

Land acknowledgement

Thompson Rivers University is on the traditional lands of the Tk'emlúps te Secwépemc; Louis Creek study sites are on the Simpcwúl'ecw traditional lands, both of which are part of the traditional and unceded territory of the Secwépemc.

Background

Louis Creek, BC (Figure 1), has been identified as a high priority for restoration efforts due to a loss of riparian vegetation and cows having direct-access to the stream causing erosion and increased loss of riparian vegetation.

Streambank restorations included the introduction of riprap (human-placed boulders providing both streambed and streambank protection), coarse woody debris (CWD) and replanting vegetation which increases bankside stability and improves stream conditions for local fish populations (coho, chinook & rainbow trout), and other species, including invertebrates (Figure 2).

Introduction of riprap, CWD and the reestablishment of riparian vegetation increases dissolved oxygen, decreases stream temperatures, and provides cover and places of rest for fish (Bjornn and Reiser 1991).

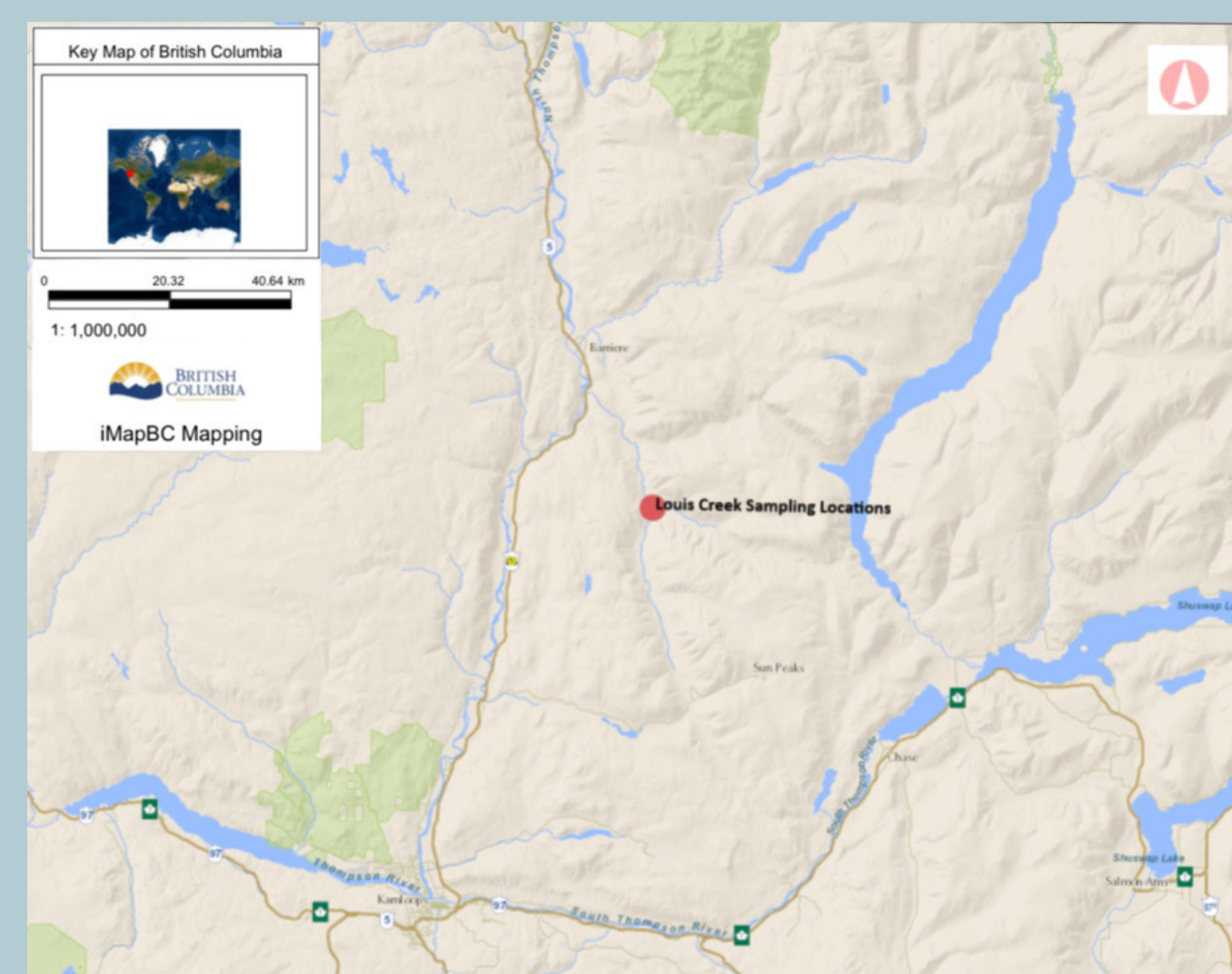


Figure 1. Louis Creek study sampling locations in respect to location of Kamloops, British Columbia. iMap BC.

