	0	-1.27
18.485	22.274	16.373	17.931	21	0	-1.558
18.271	22.321	16.659	18.368	20.9	0	-1.709
18.01	21.987	16.542	18.279	19.1	0.16	-1.737
17.962	21.987	16.166	18.01	20.2	0.03	-1.844
17.486	20.817	16.151	17.698	19.1	0	-1.547
16.201	17.177	15.767	16.483	17.2	0.67	-0.716
16.558	18.58	15.84	16.759	18.9	0.15	-0.919
17.796	20.222	16.347	17.641	21.1	0	-1.294
17.701	20.913	16.404	17.907	17.4	0	-1.503
16.939	20.15	15.599	17.078	16.9	0	-1.479
16.963	20.722	14.976	16.574	18.2	0	-1.598
17.344	21.39	15.325	17.082	18.6	0	-1.757
18.509	22.465	16.195	17.891	20.1	0	-1.696
19.008	23.184	16.809	18.617	21.7	0	-1.808
19.436	23.352	17.755	19.48	20.7	0	-1.725
19.698	24.171	17.819	19.828	19.7	0.05	-2.009
19.246	22.369	17.895	19.293	18.8	0	-1.398
19.151	22.058	17.844	19.199	20.5	0	-1.355
19.413	22.705	18.163	19.693	20	0	-1.53
17.915	21.819	16.839	18.341	15.8	0	-1.502
16.844	20.412	15.525	16.949	15.2	0.09	-1.424
16.677	20.722	14.873	16.504	18.4	0.03	-1.631
18.438	22.872	15.976	17.868	18.9	0	-1.892
19.27	23.256	17.08	18.785	19.5	0	-1.705
16.701	17.368	16.205	16.674	16	2.81	-0.469
17.724	20.746	16.307	17.568	17	0	-1.261
17.796	21.604	15.716	17.114	18.7	0	-1.398
17.843	20.412	16.598	17.94	19.6	0	-1.342
18.01	21.199	16.72	18.06	20.4	0.22	-1.34
17.177	19.032	16.463	17.308	17.8	0.08	-0.845
17.653	21.485	16.363	17.943	19.3	0.03	-1.58
19.508	23.545	17.241	18.992	20.5	0	-1.751
16.844	18.247	16.156	16.937	15.5	1.05	-0.781
18.01	20.46	16.646	17.689	17.4	0	-1.043
19.722	23.761	17.929	19.635	20.9	0	-1.706
19.603	24.026	18.007	19.687	22	0.03	-1.68
20.579	24.968	18.532	20.136	21.7	0.06	-1.604
20.722	23.905	19.658	21.229	21.7	0.14	-1.571
19.841	24.605	18.406	20.167	20.6	0	-1.761
19.865	24.388	17.926	19.842	21.2	0	-1.916
20.46	25.768	18.506	20.513	21.3	0	-2.007
20.031	24.798	18.565	20.502	21.2	0	-1.937
18.438	19.413	18.01	18.896	17.5	0.58	-0.886
19.96	22.345	18.616	19.816	20.3	0.5	-1.2
20.579	23.785	19.224	20.656	19.5	0	-1.432
19.912	23.088	18.857	20.388	20.7	0.03	-1.531
20.603	24.847	19.024	20.767	21.2	1.16	-1.743
19.27	21.318	18.461	19.561	19.5	0.07	-1.1
19.508	22.585	18.432	19.708	19.7	0.42	-1.276

