Alberta Conservation Association
2016/17 Project Summary Report

Project Name: Westslope Cutthroat Trout Recovery and Watershed Disturbance

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Partnerships

Alberta Environment and Parks
City of Lethbridge – Water and Wastewater

Key Findings

- Streams with lower disturbance have more scour-pools to collect sediment and more pool habitat to support westslope cutthroat trout.
- Vicary, White and Daisy creeks are key watersheds driving westslope cutthroat trout abundance in the upper Oldman River watershed.
- White Creek is a crucial stream for adult westslope cutthroat trout, and Vicary Creek is a major juvenile rearing stream.

Introduction

Westslope cutthroat trout (WSCT) in Alberta is considered *Threatened* under Canada's *Species at Risk Act* legislation (Fisheries and Oceans Canada 2014). Long-term survival of the species requires identification, protection and restoration of strongholds where genetically pure fish remain. In 2016/17, we completed a two-year study to document abundance, population structure and distribution of genetically pure WSCT relative to current sediment, disturbance and pool-habitat measures in the upper Oldman River watershed. In the first year of the study, we completed electrofishing and comprehensive sediment surveys on the mainstems of three major watersheds—White, Hidden and Dutch creeks—as well as on numerous smaller sub-watershed reaches near the headwaters. In year two, we completed surveys on Daisy, Vicary, South Racehorse, North Racehorse and Racehorse creeks and remaining sub-watershed reaches.

Methods

During the summers of 2015 and 2016, we collected fish, sediment and pool-habitat data at 73 spatially balanced reaches in eight major watersheds and ten sub-watersheds of the upper Oldman River watershed, spanning a range of linear disturbance categories 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). We sampled ten reaches on Dutch (*high*) and Hidden (*moderate*)

creeks; seven reaches on White (*negligible*), Daisy (*moderate*) and Vicary (*high*) creeks; six reaches on South Racehorse Creek (*high*); and five reaches on Racehorse (*high*) and North Racehorse (*high*) creeks. We also sampled 16 reaches on ten headwater tributaries (variable). We sampled fish using Smith-Root Type-12 backpack and SR6 totebarge electrofishers at reaches 300 – 600 m in length. We measured (fork length, FL) and enumerated all captured fish before releasing them. We also collected tissue samples from WSCT in streams where genetic status was uncertain. We performed sediment and pool surveys using a Turner-Hillis (Turner et al. 2012) deposited sediment sampler (DSS) and used grid-toss methods (Kusnierz et al. 2013) to measure sediment quantity and proportion at each sampling reach. We examined effects of disturbance, sediment quantity and scour-pool frequency relative to WSCT catch rates, population structure, and estimated total (≥70 mm FL), juvenile (<150 mm FL) and adult (≥150 mm FL) abundances by disturbance category and watershed.

Results

We captured over 3,800 cutthroat trout and collected more than 1,100 genetic samples. Within the eight major watersheds, those with *negligible* disturbance had significantly higher WSCT catch rates (one-way ANOVA; $F_{2,54} = 6.28$, $p = 0.004$), more fine sediment deposition ($F_{2,53} = 4.1$, $p = 0.023$) and more scour-pools ($F_{2,53} = 11.5$, $p = <0.0001$) than those with *high* and *moderate* disturbances (Figure 1). We estimated the highest mean abundances on the mainstems of Vicary (*high*), followed by White (*negligible*) and Daisy (*moderate*) creeks. We estimated total ($n = 20{,}932$) and juvenile ($n = 14{,}344$) abundance in Vicary Creek to be greater than that of Racehorse, South Racehorse, North Racehorse, Dutch and Hidden creeks combined (combined total $n = 17{,}860$ and juvenile $n = 8{,}519$) (Figure 2). Similarly, we estimated adult abundance in White Creek ($n = 9{,}012$) to be greater than Racehorse, South Racehorse, North Racehorse and Dutch creeks combined (combined adult $n = 8{,}519$). Juveniles accounted for the greatest proportion of the catch in Vicary and Daisy creeks, whereas adults were most prevalent in White Creek. We observed the lowest abundances of both juvenile and adult fish in Hidden Creek.