Study objectives

The objectives of this study were to:

- Evaluate the macroinvertebrate community change of 1-yr and 2-yr old sections of stream bank to determine whether the restoration efforts are effective with respect to improving the aquatic diversity of Louis Creek, BC.

Methods

Sample collecting

- This project saw the use of two sampling sites, Site A and Site B – Site A was located downstream and was restored over the winter of 2021/2022; Site B, further upstream, was restored over the winter of 2020/2021 (Figure 3).



Figure 2. Riprap and CWD of Site B bankside, Louis Creek, BC. 2021.

Note: Restoration efforts took place in the winter months to minimize any potential damage or erosion to the bankside and streambed.

- 10 sampling units at each site (1 x 2 m each, totaling 20 m²) were sectioned off.
- Using a modified '3-minute travelling kick', samples were collected in a 250 μm mesh D-frame net.
- Samples were preserved in 80% ethanol in Whirl-Pak™ bags (Figure 4).



Figure 3. Site A and Site B of Louis Creek, BC.

Sample sorting & data collection

- Invertebrates were removed from all sediment, organic matter and rocks (Figure 5)
- Invertebrates were identified to family level
- Biomass was calculated by measuring the length of each invertebrate and using length-weight regression equations
- Response variables included total abundance and total Ephemeroptera, Plecoptera, Trichoptera (EPT) and the ratio of EPT to Diptera (EPT/D)



Figure 4. Collecting and bagging samples from Louis Creek, BC.

Data analysis

- I used non-parametric Mann-Whitney U tests for significance, after assumptions regarding normality or equal variance were not met.

Note: The same collection and analysis techniques were used in 2021 and 2022; sample units corresponded with GPS coordinates taken in 2021

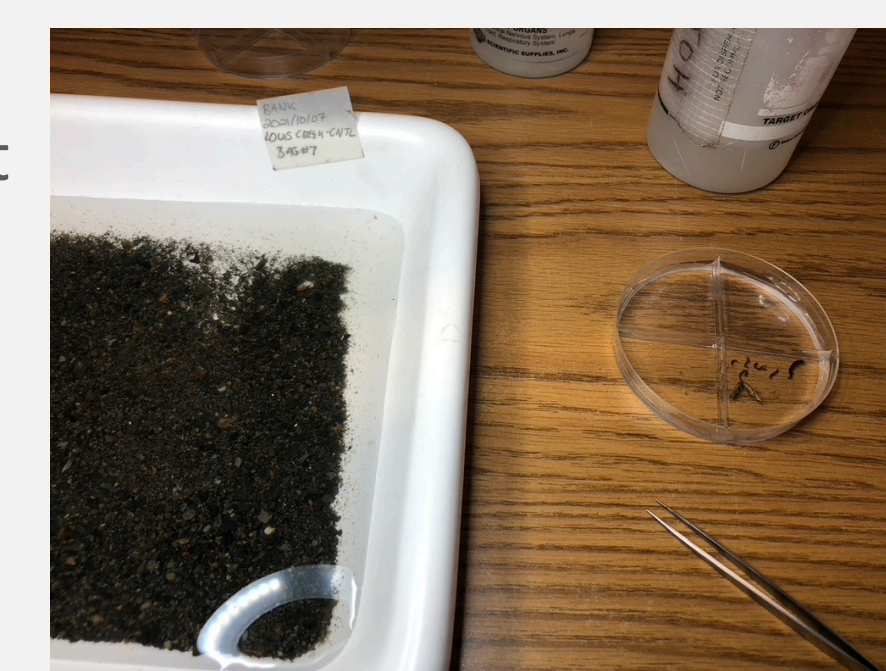


Figure 5. Removing invertebrates from sediment collected at respective sampling sites to be later identified and measured.