19.389	21.748	18.357	19.527	19.9	0.17	-1.17
18.747	20.674	18.231	19.22	18	0.09	-0.989
19.103	21.628	17.942	19.103	19.9	0	-1.161
18.533	21.628	17.194	18.446	19.5	0	-1.252
17.915	21.652	16.326	17.749	18.4	0	-1.423
18.057	21.652	16.148	17.668	19.5	0.07	-1.52
17.843	21.533	16.507	18.069	18	0	-1.562
17.011	20.698	15.181	16.625	18.5	0	-1.444
17.677	21.27	15.63	17.08	19.4	0	-1.45
18.985	22.8	17.005	18.467	20.6	0	-1.462
18.343	20.507	17.262	18.357	16.2	0.62	-1.095
16.415	18.699	14.882	15.941	13.4	0	-1.059
17.153	20.269	15.398	16.611	18.3	0	-1.213
18.485	21.366	16.697	17.919	20	0	-1.222
17.153	19.603	15.597	16.603	13.9	0.19	-1.006
15.652	19.318	13.839	14.558	13.7	0.08	-0.719
15.724	18.699	14.424	15.57	15	0	-1.146
16.844	19.888	15.023	16.053	18	0	-1.03
15.414	16.129	14.545	14.845	12.4	10.93	-0.3
14.529	14.912	14.199	14.484	13.7	0.48	-0.285
15.294	16.296	14.479	14.964	16.2	0.03	-0.485
16.701	17.819	15.39	15.996	17.1	0	-0.606
17.653	17.463	16.257	16.719	16.5	2.4	-0.462
15.247	15.605	14.262	14.668	13.4	1.31	-0.406
13.618	14.242	12.764	13.148	13	0	-0.384
13.642	14.218	12.054	12.38	15.2	0	-0.326
14.553	15.461	12.932	13.353	15.8	0	-0.421
15.151	16.368	13.91	14.472	16.8	0	-0.562
15.27	16.392	14.307	14.837	13.5	0.21	-0.53
13.834	14.242	11.902	12.334	9.6	0	-0.432
12.389	13.425	10.827	11.248	12.2	0	-0.421
13.185	14.218	11.472	11.92	13.1	0	-0.448
16.129	16.177	14.075	14.411	12.1	1.71	-0.336
12.63	13.161	11.516	11.863	9.2	0	-0.347
12.944	13.353	12.233	12.564	13.7	0	-0.331
14.936	15.461	14.113	14.469	18.3	3.68	-0.356
15.127	15.986	14.505	15.037	13.6	0.08	-0.532
12.823	13.112	11.389	11.732	11.5	0.18	-0.343
11.807	12.364	10.503	10.763	10.7	0	-0.26
12.944	13.401	12.154	12.428	13	0.35	-0.274
12.823	13.257	12.16	12.569	8.9	0	-0.409
10.663	11.151	9.295	9.527	9	0.31	-0.232
11.734	11.856	10.296	10.385	11.7	3.24	-0.089
13.93	14.146	12.661	12.941	14.4	2.04	-0.28
13.522	13.858	12.533	12.868	11.2	0.91	-0.335
12.678	13.209	11.648	11.942	13.8	0	-0.294
12.606	13.088	11.46	11.745	14.1	0	-0.285
11.613	11.832	10.467	10.624	11.6	0.7	-0.157
11.71	12.05	11.301	11.528	10.4	0.13	-0.227
12.534	12.944	11.917	12.2	11.6	0.08	-0.283

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12.606	12.871	11.223	11.521	9.4	0.08	-0.298
10.59	10.956	10.094	10.306	5	0.63	-0.212
9.46	9.682	8.204	8.275	5.5	0.6	-0.071
10.638	10.81	9.246	9.307	9.6	0	-0.061
11.394	11.565	10.078	10.244	7.6	1.13	-0.166
8.767	8.817	7.917	7.914	2.1	1.54	0.003
7.142	7.368	6.49	6.565	0.5	0	-0.075
8.22	8.22	6.789	6.705	3.9	0.1	0.084
11.565	11.832	9.913	10.071	12.2	0.03	-0.158
12.461	12.775	11.53	11.839	8.4	1.64	-0.309
9.509	9.731	8.205	8.382	4.6	0	-0.177
8.593	8.717	7.137	7.15	6.7	0.26	-0.013
9.386	9.534	8.008	8.016	10.1	0	-0.008
12.799	12.847	11.103	11.268	13.2	3.36	-0.165
12.025	12.292	11.235	11.54	10.8	0	-0.305
		14.214	**15.003**	**14.854**		**-0.789**

		17dys> 18*C				
38dys> 18*C	77dys> 18*C		35dys> 18*C			
6dys> 20*C	58dys> 20*C		8dys> 20*C			

