

# **Peter Hope Lake Stock Assessment (Kamloops B.C.) 2025**

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Abstract: .....	3
Introduction.....	4
Methods: .....	5
Gillnet Sampling .....	5
Lake Chemistry .....	5
Statistical analysis .....	6
Results:.....	6
Limnological Characteristics.....	6
Fulton’s Condition Factor (K).....	7
Length – Weight Regression.....	10
Population Trends and Structure.....	11
Discussion/Recommendations: .....	13
Limnological Overview.....	13
Fulton’s Condition Factor (K).....	14
Length-Weight Regression.....	14
Population Trends and Structure.....	14
Conclusion .....	15
References.....	16
Appendix A.....	17
Appendix B.....	19

## Abstract:

On September 24<sup>th</sup> & 25<sup>th</sup> 2025, a stock assessment was completed in Peter Hope Lake to report on the composition of Rainbow trout (RB, *Oncorhynchus mykiss*) and Kokanee (KO, *Oncorhynchus nerka*) stocks. The purpose of the study was to estimate population characteristics to support management decisions related to stocking, regulations, and conservation efforts. Fish were sampled using two overnight gill nets, and individuals were counted and measured to assess population structure and condition. Length-weight analysis, Fulton's condition factors, and population trends were analyzed and compared across datasets from 2019, 2023, and 2025 using Microsoft Excel and Minitab software. Limnological data was also collected during the study period to provide a broader understanding of what may influence overall abundance within Peter Hope Lake. A Secchi depth of 5.5 m suggested oligotrophic conditions, while also demonstrating thermal stratification as a well-defined thermocline was observed at 9 m, accompanied by a sharp decline in dissolved oxygen and temperature. Through statistical analysis, we found that Fulton's Condition Factor indicated peak condition for Kokanee at fork lengths of 350 – 400 mm and for Rainbow trout at 400 – 450 mm, however, calculated condition factors resulted in suboptimal fish body conditions in this waterbody. Management suggestions include increasing food, decreasing stocking rates, and maintaining current regulations.

# Introduction

Peter Hope Lake is a stocked waterbody located in the Thompson-Okanagan region, located approximately 60 minutes outside of Kamloops, British Columbia. This waterbody is located at an elevation of 1095 m and has an area of 115.9 m<sup>2</sup> (Watershed Dictionary Query – ‘Peter Hope Lake’, n.d.). The lake has a mean depth of 11.6 m and a maximum depth of 33 m (Watershed Dictionary Query – ‘Peter Hope Lake’, n.d.). This lake is fed primarily by Peter Hope Creek, which is a tributary to Nicola Lake (Andison, A. 2008.). Historically, the lake was dammed for an irrigation reservoir but is now used as a popular lake for wildlife viewing, fishing, and recreation (Andison, A. 2008.). Peter Hope was known to be naturally “fishless” prior to being stocked as a monoculture system of Rainbow trout, until the introduction of Kokanee stocks (*Oncorhynchus nerka*) in 2017 (Mushet, et al., 2020). The lake has been stocked with many strains of fry and yearling, namely Pennask, Lussier River, and Bridge strains, with the most recent being a Blackwater strain (Fish Stocking Reports, n.d.).

Stock assessments integrate valuable information to evaluate the status and dynamics of fish populations. By analyzing this data, population sizes can be estimated, along with relative age and mortality rates within the waterbody. Suggestions may be deduced from these data to conserve healthy populations of stocks. Current restrictions of Peter Hope Lake include no ice fishing, single hook, and a bait ban (2025-2027 BC Freshwater Fishing Regulations Synopsis, 2025).

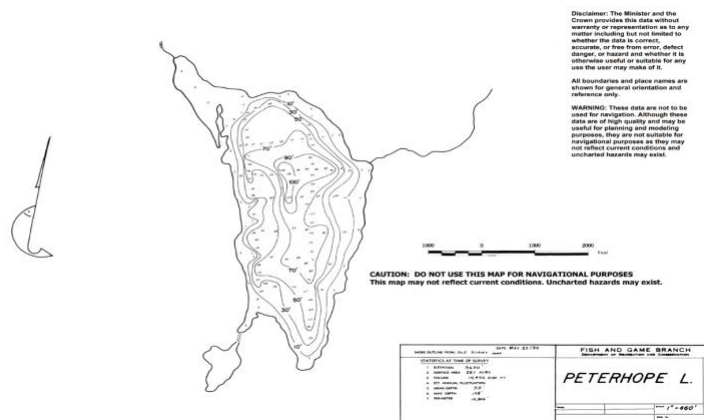


Figure 1. Bathymetric Map of Peter Hope Lake (NRSC4100- Fisheries Management Moodle).

## Methods:

### Gillnet Sampling

This assessment was completed by the TRU Fisheries Management class, who have been conducting stock assessments on Peter Hope Lake since 2023. Two 7-panel gill nets were set on September 24<sup>th</sup>, 2025 and fish were collected approximately 15-16 hours after net deployment. The first net was a sinking net set over the shoal of the lake, starting at a depth of 1.4 m and ending at 3.5 m. The second net was a floating, deep-set net starting at a depth of 1.5 m and ending at 14.5 m. Each net was dispatched perpendicular to the shoreline on the southern side of the lake. Gillnet depths were selected to target both Rainbow trout (*Oncorhynchus mykiss*) and Kokanee (*Oncorhynchus nerka*), as they are bottom dwelling fishes that reside in mid to deep-water (Mushet, et al., 2020).