Results

- Restoration efforts saw a significant increase of total abundance, total EPT and EPT/D at both Site A and Site B (Figures 7, 8 & 9 respectively).
- Unlike Site A, Site B did not see a significant change in total biomass (Figure 6).

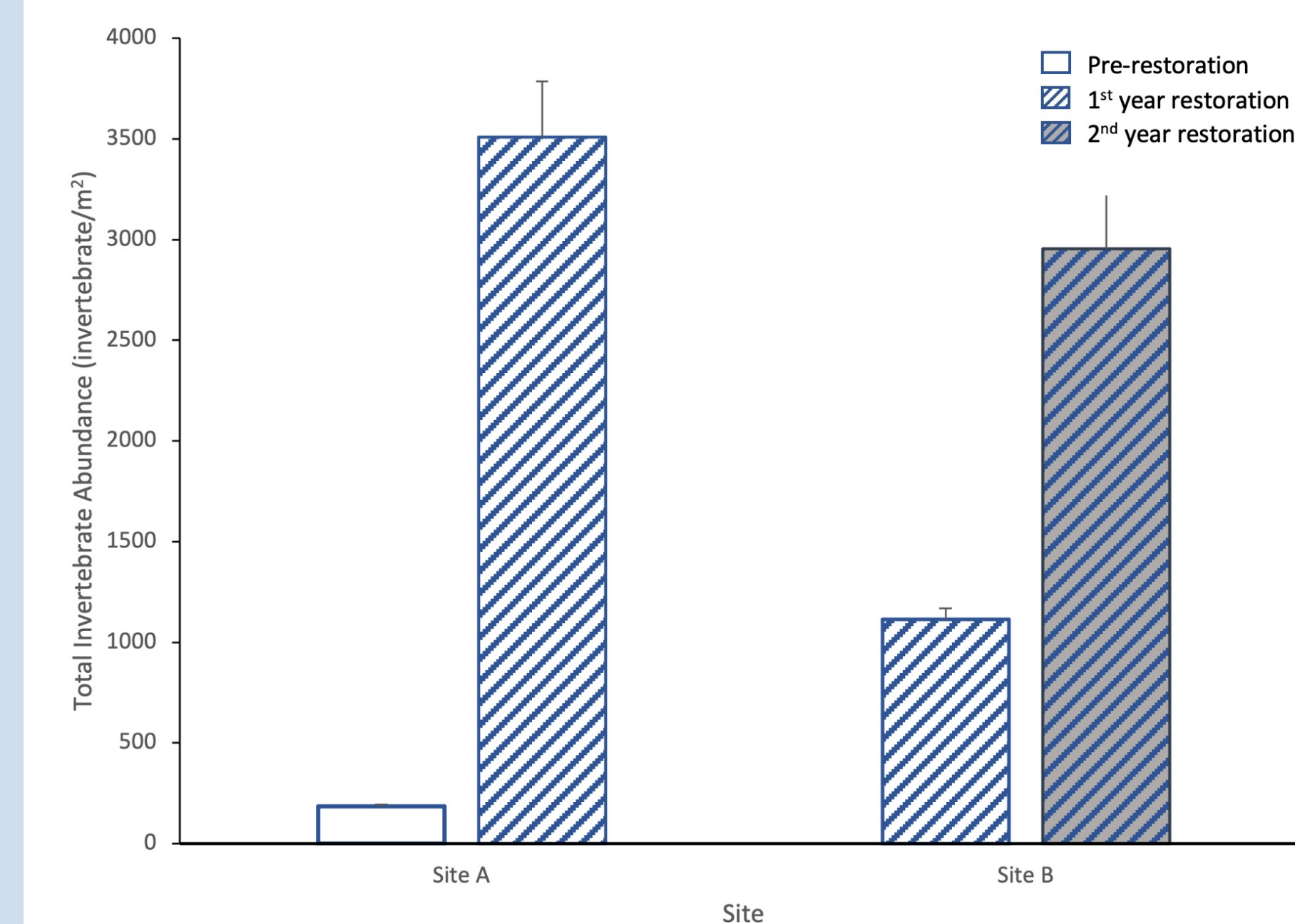


Figure 7. Mean total abundance (Invertebrates/m²) of both Site A, before and after restoration, and Site B, first- and second-year post-restoration with error bars that display 95% confidence intervals. Louis Creek, BC.