TROUT CREEK DATA

Max: Upper Trout Temp, °C	Avg: Upper Trout Temp, °C	Max: Lower Trout Temp, °C	Avg: Lower Trout Temp, °C	Avg Air Temp *C	Rainfall Amt (mm)	Max Water Temp Variation
4.168	3.188	4.662	3.609	2.4	0	-0.494
6.433	3.475	7.242	4.193	2.2	0	-0.809
6.153	3.934	6.889	4.78	3.2	0.05	-0.736
3.591	1.275	4.558	2.221	-0.2	1.09	-0.967
5.796	3.172	7.217	3.822	5.3	0.23	-1.421
6.839	4.156	7.82	4.952	5.1	0	-0.981
7.544	4.44	8.22	5.296	6.7	0	-0.676
5.257	4.345	5.898	4.935	5.7	0.1	-0.641
7.015	4.48	8.195	5.196	3.8	0	-1.18
8.07	4.83	9.064	5.782	5.1	0	-0.994
8.469	5.398	9.287	6.174	7.6	0	-0.818
11.686	7.756	12.871	8.814	11.4	0	-1.185
12.268	9.463	14.026	10.896	12.5	0	-1.758
10.98	8.481	12.195	9.904	8.8	0	-1.215
10.663	7.143	11.686	8.431	5.7	0	-1.023
11.102	7.581	11.904	8.782	7.3	0	-0.802
10.467	8.127	11.102	9.055	9.2	0.74	-0.635
9.015	7.019	10.32	7.73	5.7	2.23	-1.305
7.895	5.398	8.419	5.563	8	4.43	-0.524
8.941	8.323	10.32	9.332	10	3.91	-1.379
7.318	6.44	7.82	6.913	6.9	0	-0.502
8.344	6.609	8.891	7.145	6.2	0	-0.547
7.469	6.437	7.845	6.817	5.9	0.24	-0.376
6.026	5.096	6.763	5.569	3.1	0	-0.737
7.92	5.202	8.593	5.739	3.9	0	-0.673

6.179	4.792	6.839	5.399	3.6	0	-0.66
7.795	5.483	8.27	6.031	3.6	0	-0.475
7.67	6.305	8.568	6.972	5	0	-0.898
11.273	7.39	12.05	8.227	7.6	0	-0.777
9.312	7.28	10.443	8.381	7.8	0	-1.131
8.444	7.513	9.238	8.345	9.7	0.02	-0.794
9.509	7.796	10.736	8.671	7	0	-1.227
12.389	8.042	13.04	9.165	7.5	0	-0.651
11.175	8.277	11.88	9.452	6.7	0.12	-0.705
9.213	8.202	9.977	9.084	8.8	2.24	-0.764
10.565	9.43	11.662	10.29	10.7	2.79	-1.097
11.346	9.367	12.63	10.256	9.7	0	-1.284
8.866	8.095	9.952	8.859	6.1	0	-1.086
8.02	7.052	8.494	7.573	6.8	0	-0.474
11.977	9.186	12.968	9.868	13.2	0	-0.991
11.759	10.188	12.944	11.117	13.6	0.02	-1.185
11.151	10.318	12.098	11.233	12.4	2.14	-0.947
11.832	10.454	12.968	11.333	10.3	0	-1.136
13.209	9.776	14.385	10.833	8.6	0	-1.176
14.553	10.946	15.557	12.1	13.7	0	-1.004
14.792	11.617	16.344	13.045	16.5	0	-1.552
15.7	12.446	17.344	13.891	14.8	0	-1.644
13.497	11.921	15.509	13.37	15.2	0	-2.012
12.678	11.911	14.409	13.329	15.2	0	-1.731
15.031	11.663	17.011	13.214	15	0	-1.98
15.796	12.591	17.962	14.312	12.5	0.03	-2.166
15.915	13.391	18.081	15.046	11.5	0.03	-2.166
15.915	12.87	17.724	14.676	11.8	0	-1.809
13.185	11.784	14.912	13.526	13.2	0	-1.727
11.273	9.608	12.775	10.847	7.9	0.92	-1.502
10.467	9.211	11.443	10.161	10.6	0.05	-0.976
11.686	10.466	13.064	11.582	13.8	0.13	-1.378
14.433	11.695	16.439	13.221	12.4	0	-2.006
13.305	11.42	15.366	13.129	13.5	0.12	-2.061
12.727	11.575	14.96	13.16	10.4	0	-2.233
11.175	10.133	12.292	11.285	7.5	0.03	-1.117
9.879	9.338	11.151	10.414	6.1	0.19	-1.272
9.903	9.176	10.98	10.132	6.2	0.65	-1.077
13.185	10.416	15.008	11.794	10.3	0.09	-1.823
15.581	11.745	17.582	13.673	14.4	0	-2.001
12.654	11.472	14.409	13.142	11.2	0.66	-1.755
11.565	11.037	13.642	12.867	9.7	0.22	-2.077
16.034	12.411	17.843	14.122	13.3	0.08	-1.809
17.558	13.5	19.532	15.562	14.3	0	-1.974
16.915	13.818	19.246	15.829	14.5	0	-2.331
15.629	13.705	17.843	15.69	14.2	0.09	-2.214
17.534	13.923	19.413	15.977	12.8	0	-1.879
15.963	13.869	18.628	15.865	12.5	0	-2.665
18.081	13.884	20.007	16.018	12.7	0	-1.926
16.82	13.761	19.912	16.449	13.2	0.07	-3.092