After retrieving the nets on the morning of September 25<sup>th</sup>, 2025, a crew worked onboard a watercraft to ensure all animals were euthanized according to CCAC guidelines (*Guidelines on the Care and Use of Fish in Research, Teaching and Testing*. 2005.). Following these practices, all fish were measured for fork length (mm) and weight (g). Otoliths were extracted from the skull of the fish to determine age. An internal examination of each fish was performed through dissection and was used to determine sex, maturity, stomach contents, abnormalities, and disease presence.

### Lake Chemistry

A water chemistry panel was conducted by the TRU Fisheries Management class on September 25, 2025. Chemical information was collected using a YSI ProDDS multi-meter, at 1 m intervals, with the maximum recorded depth being 13 m. A zooplankton tow also occurred at a depth of 9 m.

## Statistical Analysis

We used Minitab software and assessed three sets of stock assessment data: our 2025 sample as well as with historical data from 2019 and 2023. Our analysis includes length-weight relationships and regression analysis to determine overall fish condition of this population. The data were log transformed to verify normality assumptions and to further examine linear relationships among representative size classes. The significance of these relationships were evaluated using the slopes of the resulting regression lines as indicators of fish condition.

Fulton's Condition Factor Index was also applied to these datasets to assess individual health and relative condition based on length-weight data presented. To further describe and examine population structure, length-frequency analyses were conducted to identify size and age classes to use as a projection of growth. Histograms were constructed to visualize the length-frequency distributions of both KO and RB and were used to further estimate age cohorts.

## Results:

### Limnological Characteristics

The pH of the lake was recorded and determined to be 8.83, while the conductivity was 386  $\mu\text{S}/\text{cm}$ . Temperature and dissolved oxygen profiles were both recorded at one-meter intervals to a maximum depth of 13 m (Figure 2). From Figure 2., we can estimate that a thermocline can be found at a depth of 9 m. From our graph, there is a decrease in temperature from approximately 16.2 °C to 6.7 °C at the depth of 13 m. Dissolved oxygen concentrations were elevated until depths of approximately 9 m, indicating well-oxygenated conditions throughout the water column.

Through a zooplankton tow, we found a density of 35 animals/L, the composition of which were Cladocerans (72%), Copepods (25%) and a small proportion of Rotifers (3%). Additionally, using a Secchi disk we measured the density and turbidity of the water. The mean Secchi depth was found to be 5.5 m, reflecting relatively clear water and low turbidity.

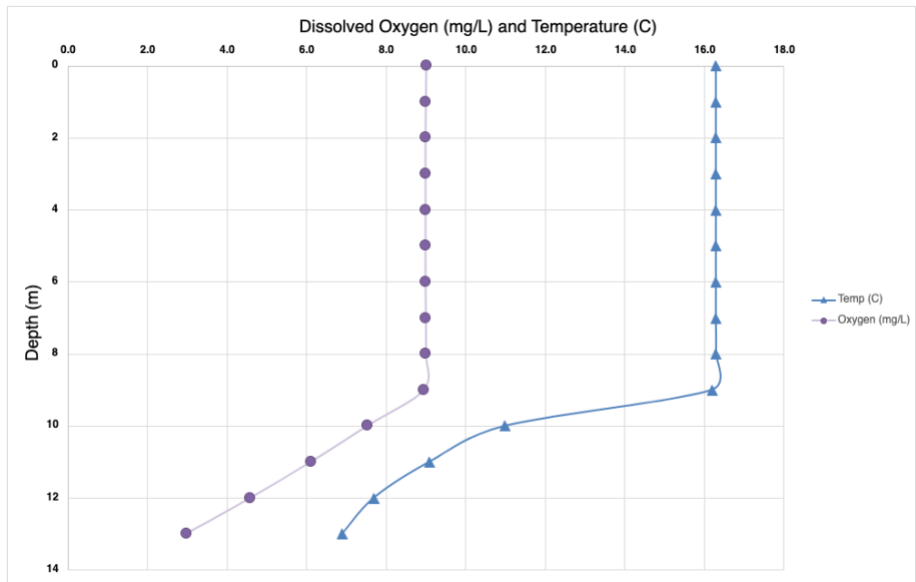


Figure 2. Depth profile of Peter Hope Lake measuring both temperature and dissolved oxygen by lake depth.

### Fulton’s Condition Factor (K)

Fulton’s condition factor is a measure of fish condition by a comparison of length and weight of individual fish in a population (Heise, 2025). This index assumes isometric growth, meaning fish shape does not change with growth (Heise, 2025). Using the following equation, a condition factor (CF) equal to 3 assumes the stock is maintaining health (Heise, 2025). A CF less than 3 means the stock is unhealthy and further action must be pursued (Heise, 2025). A CF greater than 3 means the stock is over productive, and further action may be needed to supplement the health of the population (Heise, 2025). The Fulton’s condition factor formula is:

$$CF = (W / L^3 \text{ (mm)}) * 100\,000$$

Where W = weight (g), L = length, CF = condition factor (Heise, 2025).

