Alberta Conservation Association

2020/21 Project Summary Report

Project Name: Westslope Cutthroat Trout Range Expansion Feasibility

Fisheries Program Manager: Peter Aku

Project Leader: Jason Blackburn

Primary ACA staff on project:

Jason Blackburn, Andrew Clough, Kevin Fitzsimmons Brad Hurkett, and Logan Redman

Partnerships

Alberta Environment and Parks

Fisheries and Oceans Canada

Key Findings

- We are finalizing a range expansion framework to facilitate decisions for reintroductions of Westslope cutthroat trout into habitats above fish barriers.
- We have expanded barrier surveys and stream temperature monitoring into the Bow River watershed to evaluate candidate locations for Westslope cutthroat trout range expansions.

Abstract

The historic range of Westslope cutthroat trout (WSCT) in Alberta lies entirely within the Oldman and Bow River watersheds. In recent decades genetically pure populations have declined to approximately 5% of the historic distribution, and the threat to their long-term survival continues to intensify in the headwater streams and tributaries of the Southern Rockies and East Slopes where they primarily reside. Recovery of the species requires strong protections for existing populations, as well as recolonization and expansion of their current range. Invasive species are among the biggest contributors to WSCT declines through hybridization and

competition, and the subsequent population fragmentation incurred when neighbouring watersheds become dominated by hybridized and invasive species. Since 2018, we have been adapting a framework originally developed by researchers of bull trout into a developing framework for WSCT range expansion feasibility in Alberta. We continue to catalogue habitats and gather information to populate that framework, while also researching practical criteria to use for evaluating candidate locations for future introductions. We recently completed a manual that assesses and ranks barriers, enabling the evaluation of invasion risk at potential candidate locations. Similarly, we have established summer stream temperatures as a strong predictor of WSCT abundance, and a measure of candidate habitat quality. In 2020 we expanded the stream temperature monitoring and barrier assessments that were completed in the Oldman River watershed, to encompass the Bow River watershed, and began finalizing candidate lists of streams and lakes to be evaluated using a completed framework. We will continue to rank habitats through 2021 to inform the feasibility of future WSCT reintroduction projects and ensure the survival of this iconic species in Alberta.

Introduction

Recovery of Westslope cutthroat trout (WSCT) in Alberta requires recolonization and expansion of their range, which is currently 5% of the historic distribution. Invasive species are a key threat to WSCT persistence (Fisheries and Oceans Canada 2014), and a primary consideration when investigating range expansion potential. Since 2018, we have been adapting a framework originally developed for bull trout (Galloway et al. 2016), for potential WSCT range expansions. We continue to quantify habitats and gather information to populate the framework, while researching other practical criteria to evaluate habitats for future introductions. We recently completed a manual to assess and rank barriers which has enabled assessment of invasion risk, and stream temperature monitoring has established summer growing degree days (SGDD) as a strong predictor of WSCT abundance providing a measure for habitat quality. In 2020 we expanded these two measures from the Oldman River watershed to encompass the Bow River watershed and began finalizing candidate lists of streams and lakes to be evaluated using a completed framework through 2021.

Methods

From May through August 2020, we deployed data loggers to monitor in-stream summer temperatures at 35 locations, 21 in the Upper Oldman River watershed and 14 in newly established locations in the Bow River watershed. We calculated summer growing degree days (SGDD) (Coleman and Fausch 2007) as the three-month (June, July, and August) summer average per stream of daily mean temperature and consulted thermal requirements for WSCT in Bear et al. 2007. In September, we completed assessments of barriers linked to candidate habitats via the associated Alberta Conservation Association (ACA) barrier assessment project. In winter 2020, we continued comprehensive GIS searches for lakes and watersheds to assess the quantity of available habitat for potential WSCT reintroductions in the Oldman and Bow River watersheds. We investigated watersheds and lakes across the green zone of Alberta's East Slopes to subsequently evaluate with a range expansion framework. We researched practical criteria to apply toward the framework, including indices to rank lake habitats for range expansion potential.

Results

In-stream temperature spanned a range of 858 SGDD, from cold, slow-growth conditions in Lyall Creek (190 SGDD) (Upper Oldman River watershed) to warmer, faster-growth conditions in Three-Point Creek (1,047 SGDD) (Bow River watershed) (Figure 1). Two streams monitored in the Bow River watershed in 2020 had SGDD totals similar to notable WSCT strongholds in the Oldman River watershed (i.e., White Creek) (Figure 1). Among the streams in the Bow River watershed with the highest SGDD were Three Point Creek and Flat Creek (Figure 1). We experienced considerable losses of temperature information in 2020, with 10 loggers either unaccounted for, damaged by high spring flows, or recovered above the stream surface (Figure 1). We identified approximately 62 watersheds and 60 lakes as candidates to evaluate for range expansion feasibility. We identified six indices for ranking lake potential, including habitat quantity measures of surface-area (ha) and maximum-depth (m); habitat complexity measures that include the lake-morphology-based indices of shoreline-development-ratio and relative-depth (Kalff 2002); and life-history-based characteristics including the presence of inlet/outlet tributaries and tributary spawning substrates. We continued to develop a scoring system to

quantify the combined criteria across candidate locations and to comprehensively evaluate their respective range expansion potentials.