17.867	14.115	20.269	16.649	13	0	-2.402
20.174	15.897	21.461	17.898	19.3	0	-1.287
19.698	16.171	21.676	18.391	18.4	0.06	-1.978
17.034	15.411	19.056	17.592	17.4	0.07	-2.022
15.294	14.044	17.51	16.29	12.3	2.36	-2.216
14.17	13.299	16.32	15.331	13.5	1.23	-2.15
17.415	14.503	19.627	16.535	17.4	0.03	-2.212
14.792	14.126	17.034	15.998	14.8	5.99	-2.242
16.32	14.13	17.605	15.386	15.5	0.84	-1.285
15.7	14.138	17.344	15.769	16	0.17	-1.644
18.652	15.048	20.531	16.895	17.9	0	-1.879
20.936	16.744	22.657	18.637	21	0	-1.721
20.889	17.142	22.226	19.081	20.9	0	-1.337
20.388	17.175	22.561	19.409	19.1	0.16	-2.173
21.008	17.093	22.944	19.458	20.2	0.03	-1.936
18.913	16.575	21.175	18.995	19.1	0	-2.262
16.344	15.441	18.771	17.821	17.2	0.67	-2.427
16.106	15.156	18.961	17.402	18.9	0.15	-2.855
19.294	16.308	21.079	18.361	21.1	0	-1.785
19.722	16.823	21.437	18.874	17.4	0	-1.715
18.937	16.278	21.27	18.522	16.9	0	-2.333
20.15	16.153	21.795	18.326	18.2	0	-1.645
20.841	16.646	22.393	18.833	18.6	0	-1.552
21.795	17.465	23.04	19.313	20.1	0	-1.245
21.413	17.756	23.04	19.673	21.7	0	-1.627
20.817	18.187	23.088	20.218	20.7	0	-2.271
22.585	18.77	24.002	20.637	19.7	0.05	-1.417
20.317	18.07	22.011	20.071	18.8	0	-1.694
20.031	17.771	21.963	19.951	20.5	0	-1.932
20.936	18.246	22.537	20.059	20	0	-1.601
20.936	17.843	22.561	19.881	15.8	0	-1.625
18.961	16.597	20.793	18.673	15.2	0.09	-1.832
21.079	16.82	22.681	18.872	18.4	0.03	-1.602
21.533	17.529	23.208	19.635	18.9	0	-1.675
22.106	18.478	23.448	20.184	19.5	0	-1.342
18.39	16.633	19.888	18.614	16	2.81	-1.498
20.293	17.081	21.963	19.255	17	0	-1.67
20.793	17.024	22.513	19.229	18.7	0	-1.72
18.842	17.149	21.056	19.38	19.6	0	-2.214
19.627	17.3	22.011	19.636	20.4	0.22	-2.384
17.463	16.468	19.936	18.913	17.8	0.08	-2.473
20.865	17.399	22.633	19.547	19.3	0.03	-1.768
22.465	18.499	23.833	20.331	20.5	0	-1.368
18.675	16.454	20.269	18.655	15.5	1.05	-1.594
18.152	16.493	20.007	18.52	17.4	0	-1.855
21.581	18.132	23.136	20.161	20.9	0	-1.555
22.13	18.898	23.665	20.841	22	0.03	-1.535
22.729	19.268	24.122	21.183	21.7	0.06	-1.393
21.891	20.116	23.617	21.669	21.7	0.14	-1.726
22.729	19.518	24.363	21.471	20.6	0	-1.634