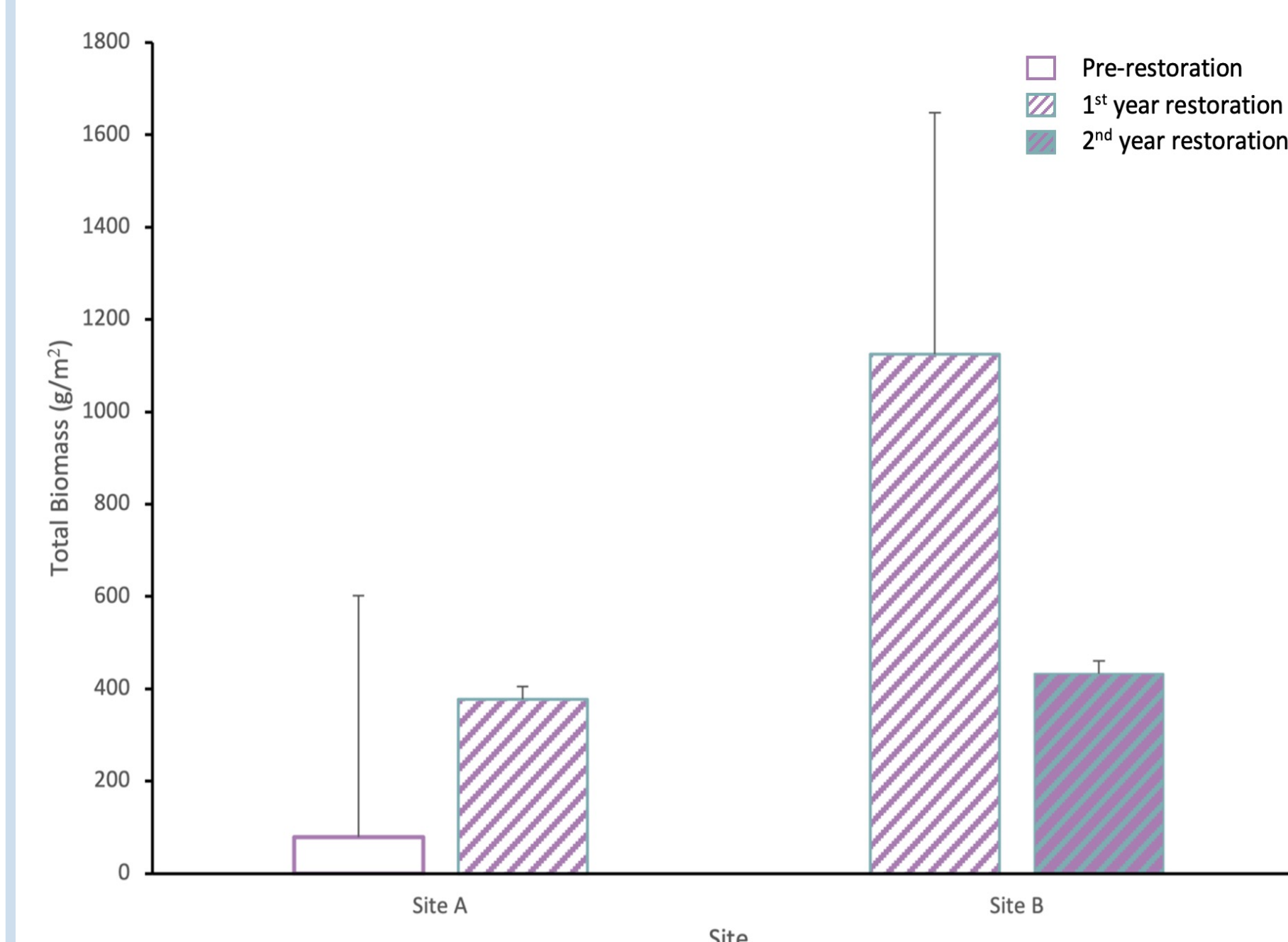


Figure 6. Mean total biomass (g/m²) of both Site A, before and after restoration, and Site B, first- and second-year post-restoration with error bars that display 95% confidence intervals. Louis Creek, BC.

