

Pass Creek Instream and Off Channel Habitat Restoration

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EXECUTIVE SUMMARY

Pass (Norns) Creek is the first major tributary to the Columbia River below Hugh Keenleyside Dam adjacent to the town of Castlegar, BC. Pass Creek provides approximately 2.2 km of important spawning habitat for Rainbow Trout (*Oncorhynchus mykiss*), Kokanee (*Oncorhynchus nerka*), and Mountain Whitefish (*Prosopium williamsoni*) migrating from the Columbia River. In 2015, the Pass Creek Park Management Plan was developed to guide future development, operations and decision-making for the park (Olson-Russello and Anderton 2015).

The primary objectives of this project were:

1. Instream Fish Habitat Restoration and Monitoring Plan: prepare an instream restoration and monitoring plan for juvenile rearing and adult overwintering habitat options (Aligns with Priority Action 1 : Habitat-based Action, FWCP 2012).
2. Spawning Channel Feasibility: develop a feasibility study to disconnect the existing swimming pond water supply from surface water withdrawal, and repair a historic off-channel/spawning channel back to a naturalized state. Included in this assessment is determining a spectrum of options for alternative water sources to provide fresh water into the existing swimming ponds at Pass Creek Regional Campground (Aligns with Priority Action 1 : Research and Information Acquisition Action, FWCP 2012).

In July 2018, the Okanagan Nation Alliance (Kari Alex, Biologist), Mountain Station Consultants (Alan Thomson, P. Eng) and the Regional Parks Manager for the Regional District of Central Kootenay (Cary Gaynor) conducted site assessments at Pass Creek. Data collection and photo documentation were completed to address the objectives.

Briefly, the findings and recommendations for fish habitat restoration in the main stem channel of Pass Creek include (taken from Alex 2019, see Appendix A):

- The meander bends with a radius of curvature less than 60 m are currently and will continue to erode. Any effort to reduce the floodplain width will make these issues worse;
- Gravel sizes are typically too large for spawning Kokanee and small bodied Rainbow Trout;
- Increasing the bankful width to >26 m so the stream can access during Q_{2yr} and decreasing the reach slope (from 0.6% to 0.2%) with more Newbury riffles will retain the substrate sizes that Kokanee and Rainbow Trout use for spawning (30 mm);
- Although this may not be feasible, any further narrowing of the stream will coarsen the bed material negatively for spawners. Spawning channel options may be more suitable but low flow during the fall will be an issue for rearing Rainbow Trout and Shorthead Sculpin;
- Given the reduction in wetted widths, off channel or side channel engagement during spring freshet could offset the stream power during this time and possibly

assist the main channel in retaining smaller gravel bed material. More work is needed to assess the size of these off channel habitats and the flood flow they can accommodate;

- Add more woody debris structures that can withstand a flood discharge of $49 \text{ m}^3/\text{s}$ or $Q_{10\text{yr}}$; and,
- For low flow instream structure, add boulder clusters in pools for cover.

Recommendations for moving forward with assessments:

- Install and maintain discharge station on Pass Creek;
- Continue monitoring water temperature in mainstem and side channel of Pass Creek;
- Survey for hydraulic modeling of potential restoration options;
- Present and discuss these concepts at the community level;
- Monitor the system prior to any works; and,
- Seek out collaboration for these tasks.

Briefly, the key findings and recommendations for the swimming pond and spawning channel include (taken from Thomson 2019, see Appendix B):

The recreational pond requires some significant maintenance and upgrading of infrastructure if it is to function as intended. The pond liner requires replacing, and most of the water control structures should be replaced or refurbished. Furthermore, some additional improvements and additions to the infrastructure could provide secondary benefits of increasing the quality and area of Rainbow Trout spawning and rearing habitat in the side channel and preventing fish entry into the pond.

In order to maintain the function of the recreational pond from a water supply perspective, it is recommended that:

- Other variables that may limit recreational pond continued use or operation be recognised and analysed;
- The pond liner is replaced for the existing or smaller pond footprint;
- Groundwater from a new well is used to maintain water levels in the pond when surface water has filled the pond; and
- The pond outlet infrastructure is replaced.

