Alberta Conservation Association
2015/16 Project Summary Report

Project Name: Westslope Cutthroat Trout Recovery and Watershed Disturbance

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Partnerships

Alberta Environment and Parks

Key Findings

- White Creek is crucial to the sustainability of Westslope cutthroat trout in the upper Oldman River watershed, with fish abundances exceeding those of Dutch and Hidden creeks by 7-fold and 10-fold margins, respectively.
- Availability of pool habitat is a key driver influencing Westslope cutthroat trout abundance; abundance decreased as the frequency of pools decreased but not in a consistent pattern with disturbance level.
- Streams with more pools retain more of the sediments transported there.

Introduction

Westslope cutthroat trout (WSCT) in Alberta are considered *Threatened* under Canada's *Species at Risk Act* (Fisheries and Oceans Canada 2014). Long-term survival of the species requires identification, protection and restoration of strongholds where genetically pure fish remain. One of the major threats to the species is increased deposition of fine sediment into streams from human-caused disturbances such as roads, timber harvesting, cattle grazing, unregulated off-highway-vehicle trail networks, and recreational camping areas, which alter the surrounding landscape. Increased sedimentation into streams from these sources has been identified in Alberta's provincial recovery plan as a major limiting factor influencing recovery success of WSCT. An improved understanding of the effects of sedimentation on WSCT streams will better inform restoration efforts.

The upper Oldman River watershed is the largest core area of genetically pure WSCT within its historical range in Alberta. Watersheds in the core area have experienced varying degrees of human disturbance. The primary objective of this study is to document abundance, population structure and distribution of genetically pure WSCT relative to current sediment and habitat measures across a range of watershed disturbance levels.

Methods

From July 6 to September 1, 2015, we collected fish, sediment and habitat data from 36 reaches in the upper Oldman River watershed distributed across three linear disturbance categories. Disturbance categories were based on density of all linear features and defined following Fiera (2014) as *high* (>3 km/km^2), *moderate* (>1.2–3 km/km^2), *low* (0.6–1.2 km/km^2) and *negligible* (0–0.6 km/km^2); corresponding watersheds were Dutch Creek (*high*), Hidden Creek (*moderate*) and White Creek (*negligible*). We sampled 10 reaches on Dutch Creek, 10 reaches on Hidden Creek, and 7 reaches on White Creek, as well as 9 reaches on various headwater tributaries with variable disturbance levels. One crew of two people sampled fish using a Smith-Root type-12 backpack electrofisher at reaches ranging from 300–500 m in length. We collected biological data including species, fork length (mm), total length (mm), and weight (g), before returning fish to the stream. We also collected WSCT tissue samples in streams where genetic status is currently undefined. A second two-person crew performed sediment and pool surveys using a Turner-Hillis (Hillis et al. 2012) deposited sediment sampler (DSS) (481 samples) and grid-toss methods (Kusnierz et al. 2013) (762 tosses) to determine average sediment quantity and proportion at each reach. We measured average DSS-collected sediment (<6 mm diameter) volume (mL/L) per site and relative proportion of fine sediments (<2 mm and <6 mm) and preferred spawning gravels (<35 mm) (percent) using grid-toss methods. We measured relative streambed colmation (i.e., compaction) by inserting pine stakes (316 total) into the streambed at scour-pool tail-outs following procedures in Marmonier et al. (2004).

Results

We captured 2,065 WSCT, collected 372 genetic samples and counted 450 pools. Average catch-per-unit-effort was highest in White Creek (*negligible* disturbance), followed by Dutch Creek (*high* disturbance) and Hidden Creek (*moderate* disturbance). We observed a close relationship between fish abundance and pool frequency; generally, fish abundance decreased as the frequency of pools decreased but not in a consistent pattern with disturbance level. Similarly, we observed a close relationship between pool frequency and proportion of anoxic-coloured stakes (Figure 1). White Creek exhibited the highest pool frequency, sediment quantity, percent spawning gravels and proportion of stakes with anoxic colouration. Spawning-sized gravels increased as disturbance level decreased (Figure 1).