The Fulton's condition factor within our study provides a direct measure of the relationship between fish size and body condition across age classes. Figure 3. illustrates the relationship between Fork length (FL) and K for the 2025 KO populations. The overall fish condition for Kokanee can be seen to peak at 350 – 400 mm. The slope of the line was found to be 1.904 while the  $R^2$  value appeared to be 0.363. As for the 2025 RB populations, an average high Fulton's K is seen between 400 – 450 mm (Figure 4.) The slope of the line is 1.558 and the  $R^2$  value was determined to be 0.342. Both graphs show a negative correlation when compared via regression analysis. Fulton's K values throughout 2025, 2023, and 2019 are shown in Figure 5.

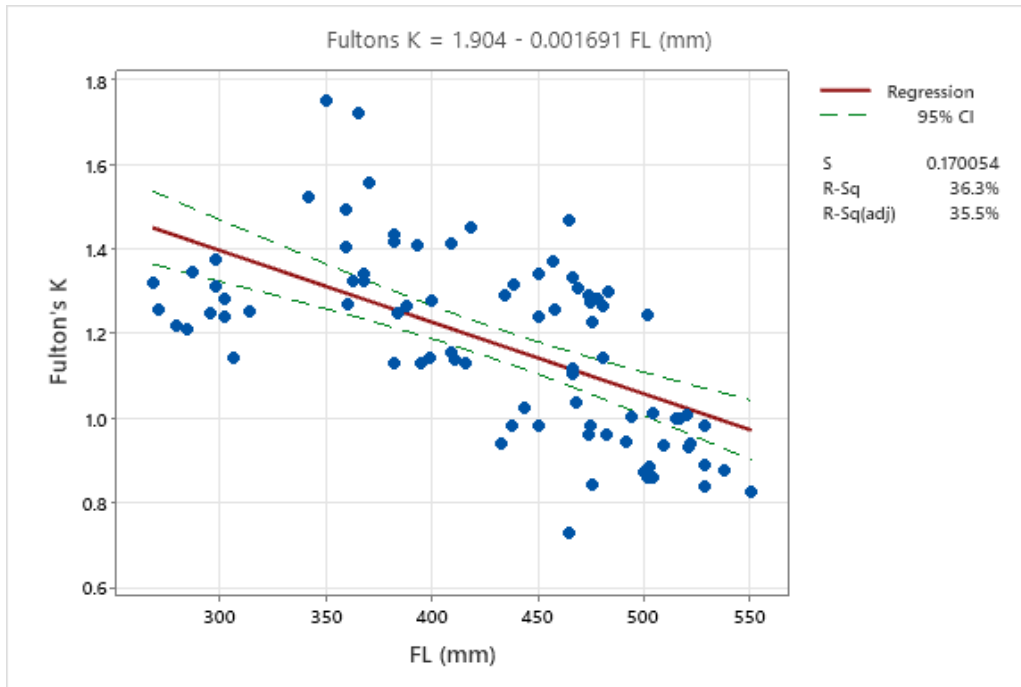


Figure 3. Fulton's Condition Factor of the 2025 stocks of Peter Hope KO.