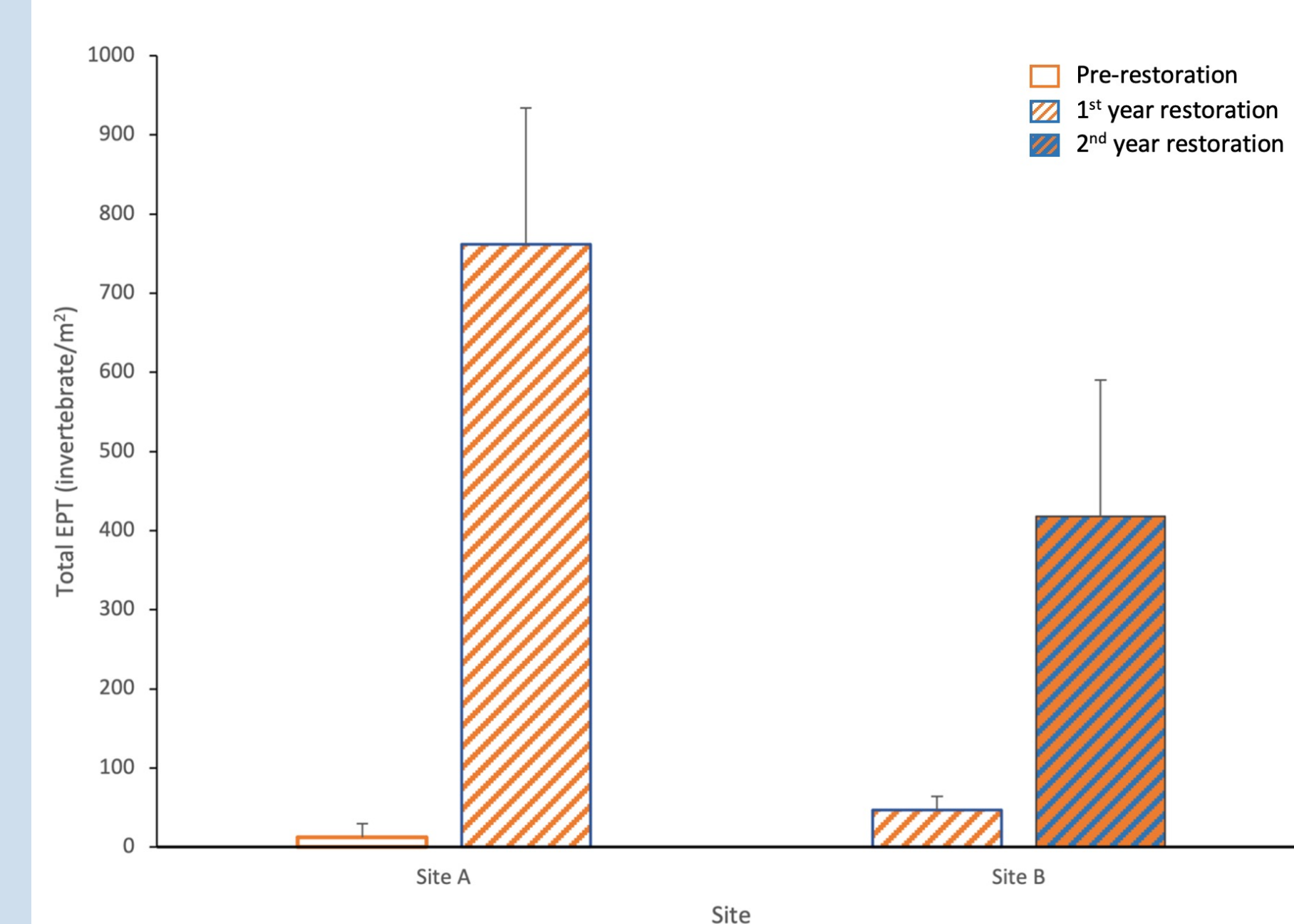


Figure 9. Mean total EPT/D of both Site A, before and after restoration, and Site B, first- and second-year post-restoration with error bars that display 95% confidence intervals. Louis Creek, BC.