22.465	19.032	24.122	21.201	21.2	0	-1.657
22.513	19.325	24.002	21.342	21.3	0	-1.489
21.151	19.188	23.04	21.127	21.2	0	-1.889
19.46	17.738	21.103	19.751	17.5	0.58	-1.643
20.079	18.176	21.915	20.085	20.3	0.5	-1.836
21.676	19.206	23.472	21.217	19.5	0	-1.796
21.342	19.081	23.28	21.276	20.7	0.03	-1.938
21.987	19.345	23.833	21.396	21.2	1.16	-1.846
19.698	18.402	21.509	20.496	19.5	0.07	-1.811
20.317	18.379	22.082	20.362	19.7	0.42	-1.765
19.888	18.157	21.509	20.103	19.9	0.17	-1.621
18.842	17.965	21.079	19.956	18	0.09	-2.237
20.507	18.161	22.321	20.226	19.9	0	-1.814
19.984	17.917	21.557	19.78	19.5	0	-1.573
20.222	17.503	22.034	19.539	18.4	0	-1.812
20.198	17.457	21.939	19.441	19.5	0.07	-1.741
20.317	18.018	21.891	19.795	18	0	-1.574
19.627	17.062	21.819	19.217	18.5	0	-2.192
19.936	17.172	21.772	19.251	19.4	0	-1.836
20.841	18.179	22.369	19.803	20.6	0	-1.528
19.032	17.842	20.984	19.499	16.2	0.62	-1.952
18.105	16.24	20.198	18.372	13.4	0	-2.093
19.151	16.704	21.103	18.698	18.3	0	-1.952
19.603	17.649	20.889	19.037	20	0	-1.286
18.58	17.247	20.317	18.658	13.9	0.19	-1.737
16.939	15.342	19.246	17.423	13.7	0.08	-2.307
17.677	15.867	20.126	17.93	15	0	-2.449
18.152	15.883	19.746	17.856	18	0	-1.594
16.939	14.886	18.343	16.134	12.4	10.93	-1.404
14.768	14.271	15.867	15.209	13.7	0.48	-1.099
16.487	14.935	17.915	16.283	16.2	0.03	-1.428
17.415	15.493	19.27	17.4	17.1	0	-1.855
17.558	16.444	19.413	18.182	16.5	2.4	-1.855
15.796	14.831	17.677	16.281	13.4	1.31	-1.881
15.676	14.003	17.653	15.491	13	0	-1.977
15.533	13.193	17.629	15.093	15.2	0	-2.096
16.558	13.95	18.58	15.893	15.8	0	-2.022
17.106	14.568	19.246	16.605	16.8	0	-2.14
16.987	15.045	18.533	17.001	13.5	0.21	-1.546
14.984	13.44	17.058	15.59	9.6	0	-2.074
14.553	12.15	16.844	14.583	12.2	0	-2.291
14.888	12.555	17.034	14.753	13.1	0	-2.146
15.748	14.337	17.582	16.016	12.1	1.71	-1.834
14.218	12.689	16.344	14.405	9.2	0	-2.126
13.738	13.073	15.079	14.559	13.7	0	-1.341
15.318	14.264	16.463	15.423	18.3	3.68	-1.145
15.796	14.882	17.177	16.101	13.6	0.08	-1.381
13.714	12.453	15.819	14.027	11.5	0.18	-2.105
13.016	11.324	15.031	12.979	10.7	0	-2.015
13.137	12.203	14.29	13.401	13	0.35	-1.153

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14.05	12.929	15.963	14.476	8.9	0	-1.913
12.074	10.462	14.242	12.452	9	0.31	-2.168
11.37	10.576	12.461	12.008	11.7	3.24	-1.091
13.666	12.542	14.314	13.064	14.4	2.04	-0.648
13.642	12.873	14.218	13.642	11.2	0.91	-0.576
13.281	12.01	14.673	12.892	13.8	0	-1.392
13.161	11.822	14.625	12.94	14.1	0	-1.464
12.147	10.956	13.425	12.053	11.6	0.7	-1.278
11.929	11.467	12.775	12.301	10.4	0.13	-0.846
12.727	12.001	13.786	12.873	11.6	0.08	-1.059
12.437	11.776	13.906	12.907	9.4	0.08	-1.469
11.248	10.633	12.243	11.554	5	0.63	-0.995
9.879	8.755	11.224	9.739	5.5	0.6	-1.345
10.907	9.455	11.662	10.24	9.6	0	-0.755
11.127	10.5	12.025	11.369	7.6	1.13	-0.898
8.668	8.146	9.509	8.808	2.1	1.54	-0.841
7.77	6.962	8.965	7.626	0.5	0	-1.195
7.995	6.823	8.419	7.266	3.9	0.1	-0.424
11.516	9.647	12.268	10.106	12.2	0.03	-0.752
12.364	11.543	13.377	12.417	8.4	1.64	-1.013
10.1	8.821	10.98	9.665	4.6	0	-0.88
8.817	7.61	9.829	8.364	6.7	0.26	-1.012
9.435	8.052	10.369	8.806	10.1	0	-0.934
12.025	10.652	13.57	11.505	13.2	3.36	-1.545
11.929	11.348	12.703	12.11	10.8	0	-0.774
19.026	16.873	20.846	18.794	17.642		-1.820
66dys > 18*C	25dys > 18*C	86dys> 18*C	64dys> 18*C			
40dys > 20*C	1dys > 20*C	66dys> 20*C	22dys> 20*C			
33%	12.50%	43%	32%			