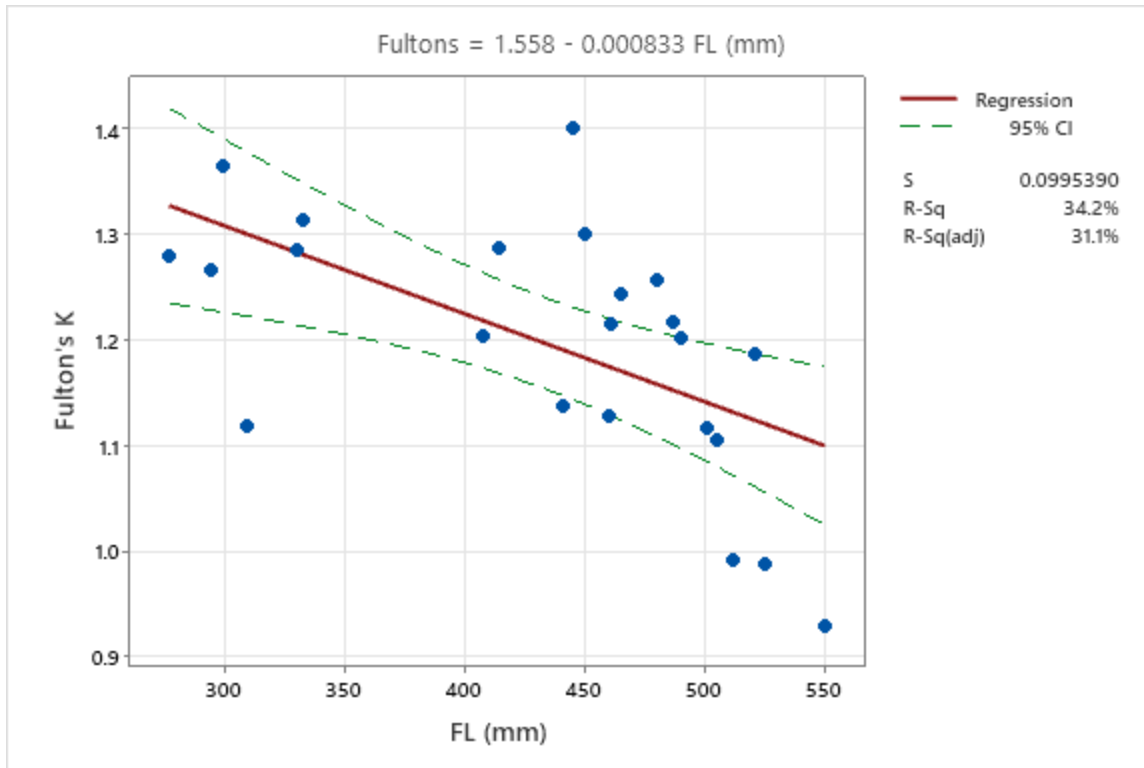


Figure 4. Fulton's Condition Factor of the 2025 stocks of Peter Hope RB.

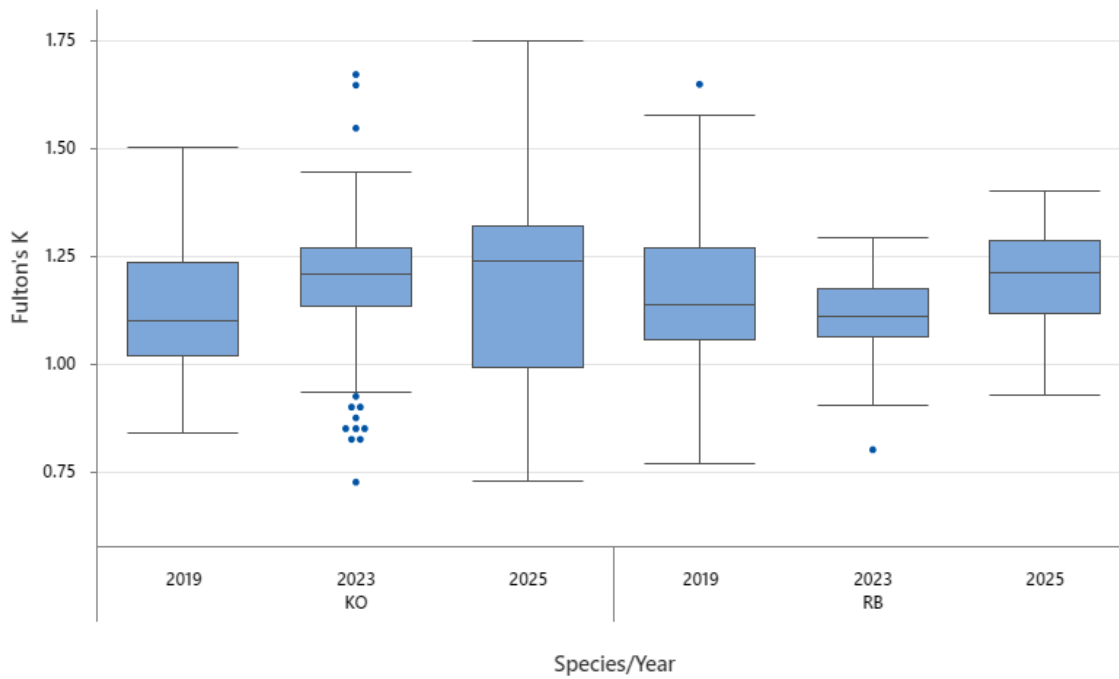


Figure 5. Fulton's Condition Factor by species over time.

## Length – Weight Regression

The length-weight analysis was performed by using the regression analysis tool in Minitab Statistical Software. To keep bias constant throughout the data, a log transformation was applied to the length and weight data to linearize the resulting graph. Using the 2025 RB dataset, the slope of the graph was 2.732, the p-value was  $< 0.05$ , and the  $R^2$  value was 0.978 (97.8 %) (Figure 6.). In 2023, the RB population slope was 2.910, the p-value was  $< 0.05$ , and the  $R^2$  value was 0.988 (98.8 %) (Appendix A). In 2019, the RB population slope was 2.809, the p-value was  $< 0.05$ , and the  $R^2$  value was 0.991 (99.1 %) (Appendix A). All graphs show a positive correlation when compared as a regression.

In the 2025 KO population, the p-value was  $< 0.05$ , the slope was reported to be 2.442, and the  $R^2$  value was 0.906 (90.6 %) (Figure 7.). In 2023, the KO population slope was 1.664, the p-value was  $< 0.05$ , and the  $R^2$  value was 0.570 (57.0 %) (Appendix A). In 2019, the KO population slope was 2.660, the p-value was  $< 0.05$ , and the  $R^2$  value was 0.877 (87.7 %) (Appendix A). All graphs show a positive correlation when compared as a regression, however, deviations are seen in the 2019 and 2023 KO graphs.