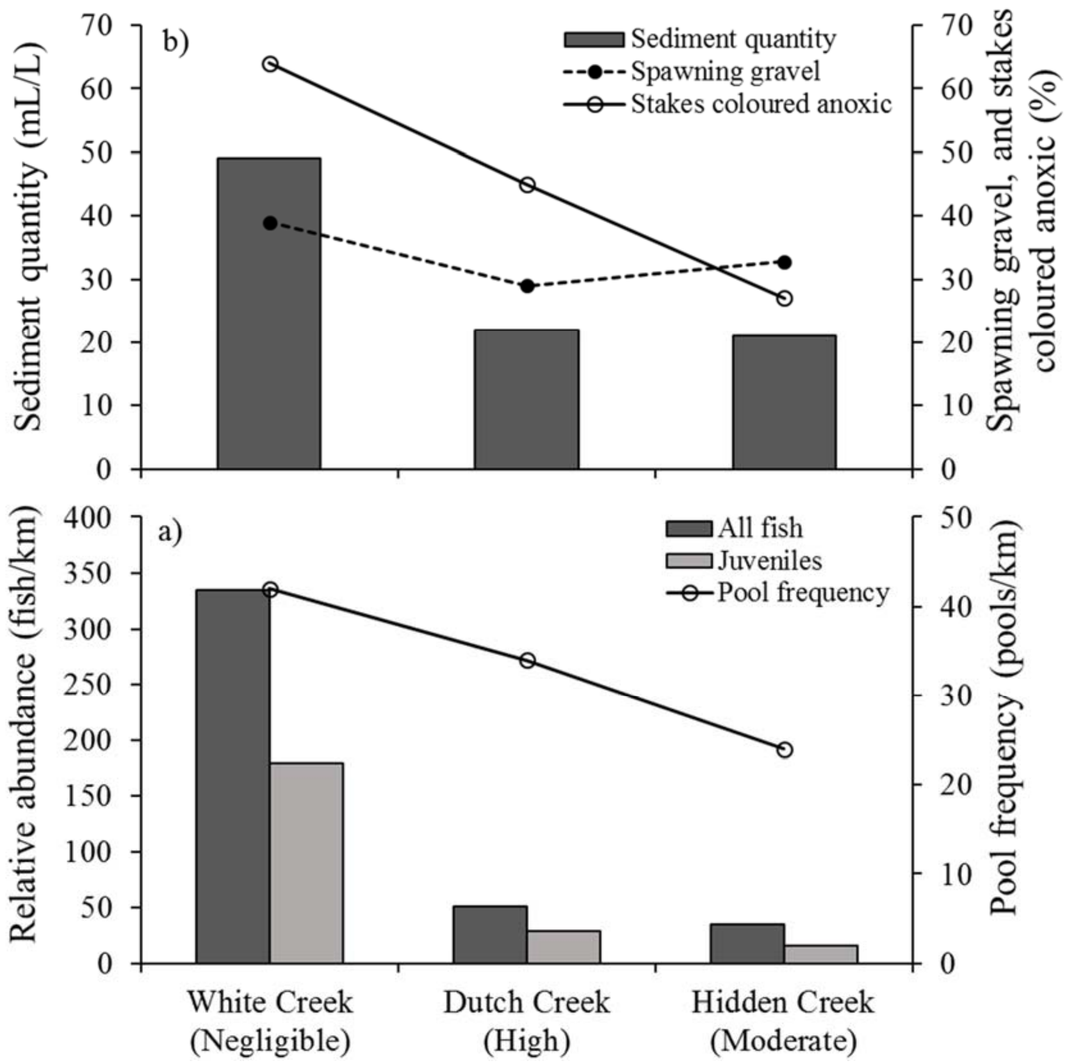

Figure 1. Abundance of Westslope cutthroat trout relative to (a) linear disturbance and pool frequency, and (b) measures of sediment and substrate relative to linear disturbance levels in the upper Oldman River watershed in 2015.

Conclusions

White Creek is crucial to the sustainability of WSCT in the upper Oldman River watershed, with fish abundances exceeding those of Dutch and Hidden creeks by 7-fold and 10-fold margins, respectively. Availability of pool habitat is a key driver influencing WSCT abundance. Links between pool frequency, colmation/compaction and sediment quantity may be a reflection of pools as settling areas where deposits accumulate and compact. Consequently streams with more pools retain more of the sediments transported there.

Communications

- Presented preliminary findings at a Westslope cutthroat riparian health advisory meeting and submitted a summary to ACA's board of directors.
- Shared watershed abundance estimates with local Alberta Environment and Parks biologists.
- Communicated preliminary findings with the Oldman Watershed Council.

Literature Cited

Fiera Biological Consulting Ltd. (Fiera). 2014. Oldman watershed headwaters indicator project – final report (Version 2014.1). Edmonton, Alberta. Fiera Biological Consulting Report No. 1346.

Fisheries and Oceans Canada. 2014. Recovery strategy for the Alberta populations of Westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Canada [Final]. *Species at Risk Act* Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa. iv + 28 pp + app.

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Turner, A., J. Hillis, and C. Rabeni. 2012. A sampler for measuring deposited fine sediments in streams. Journal of the American Water Resources Association 48(2): 366–378. DOI: 10.1111/j.1752-1688.2011.00618.x.

Photos

Alberta Conservation Association biologist Brad Hurkett measuring sediment in Dutch Creek using a grid toss. Photo: Jason Blackburn

Alberta Conservation Association staff members Jessy Dubnyk and Logan Redman electrofishing on Dutch Creek. Photo: Jason Blackburn

Alberta Conservation Association staff member Jessy Dubnyk measuring sampled sediment. Photo: Jason Blackburn

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Alberta Conservation Association staff members Jason Blackburn and Logan Redman sampling sediment on White Creek. Photo: Steven Griffeth