# APPENDIX 18-B

## Details of Baseline Fisheries Statistics

NORTHLINK CONSULTANTS
LIMITED PARTNERSHIP

# MEMORANDUM

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| TO: | Max Brownhill |
| FROM: | Adam Goodwin, John Rithaler |
| DATE: | April 11, 2017 |
| RE: | Details of baseline fisheries statistics |

The biometric characteristics (i.e. body length, weight, condition factor) of the Dolly Varden fish populations were compared across the Bear River and Bitter Creek watercourses in the Baseline Fisheries and Aquatic Resources report. No significant differences were identified in that report. To better clarify the calculations completed to address this, Northlink Consultants LP has prepared this memo.

The relationship between length and weight was consistent for each watercourse (Figure 1). To specifically test the difference in this relationship, these separate biometrics were combined into the Fulton's Condition Factor, K.

$$K = 100 * {Weight\ (g)}\Big/{Length\ (cm)^3}$$ (Ricker 1975[1])

Using the Shapiro-Wilks test for normality, it was found that the K values were not of a normal distribution (SW p-value= 0.00) and no transformation could bring them into normality. As such, the differences of K values across waterbodies were to be tested using a one-way ANOVA, which is robust to small variations in normality. A test for the equality of two variances revealed that each population has equal variance (p-value = 0.142).

The mean K value for Bear River (mean=1.063 K) was slightly greater than that of Bitter Creek (mean=1.032 K), however there is not sufficient evidence to declare these to be significantly different (F-statistic= 3.401, p-value= 0.066). As illustrated in Figure 2, though the mean K value for Bear River is slightly higher, the distribution of values for each watercourse were extremely similar and largely overlapping.

[1] Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin of the Fisheries Research Board of Canada 191:1-382.

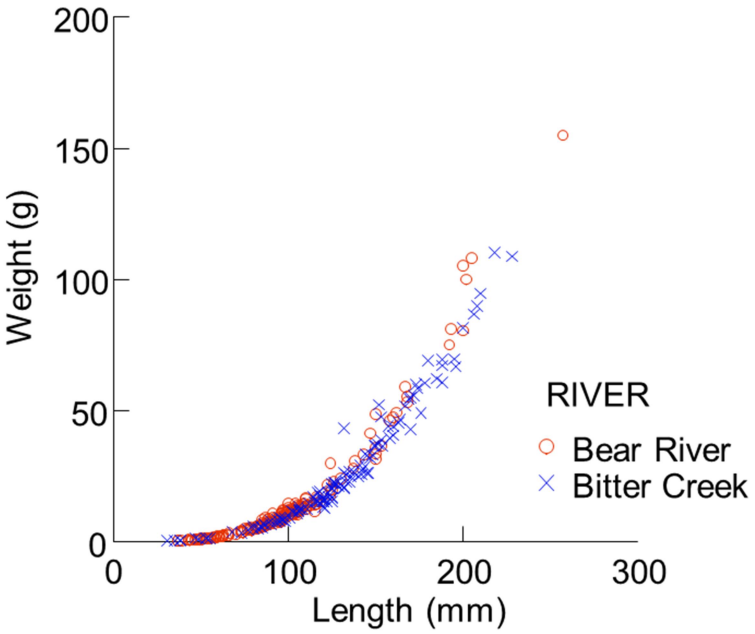


**Figure 1. Relationship of Length vs weight for Dolly Varden from both Bear River and Bitter Creek.**

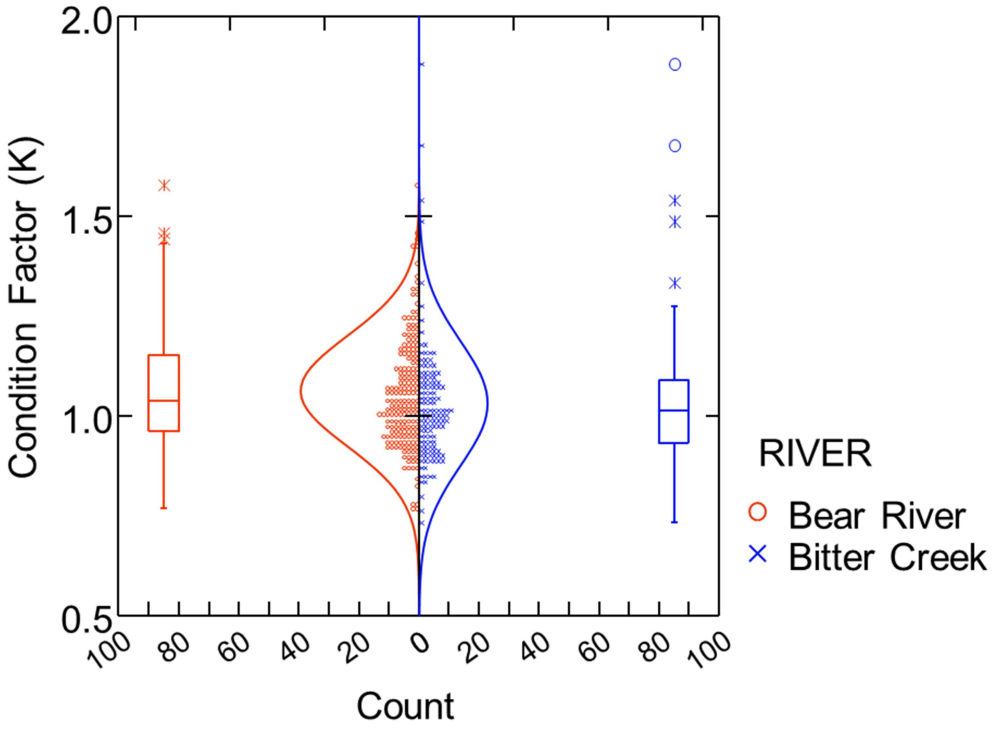


**Figure 2. Box and Histogram plots for Condition Factor for Dolly Varden from both Bear River and Bitter Creek.**

In order to focus specifically on differences in length and weight for each separate age class, a one-way ANOVA was conducted for each. Only age classes 2 and 3 had sufficient replicates to complete a statistical test. In contrast to the K values, distributions were found to be normal; however, the variances were unequal, thus the ANOVA was utilized again due to its robustness.

Fish lengths were found to be not significantly different across watercourses in age classes 2 and 3 ($F=3.060$, p-value=0.096; and $F=0.048$, p-value=0.83, respectively). Similarly, weights were not significantly different across watercourses in age classes 2 and 3 ($F=1.562$, p-value=0.277; and $F=0.041$, p-value= 0.843, respectively). Figures 3-31 and 3-32 from the Baseline Fisheries and Aquatic Resources report illustrate this comparison.