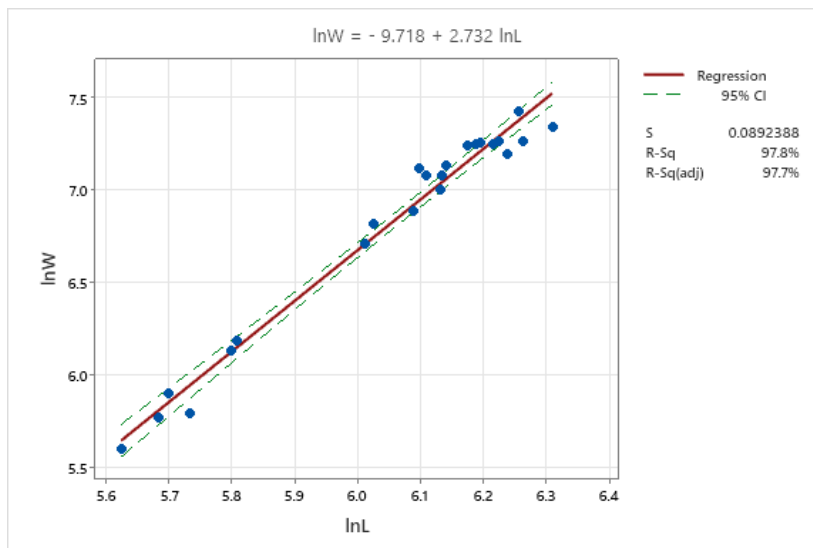


Figure 6. Linear regression of the length-weight relationship of 2025 RB in Peter Hope Lake.

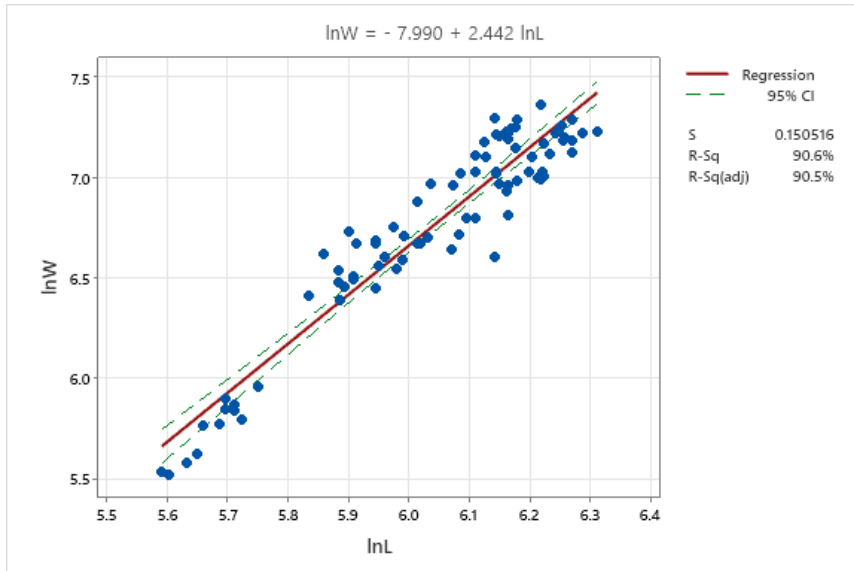


Figure 7. Linear regression of the length-weight relationship of 2025 KO in Peter Hope Lake.

## Population Trends and Structure

Using Minitab Statistical Software, fork-length-frequency histograms were created for RB and KO. In 2019, KO lengths were strongly concentrated between 350 – 420 mm. By 2023, the distribution broadened and became more evenly spread (approximately 350 – 460 mm). In 2025, the KO lengths follow a sharp curve, with the highest frequencies having lengths between 450 – 500mm. In the RB populations, the histograms show more prominent curves, as seen in Figure 8.

Sex and maturity were summarized in Table 1. and examined the 2019, 2023, and 2025 data collected for both RB and KO maturity classes and population sizes. In 2019, RB exhibited the highest number of Total Individuals being 176, while the lowest number of individuals for Rainbow trout appeared during our 2025 stock assessment at Peter Hope Lake and was found to be 23 individuals. Population trends are seen to differ between years for Kokanee with the highest number of individuals being 116 in 2023, 85 individuals in 2025, and the lowest number of individuals appearing in 2019 at 72 individuals. Data collected also accounted for the maturity of the samples, which showed most individuals were classified as immature or maturing throughout all three years. There were also small percentages of Kokanee sampled across all three years observed in the spawning and mature phases as well.