In order to advance the above, the following is recommended:

- Conduct a detailed feasibility analysis on the above pond water retention concepts. Determine pond area in order to size the pond liner accurately;
- Conduct additional analysis on the quantity and quality of groundwater required to satisfy future pond operations;
- Determine the impact a proposed minimum flow requirement in Norns Creek of $0.78 \text{ m}^3/\text{s}$ will have on pond operations; and
- Further analyse and determine how to prevent fish from entering the pond.

The existing side channel has excellent potential for increased Rainbow Trout production in Norns Creek by enhancing existing and creating additional spawning and rearing

habitat. In order to advance the Rainbow Trout spawning and rearing habitat improvement concept the following steps are recommended:

- Monitor groundwater elevations at two or three locations along the side channel alignment throughout the summer, fall and winter periods by installing a shallow well with a piezometer and data logger. Groundwater levels can also be monitored and recorded manually if data are frequently collected;
- Conduct a topographical survey of the side channel alignment between the water intake on Norns Creek and the outlet of the recreational pond;
- Determine the impact a proposed minimum flow requirement in Norns Creek of $0.78 \text{ m}^3/\text{s}$ will have on water diversion for additional fish habitat in the side channel. A new or existing water license amendment may be required to develop the side channel for fish habitat purposes.

If the results of the above analysis are positive, then further refinement of the side channel concept can proceed.

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1.0 INTRODUCTION

1.1 Project Background

Pass (Norns) Creek is the first major tributary to the Columbia River below Hugh Keenleyside Dam adjacent to the town of Castlegar, BC. Pass Creek provides approximately 2.2 km of important spawning habitat for Rainbow Trout (*Oncorhynchus mykiss*), Kokanee (*Oncorhynchus nerka*), and Mountain Whitefish (*Prosopium williamsoni*) migrating from the Columbia River. In 2015, the Pass Creek Park Management Plan was developed to guide future development, operations and decision-making for the park (Olson-Russello and Anderton 2015).

1.2 Project Objectives

The primary objectives of this project were:

- Instream Fish Habitat Restoration and Monitoring Plan: prepare an instream restoration and monitoring plan for juvenile rearing and adult overwintering habitat options. (Aligns with Priority Action 1 : Habitat-based Action, FWCP 2012).
- Spawning Channel Feasibility: develop a feasibility study to disconnect the existing swimming pond water supply from surface water withdrawal, and repair a historic off-channel/spawning channel back to a naturalize state. Included in this assessment is determining a spectrum of options for alternative water sources to provide fresh water into the existing swimming ponds at Pass Creek Regional Campground. (Aligns with Priority Action 1 : Research and Information Acquisition Action, FWCP 2012)

There have been three previous restoration projects funded by the FWCP and CBT in Pass Creek that focused on placing LWD structures and rip-rapping eroding banks. As identified in the 2014 monitoring report (ONA 2014), some of the older structures have moved or been completely destroyed by high flows. Following this report, the ONA conducted a number of projects with the objective of restoration and enhancing fish habitat in Pass Creek (restoration and armoring of an eroding stream bank, fish habitat enhancement using boulders, removal of compromised fish habitat structures, and riparian planting) (Duncan 2016, Smith 2016).

2.0 METHODS

2.1 Location

Pass Creek is bordered by the Pass Creek Regional Exhibition Grounds and Pass Creek Recreational Campground just north of the town of Castlegar, BC (Figure 1). The area is owned by the Regional District of the Central Kootenay is an important area for recreation and public use. It is the first major tributary to the Columbia River below Hugh Keenleyside Dam, and can be accessed off of Broadwater Road in the area of Raspberry. Pass Creek has 2.2 km of area accessible to fish and provides important spawning habitat for local sport fish (Thorley and Baxter 2012).



Figure 1: Location of Pass Creek relative to Castlegar, BC.

2.2 Site Assessment

In July 2018, the Okanagan Nation Alliance (Kari Alex, Biologist), Mountain Station Consultants (Alan Thomson, P. Eng) and the Regional Parks Manager for the Regional District of Central Kootenay (Cary Gaynor) conducted site assessments at Pass Creek. Data collection and photo documentation were completed to address the objectives listed in Section 1.2.

3.0 RESULTS

3.1 Fish Habitat Restoration and Monitoring Plan

Kari Alex has developed a fish habitat restoration and monitoring plan which can be found in Appendix A.