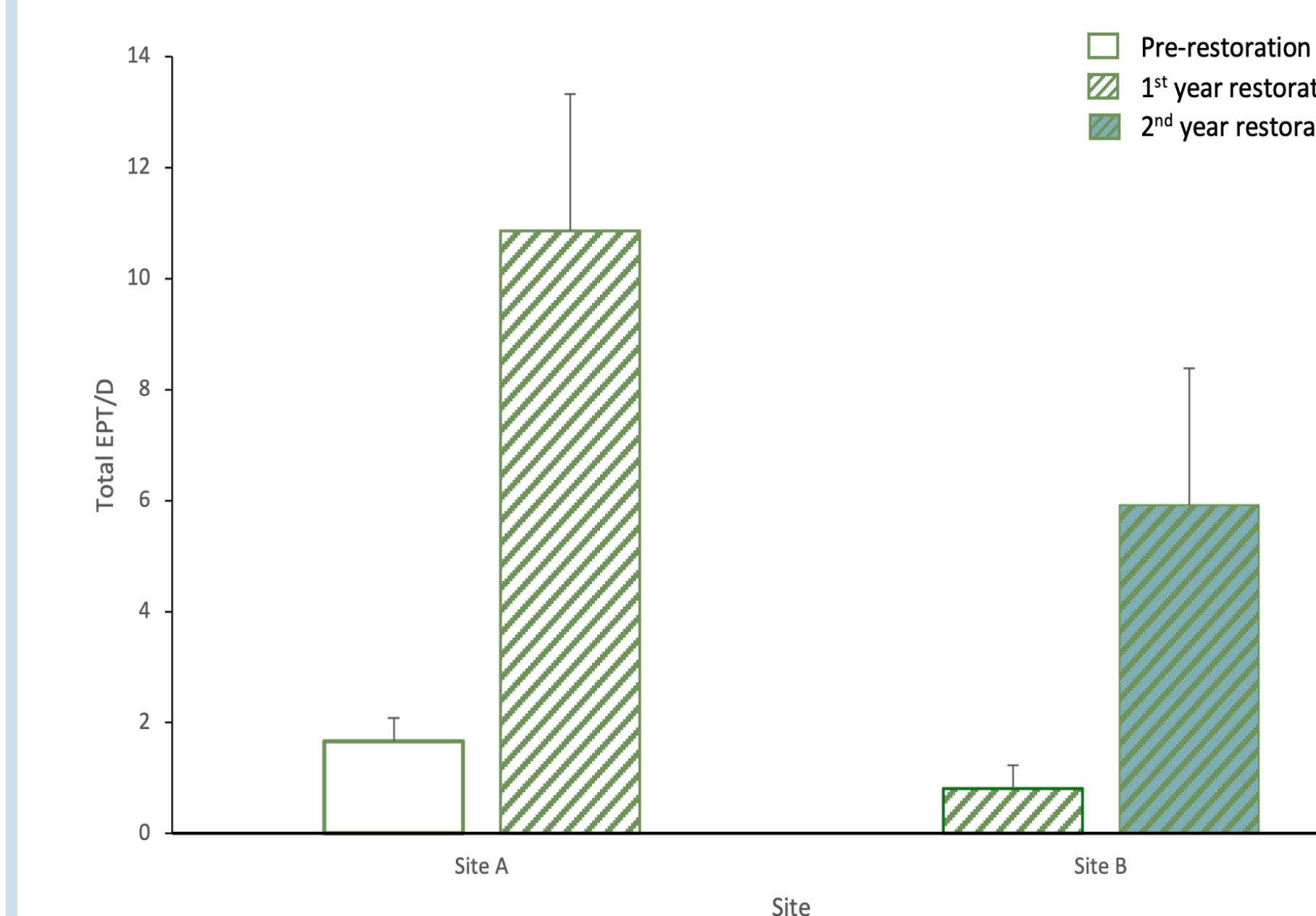


Figure 8. Mean total EPT (Invertebrates/m²) of both Site A, before and after restoration, and Site B, first- and second-year post-restoration with error bars that display 95% confidence intervals. Louis Creek, BC.

Conclusion

- Overall, restoration efforts had a positive impact on invertebrate community presence, not only showing a significant increase in abundance but also a significant increase in sensitive orders (EPT).
- Results show bankside restoration increased the total amount of aquatic invertebrate food for the fish
- With the addition of riprap and CWD, the stream is deeper, more stable and should hopefully support vegetation of all sorts (i.e., shrubs, trees, grasses)

Recommendations

- Additional vegetation planting (especially trees)
- Selective and restrictive water access for cows (i.e., fencing, stream crossing structures)
- Increased education to landowners to prevent loss of riparian area vegetation

Acknowledgements

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Literature cited

Bjornn T and Reiser D. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. American fisheries society special publications. 19:83-138.