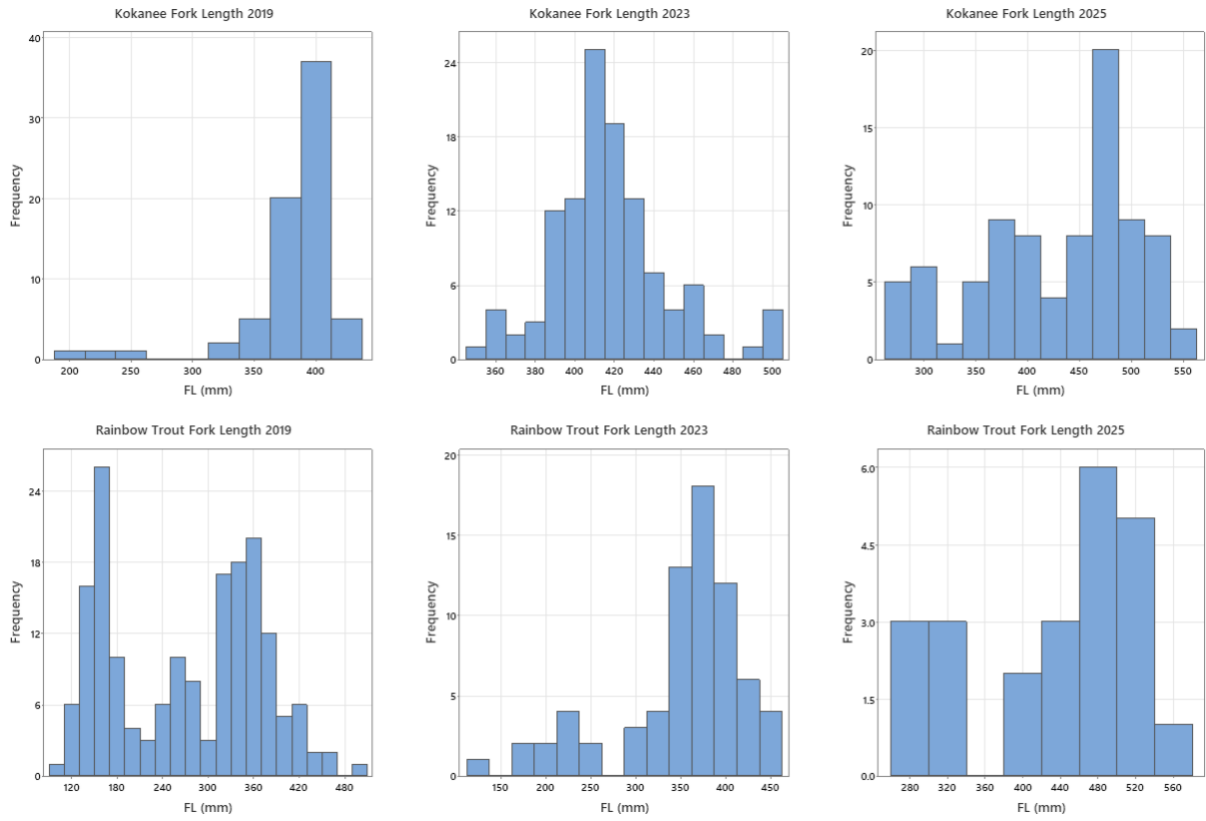


Figure 8. Histogram of Fork Length (mm) for Kokanee (top) and Rainbow Trout (bottom) in 2019, 2023, and 2025.

Table 1. Sex and Maturity of Kokanee (KO) and Rainbow Trout (RB) in 2019, 2023, and 2025.

<b>Species</b>	<b>RB</b>	<b>RB</b>	<b>RB</b>	<b>KO</b>	<b>KO</b>	<b>KO</b>
<b>Year</b>	<b>2025</b>	<b>2023</b>	<b>2019</b>	<b>2025</b>	<b>2023</b>	<b>2019</b>
<b># of Females</b>	12	45	32	24	26	57
<b># of Males</b>	6	30	21	55	88	9
<b># of Individuals (Sex unknown)</b>	5	6	123	6	2	6
<b>Total Number of Individuals</b>	<b>23</b>	<b>71</b>	<b>176</b>	<b>85</b>	<b>116</b>	<b>72</b>
<b>% of Immature</b>	47.8	33.8	69.9	50.6	93.9	100
<b>% of Maturing</b>	43.5	66.2	30.1	43.5	0.9	-
<b>% of Mature</b>	-	-	-	1.2	2.6	-
<b>% of Spawning</b>	8.7	-	-	4.7	1.7	-
<b>% of Spent</b>	-	-	-	-	0.9	-

## Discussion/Recommendations:

### Limnological Overview

The limnological results indicate that Peter Hope Lake maintains generally healthy and stable water quality conditions. The slightly basic pH of 8.83 and moderate conductivity of 386  $\mu\text{S}/\text{cm}$  suggest a well-buffered system overall. This could be influenced by surrounding characteristics and natural mineral inputs of the lake. Water clarity and evidence of thermal stratification with a thermocline appearing at a depth of 9 m indicate an oligotrophic state, reflecting moderate productivity and low risks of eutrophication. Continued monitoring of pH, conductivity, and clarity is recommended to track potential shifts in water chemistry that could influence habitat quality and overall ecosystem function.