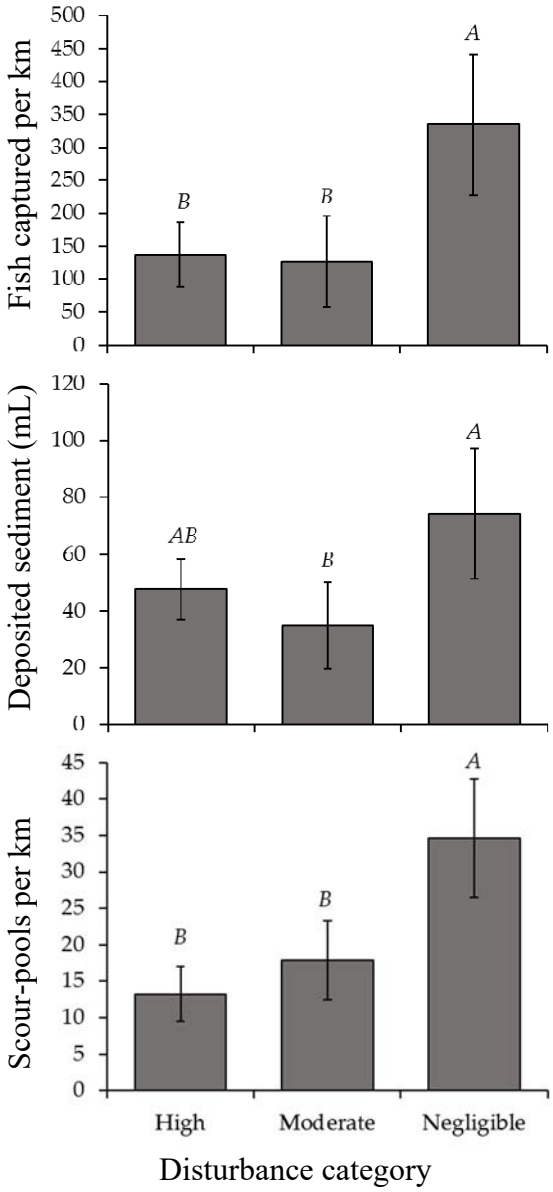

Figure 1. One-way ANOVA results of westslope cutthroat trout abundance, deposited sediment and pool-frequency relative to linear disturbance in the upper Oldman River watershed, 2015 and 2016. Letters indicate significant differences among disturbance categories; categories with the same letters do not differ significantly ($p > 0.05$). Error bars denote 95% confidence intervals.

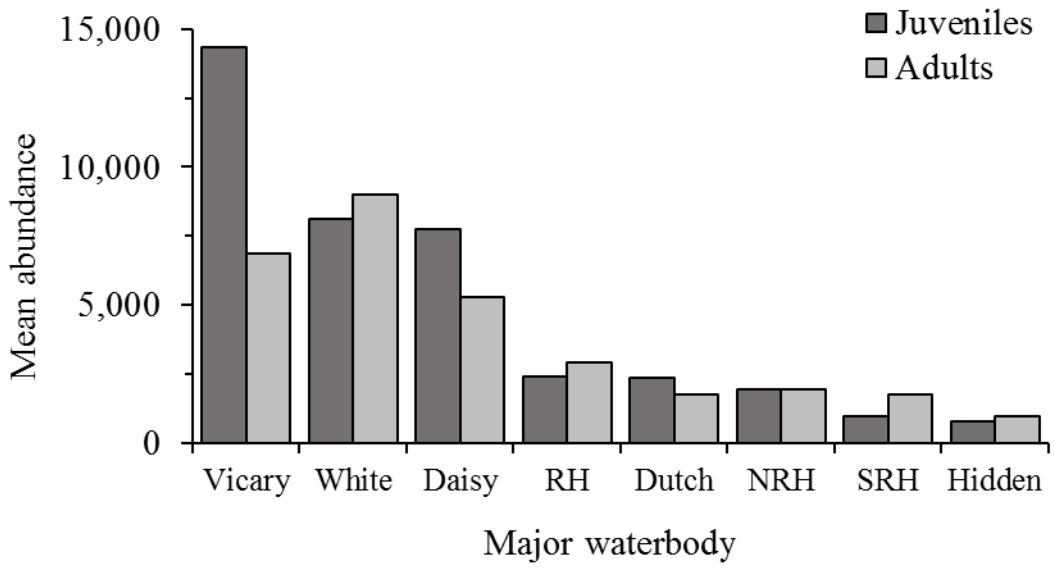

Figure 2. Abundance estimates of westslope cutthroat trout for major study streams in the upper Oldman River watershed in 2015 and 2016 calculated using nonparametric generalized additive models and capture data from 57 inventory sites, corrected using capture-mark-recapture capture efficiencies. RH = Racehorse Creek, NRG = North Racehorse Creek, SRH = South Racehorse Creek.

Conclusions

Watersheds with the lowest disturbance had the highest WSCT catch rates, sedimentation rates and scour-pool frequency, suggesting linear disturbance reduces scour-pools where sediment collects and total WSCT pool-habitat. Vicary, White and Daisy creeks are key watersheds driving WSCT abundance in the upper Oldman River watershed. White Creek is crucial habitat for adult WSCT, and Vicary Creek appears to be a major juvenile rearing stream.

Communications

- Shared watershed abundance estimates with local Alberta Environment and Parks biologists.
- Submitted WSCT tissue samples to Alberta Environment and Parks for genetic analysis.

Literature Cited

Fiera Biological Consulting Ltd (Fiera). 2014. Oldman Watershed Headwaters Indicator Project - final report (Version 2014.1). Fiera Biological Consulting Report No. 1346, Edmonton, Alberta, Canada.

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, Canada. 28 pp.

Kusnierz, P., A. Welch, and D. Kron. 2013. The Montana Department of Environmental Quality western Montana sediment assessment method: considerations, physical and biological parameter Ks, and decision making. Draft report. Quality Planning Bureau, Montana Department of Environmental Quality, Helena, Montana, USA. 59 pp.

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: 366–378.

Photos

Westslope cutthroat trout in Vicary Creek. Photo: Jason Blackburn

Alberta Conservation Association staff Logan Redman and Steven Griffeth assembling a block-net on North Racehorse Creek. Photo: Jason Blackburn

Alberta Conservation Association staff Logan Redman and Jessy Dubnyk completing a sediment assessment on South Racehorse Creek. Photo: Jason Blackburn

Alberta Conservation Association backpack electrofishing crew including Logan Redman and Steven Griffeth on Pasque Creek. Photo: Jason Blackburn