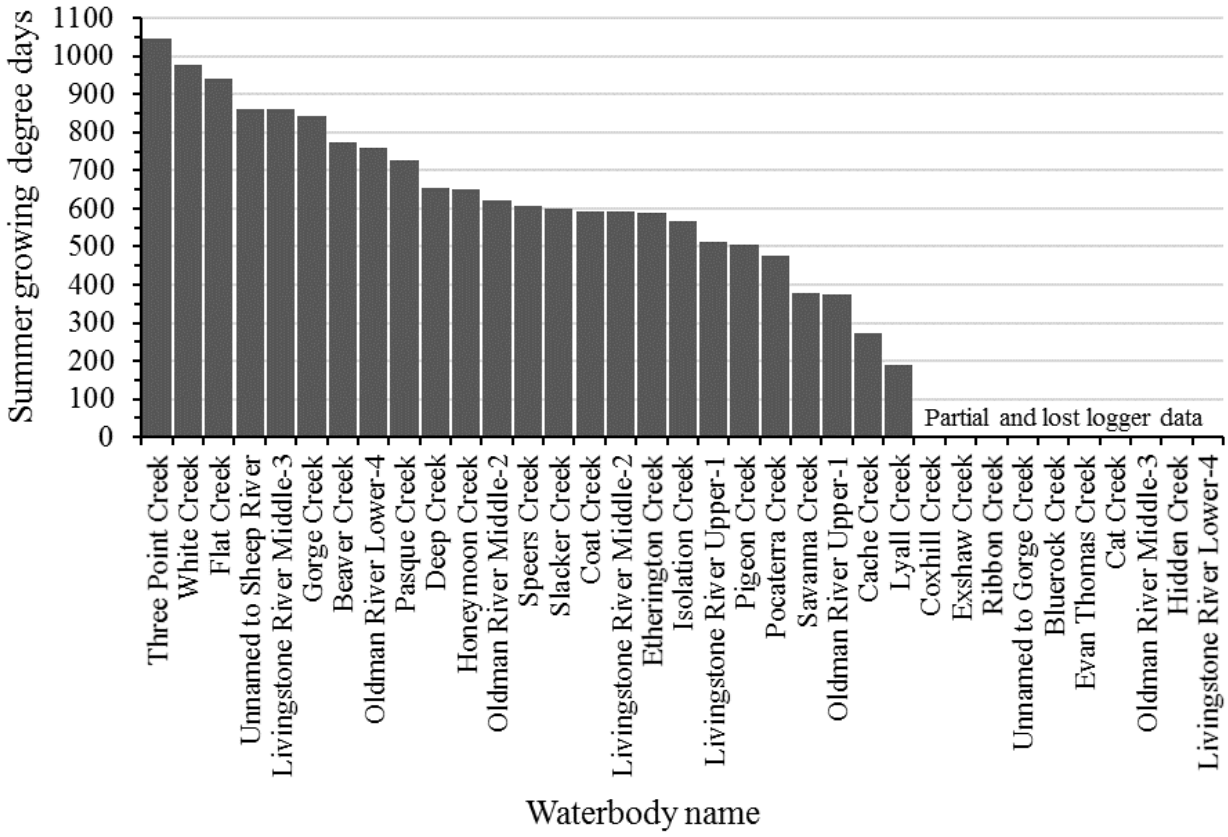

Figure 1. Three-month summer average (June, July, and August) Summer growing degree days by stream, in Upper Oldman and Bow River watersheds.

Conclusions

Mounting threats to the survival of WSCT in Alberta's East Slopes require stronger protections for existing populations and active recovery and recolonization into habitats currently unoccupied by the species. We are developing a framework to facilitate selection of the most suitable habitats for WSCT reintroductions. Evaluations are ongoing in the Oldman River and Bow River watersheds for this purpose, and we will rank both stream and lake habitats through 2021 to inform future WSCT reintroduction projects to ensure survival of this iconic species.

Communications

- Preliminary concepts have been communicated with AEP managers.

Literature Cited

Bear, E. A., McMahon, T. E., & Zale, A. V. 2007. Comparative thermal requirements of westslope cutthroat trout and rainbow trout: implications for species interactions and development of thermal protection standards. *Transactions of the American Fisheries Society*, 136(4), 1113-1121.

Coleman, M. A., and Fausch, K. D. 2007. Cold summer temperature limits recruitment of age-0 cutthroat trout in high-elevation Colorado streams. *Transactions of the American Fisheries Society*, 136(5), 1231-1244.

Fisheries and Oceans Canada. Recovery Strategy for the Alberta populations of Westslope Cutthroat Trout (Oncorhynchus clarkii lewisi) in Canada. 2014. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa. iv + 28 pp + Appendices.

Galloway, B., C. Muhlfeld, C. Guy, C. Downs, and W. Fredenberg. 2016. A framework for assessing the feasibility of native fish conservation translocations: applications to threatened Bull Trout. *North American Journal of Fisheries Management*, 36(4), 754-768.

Kalff, J. 2002. *Limnology: inland water ecosystems*. No. 504.45 KAL.

Photos

Staff investigating Dyson Falls, which effectively isolates upstream fish habitat for potential range expansion activities. Photo: Jason Blackburn.

Staff investigating an undocumented barrier series on the stream habitat above Dyson Falls.

Photo: Jason Blackburn

Staff investigating stream habitat above a barrier series on Dyson Creek. Photo: Jason Blackburn

Upstream habitat above a barrier series on an unnamed tributary to the Sheep River. Photo: Jason Blackburn