## Fulton's Condition Factor (K)

Figure 5. shows small deviations in the medians of K in both RB and KO populations over time, however, the interquartile ranges and error bars vary drastically. This is further supported the fact that both graphs have low  $R^2$  values, meaning our regression graphs for both species explain less than 40 % of the variance shown in the model. Through analysis of fish condition using Fulton's Condition Factor, our graphs showed that the 2025 KO population had a CF of 1.904, and the RB had a CF of 1.558 as indicated by the slope of the graphs. From these results, we can deduce that the KO and RB are not gaining adequate weight for their length and are therefore underweight in the Peter Hope system.

## Length-Weight Regression

Results of length-weight regressions show that all RB analyses have highly positive associations between length and weight variables. Between years, all RB populations have  $R^2$  values above 97 %, where 2019, 2023, and 2025 have  $R^2$  values of 99.1 %, 98.8 % and 97.8%, respectfully. These results mean that over 97 % of the data can be explained by the graph, specifically the length-weight relationship, demonstrating a strong correlation between length and weight of these fishes.

## Population Trends and Structure

The histograms show shifts in size between years, from which we can deduce size classes (Figure 8). In 2019, KO lengths were strongly concentrated between 350 – 420 mm, indicating a population dominated by well-established individuals. This histogram contained two age cohorts, possibly indicating a population health problem through low recruitment of fish under 350 mm. By 2023, the distribution broadened and became more evenly spread (approximately 350 – 460 mm), which suggests a mix of age classes within Peter Hope Lake and improved survival rates. However, at this stage, the population was still not adequate, as it had shifted to having a large concentration of fish between 390 and 420 mm. In 2025, the KO population included an evenly

distributed spread, creating three well-defined curves in the histogram. These fish show distinct age cohorts, indicating continued growth among the species.

Rainbow trout on the other hand, demonstrated greater variability across years. In 2019 there was a distribution of approximately 130 – 360 mm which may suggest multiple cohorts within the population based on three well-defined curves in the histogram. Again, these results indicate adequate fish growth which may be due to favourable environmental conditions. By 2023, most Rainbow trout ranged from 300 – 450 mm representing a more uniform size structure. This population, however, lacks recruitment in the smaller age divisions. In 2025, the distribution shifted toward larger fish (approximately 400 – 560 mm) representing strong growth and success from earlier years. This histogram shows two distinct age cohorts which may cause future fluctuations in age cohorts.

## Conclusion

The Peter Hope Stock Assessment completed by TRU Fisheries Management class provided useful and beneficial information regarding the overall health and dynamics of Rainbow trout (*Oncorhynchus mykiss*) and Kokanee (*Oncorhynchus nerka*) populations contributing to ongoing data collection. The study reflects current trends in the Peter Hope KO and RB populations, providing powerful insights into the coexistence of these species as well as the health of the fishery. Use of historical data assisted in creating population trends, to which we can follow and project these to make management recommendations on this stock.

Suggestions for future management include 1) to increase the food resources available to these fish stocks, as demonstrated by low body condition scores. This action will ensure that age-classes of RB are sustained and may continue a healthy population into the future. Other management suggestions are to 2) decrease stocking to subsequently decrease limiting factors related to low weights and 3) maintain angler limits and restrictions of gear.

## References

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# Appendix A

Supporting figures of Length-weight regressions:

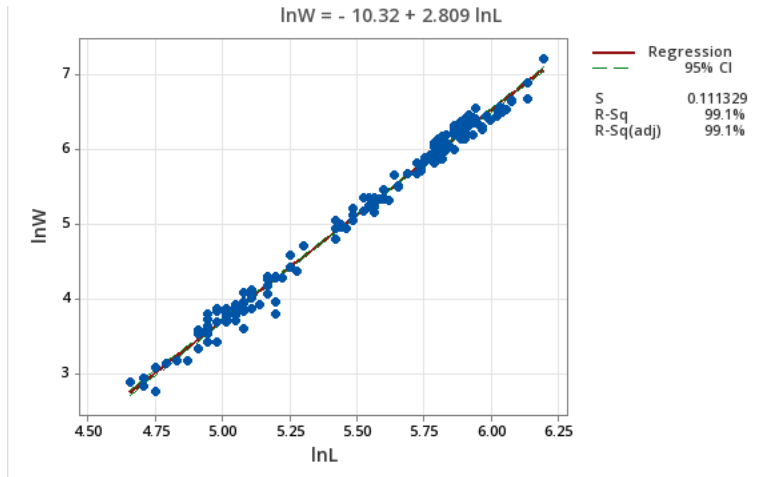


Figure 1. Linear regression of the length-weight relationship of 2019 RB in Peter Hope Lake.

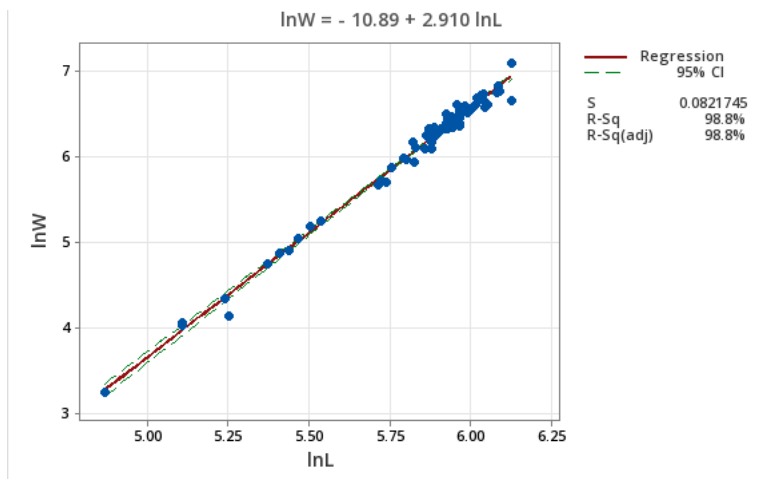


Figure 2. Linear regression of the length-weight relationship of 2023 RB in Peter Hope Lake.