3.2 Swimming Pond and Spawning Channel Assessment

Alan Thomson, P. Eng., conducted the assessment of alternative water sources for the swimming pond and spawning channel restoration. Alan's technical report can be found in Appendix B.

4.0 DISCUSSION AND RECOMMENDATIONS

A full description of the findings and recommendations for each objective can be found within the respective reports in Appendix A and B. The following is a summary of the key findings and recommendations listed within those reports.

4.1 Fish Habitat Restoration and Enhancement

Briefly, the findings and recommendations for fish habitat restoration in the main stem channel of Pass Creek include (taken from Alex 2019, see Appendix A):

- The meander bends with a radius of curvature less than 60 m are currently and will continue to erode. Any effort to reduce the floodplain width will make these issues worse;
- Gravel sizes are typically too large for spawning Kokanee and small bodied Rainbow Trout;
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- Add more woody debris structures that can withstand a flood discharge of $49 \text{ m}^3/\text{s}$ or Q_{10yr} ; and,
- For low flow instream structure, add boulder clusters in pools for cover.

Recommendations for moving forward with assessments:

- Install and maintain discharge station on Pass Creek;

- Continue monitoring water temperature in mainstem and side channel of Pass Creek;
- Survey for hydraulic modeling of potential restoration options;
- Present and discuss these concepts at the community level;
- Monitor the system prior to any works; and,
- Seek out collaboration for these tasks.

4.2 Swimming Pond and Spawning Channel Assessment

Briefly, the key findings and recommendations for the swimming pond and spawning channel include (taken from Thomson 2019, see Appendix B):

The recreational pond requires some significant maintenance and upgrading of infrastructure if it is to function as intended. The pond liner requires replacing, and most of the water control structures should be replaced or refurbished. Furthermore, some additional improvements and additions to the infrastructure could provide secondary benefits of increasing the quality and area of Rainbow Trout spawning and rearing habitat in the side channel and preventing fish entry into the pond.

In order to maintain the function of the recreational pond from a water supply perspective, it is recommended that:

- Other variables that may limit recreational pond continued use or operation be recognised and analysed;
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- The pond outlet infrastructure is replaced.

In order to advance the above, the following is recommended:

- Conduct a detailed feasibility analysis on the above pond water retention concepts. Determine pond area in order to size the pond liner accurately;
- Conduct additional analysis on the quantity and quality of groundwater required to satisfy future pond operations;
- Determine the impact a proposed minimum flow requirement in Norns Creek of 0.78 m³/s will have on pond operations; and
- Further analyse and determine how to prevent fish from entering the pond.

The existing side channel has excellent potential for increased Rainbow Trout production in Norns Creek by enhancing existing and creating additional spawning and rearing habitat. In order to advance the Rainbow Trout spawning and rearing habitat improvement concept the following steps are recommended:

- Monitor groundwater elevations at two or three locations along the side channel alignment throughout the summer, fall and winter periods by installing a shallow well with a piezometer and data logger. Groundwater levels can also be monitored and recorded manually if data are frequently collected;
- Conduct a topographical survey of the side channel alignment between the water intake on Norns Creek and the outlet of the recreational pond;

- Determine the impact a proposed minimum flow requirement in Norns Creek of 0.78 m³/s will have on water diversion for additional fish habitat in the side channel. A new or existing water license amendment may be required to develop the side channel for fish habitat purposes.

If the results of the above analysis are positive, then further refinement of the side channel concept can proceed.

5.0 REFERENCES

- Duncan, A. 2016. Pass Creek Riparian Planting Project. Prepared by the Okanagan Nation Alliance. Prepared for the Columbia Basin Trust. 7 p.
- Fish and Wildlife Compensation Program. 2012. Streams Action Plan. Prepared by BC Hydro, Province of British Columbia, and Fisheries and Oceans Canada. 11 p + 2 App.
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- Thorley, J.L. and J.T.A. Baxter. 2012. WLR Monitoring Study No. CLBMON-46 (Year 4), Lower Columbia River Rainbow Trout Spawning Assessment, Study Period: January to July 2011. Prepared for BC Hydro, Castlegar, BC.

Appendix A – Pass (Norns) Creek Fish Habitat Assessment: Preliminary options within a Regional Park

Appendix B – Conceptual Level Report for Enhancing Norns Creek Side Channel for Rainbow Trout Habitat and Restoring Pass Creek Regional Park Recreational Pond Operations