APPENDIX B

Annual Mean Comparison Charts

Shannon Brook Temperature Profile: Annual Comparison
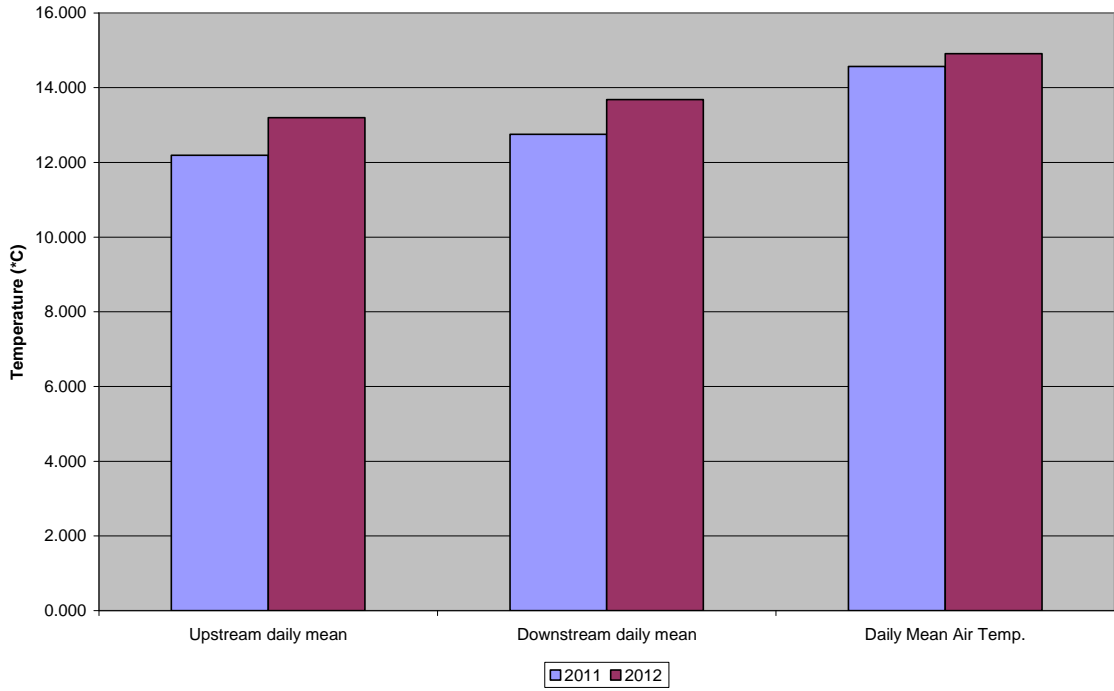
Annual Mean Temperature Comparisons:
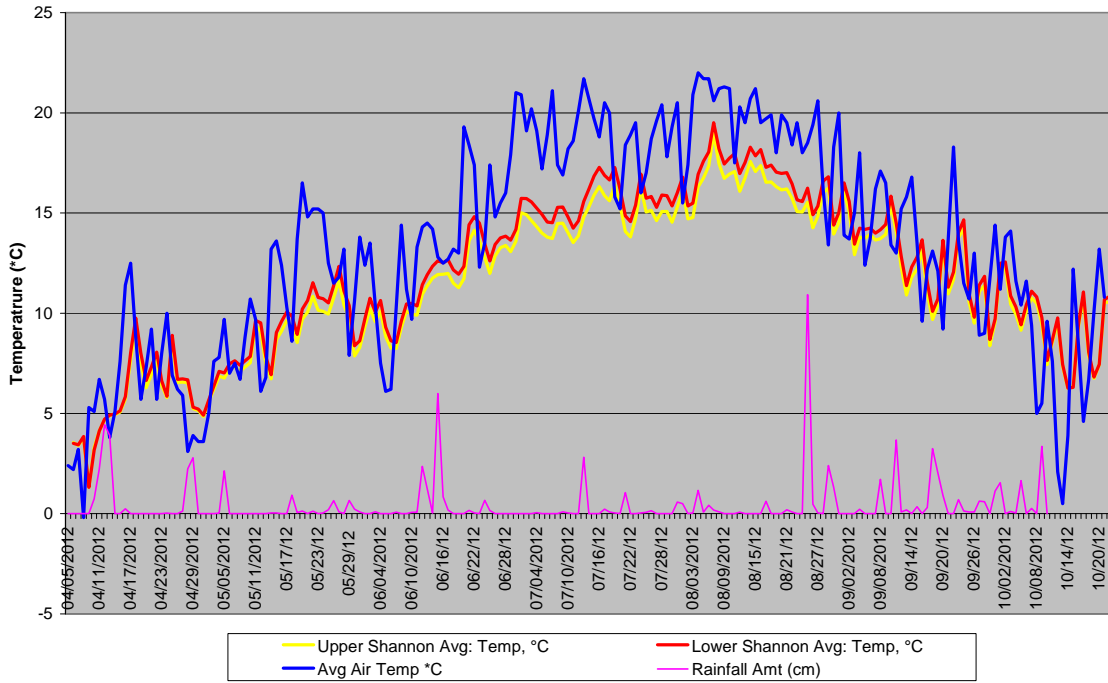**Ward's Creek - Unnamed Tributary**
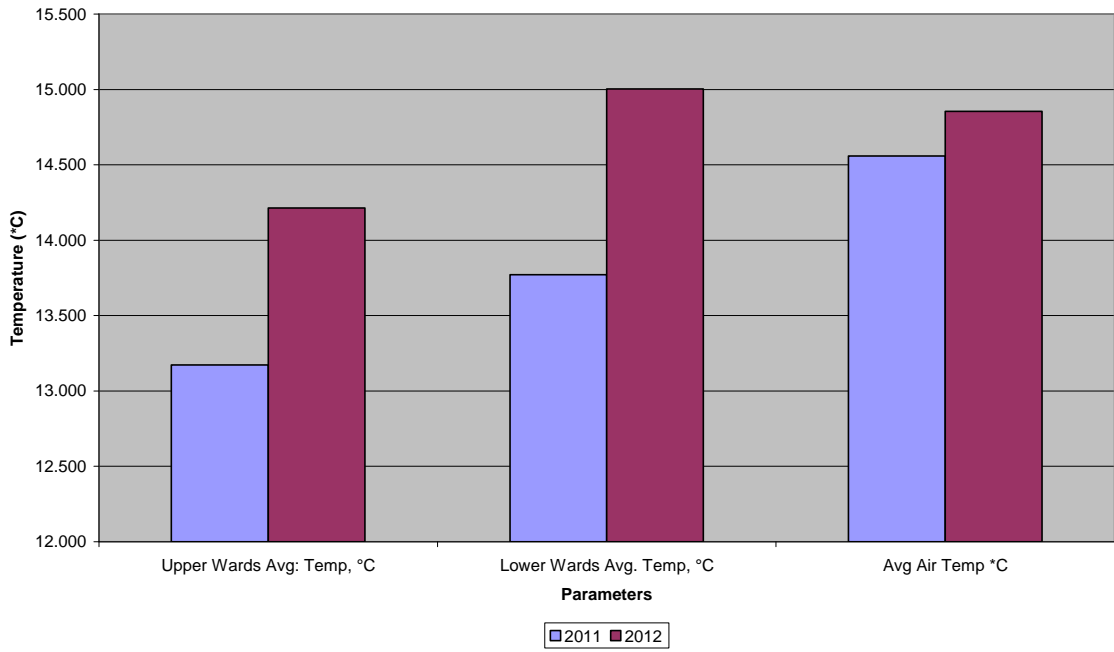
Trout Creek