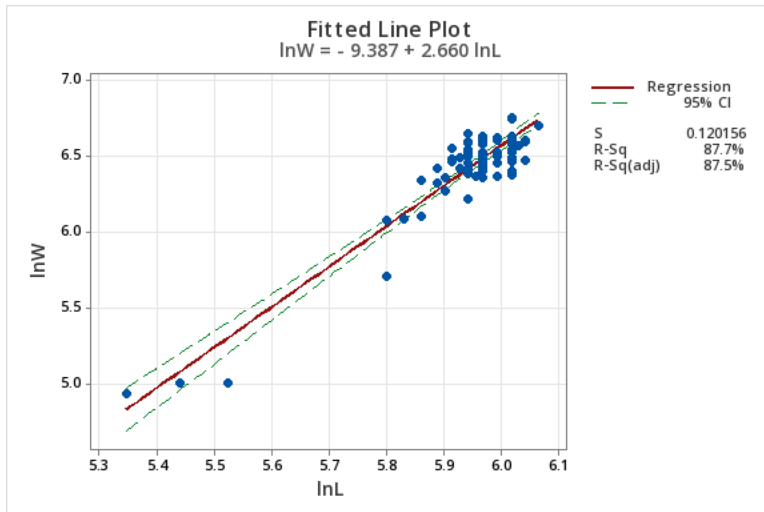


Figure 3. Linear regression of the length-weight relationship of 2019 KO in Peter Hope Lake.

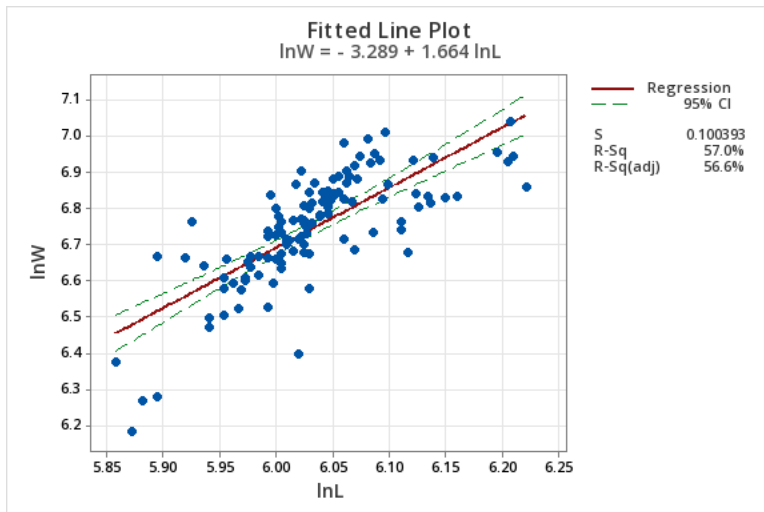


Figure 4. Linear regression of the length-weight relationship of 2023 KO in Peter Hope Lake.

# Appendix B

Supporting Tables of ANOVA Analyses:

Table 2. 2025 RB ANOVA Regression.

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Regression	1	7.43168	7.43168	933.21	0.000
Error	21	0.16723	0.00796		
Total	22	7.59891			

Table 3. 2025 KO ANOVA Regression.

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Regression	1	18.1253	18.1253	800.05	0.000
Error	83	1.8804	0.0227		
Total	84	20.0057			

Table 4. 2023 RB ANOVA Regression.

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Regression	1	1.52124	1.52124	150.94	0.000
Error	114	1.14897	0.01008		
Total	115	2.67021			

Table 5. 2019 RB ANOVA Regression.

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Regression	1	227.663	227.663	18368.69	0.000
Error	174	2.157	0.012		
Total	175	229.819			

Table 6. 2023 KO ANOVA Regression.

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Regression	1	1.52124	1.52124	150.94	0.000
Error	114	1.14897	0.01008		
Total	115	2.67021			

Table 7. 2019 KO ANOVA Regression.

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Regression	1	7.22045	7.22045	500.12	0.000
Error	70	1.01063	0.01444		
Total	71	8.23108			

Table 8. ANOVA Regression for KO Fulton's K (2025).

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Regression	1	1.36732	1.36732	47.28	0.000
Error	83	2.40021	0.02892		
Total	84	3.76753			

Table 9. ANOVA Regression for RB Fulton's K (2025).

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Regression	1	0.108295	0.108295	10.93	0.003
Error	21	0.208068	0.009908		
Total	22	0.316363			