Annual Mean Comparison Chart
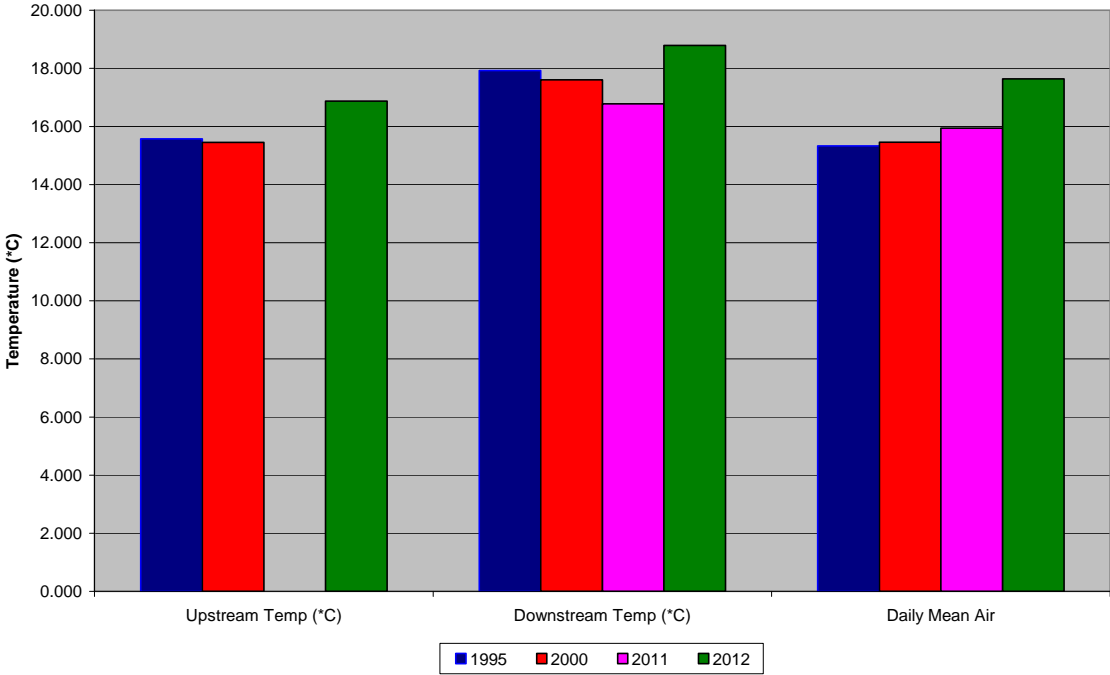
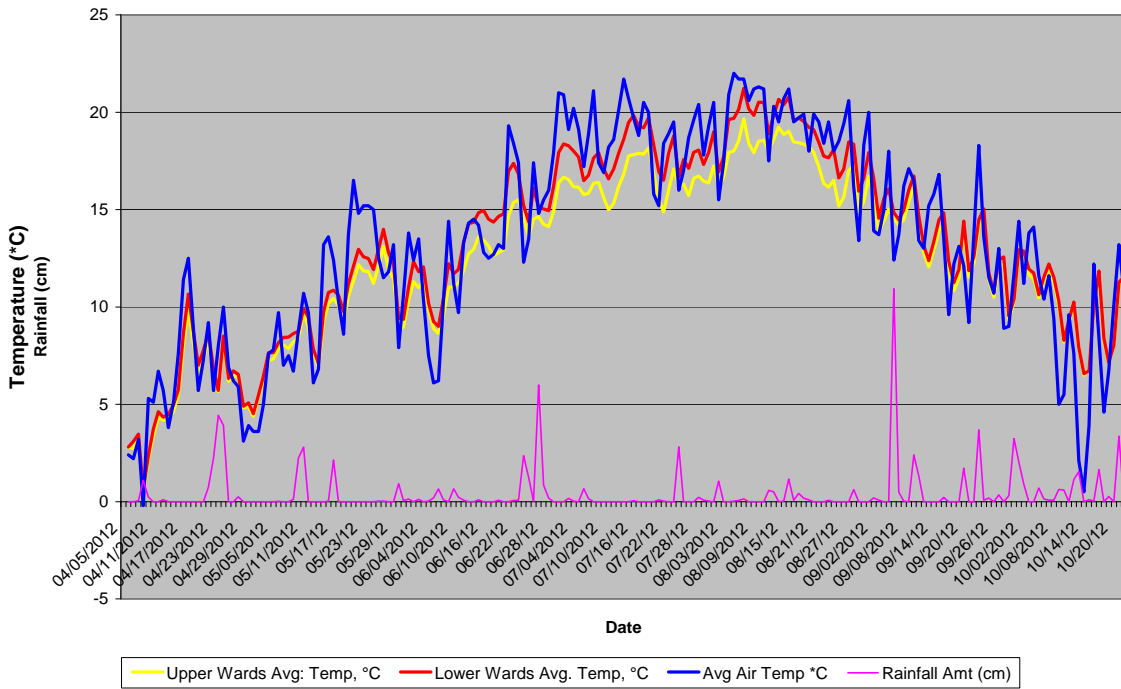# APPENDIX C

Daily Stream Temperature Profiles:
Daily Mean Temperatures

**Shannon Brook Temperature Profiles:
Daily Mean Comparisons**

Legend:
- Upper Shannon Avg: Temp, °C
- Lower Shannon Avg: Temp, °C
- Avg Air Temp *C
- Rainfall Amt (cm)

Ward's Creek: Walkerville Tributary
Daily Mean Temp Profile

Legend:
- Upper Wards Avg: Temp, °C
- Lower Wards Avg. Temp, °C
- Avg Air Temp *C
- Rainfall Amt (cm)

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Trout Creek Temperature Profile:
Daily Mean Temp