Alberta Conservation Association
2021/22 Project Summary Report

Project Name: Fish Barrier Assessments in the Bow River Drainage

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Partnerships

Alberta Environment and Parks

Fisheries and Oceans Canada – through the Canada Nature Fund

Key Findings

- We completed barrier assessments in the Bow River watershed to facilitate range expansion strategies into above-barrier reaches that are secure from invasion.
- We estimated barrier efficacy across seasons and flows using channel measurements of bankful and flood-prone height.
- We ground-truthed 54 barrier locations and performed 39 comprehensive assessments in 2021.
- Over the course of the project, we evaluated a total of 139 barrier locations and performed 87 quantitative assessments in the Bow River watershed, enabling final scoring and ranking of barriers that prevent invasions, to facilitate range expansion strategies.

Abstract

The historical 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 historical distribution. Invasive species are among the biggest contributors to the WSCT declines through hybridization and competition, and the subsequent population fragmentation. Natural waterfall barriers that impede upstream fish movements are known to protect headwater populations of WSCT from non-native rainbow trout and brook trout invasions. Consequently, ACA has undertaken broadscale inventory and assessments of these barriers as a conservation measure to identify barriers protecting crucial populations currently sustaining the species, and for recognizing opportunities to expand the WSCT range into secure unoccupied habitat reaches above barriers. Since 2017, we have developed standard methods to identify, measure, classify, and rank a complex range of fish barriers in the context of invasion risk and conservation potential; and we have completed assessments in much of the Oldman River watershed. In 2020, we finalized assessment methods into a field manual that assesses four main mechanisms that impede fish passage over barriers: 1) height/length obstructions to leaping, 2) water velocity obstructions to swimming, 3) water depth obstructions to swimming, and 4) turbulence obstructions to swimming. We also broadened surveys into the Bow River watershed, visiting a total of 125 locations between 2017 and 2021.

Once completed, we will assemble final scoring of barriers into a central document ranking them by efficacy to prevent fish passage, enabling ranking of suitable habitat reaches to inform reintroduction efforts for WSCT.

Introduction

The historical 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 historical distribution. Invasive species are among the biggest contributors to the WSCT declines through hybridization and competition (DFO 2014), and the subsequent fragmentation. Natural waterfall barriers that impede upstream fish movements are known to protect headwater populations of WSCT from non-native rainbow trout

and brook trout invasions (DFO 2014). Therefore, broadscale inventory and assessment of these barriers is an important conservation measure for identifying barriers protecting crucial populations currently sustaining the species, and for recognizing opportunities to expand the WSCT range into secure unoccupied habitat reaches above barriers. From 2017 to 2019, we developed standard methods to identify, measure, classify, and rank a complex range of fish barriers in the context of invasion risk and conservation potential; and completed assessments in the Oldman River watershed. In 2020, we finalized assessment methods and broadened surveys into the Bow River watershed. We assembled a 247-barrier catalogue of potential assessment locations, from aerial imagery, GIS searches, AEP's barrier database, and backcountry hiking and tourism resources. In 2021, we completed the final season of assessments in the Bow River watershed, enabling final scoring and ranking of barrier efficacy to prevent invasions, and the prioritization of future range expansion strategies to restore and reconnect WSCT populations.

Methods

Using ACA's *Guide to Waterfall Fish Barrier Assessment* (Blackburn et al. 2020), we assessed the four main mechanisms that impede fish passage over barriers: 1) height/length obstructions to leaping, 2) water velocity obstructions to swimming, 3) water depth obstructions to swimming, and 4) turbulence obstructions to swimming. We measured barrier dimensions including height, length, inclination, and slope-distance using a TruPulse 200X Laser Rangefinder. We measured stream depths using measuring poles and sounding lines, water velocities using a HACH FH950 Handheld Flow Meter, and turbulence using a qualitative visual assessment method that we developed. We used stream channel measurements of bankful and flood-prone heights to estimate efficacy of barriers to prevent fish passage across changing flow levels, and assess how fish size ranges were differentially obstructed relative to season.

Results

In 2021, we evaluated a total of 85 barrier locations in the Bow River watershed, of which we ground-truthed 54, and performed quantitative desktop assessment on 39. We assessed an additional 19 barrier locations from helicopter, and 12 remotely from available information (Figure 1). Over the duration of the barrier assessment project, we evaluated a total of 139 barrier locations on 59 different streams (Table 1, Figure 1). In all, we ground-truthed 125 barrier

locations and performed 87 quantitative assessments. Final barrier scores will be assembled into a central document ranking them by efficacy to prevent fish passage.
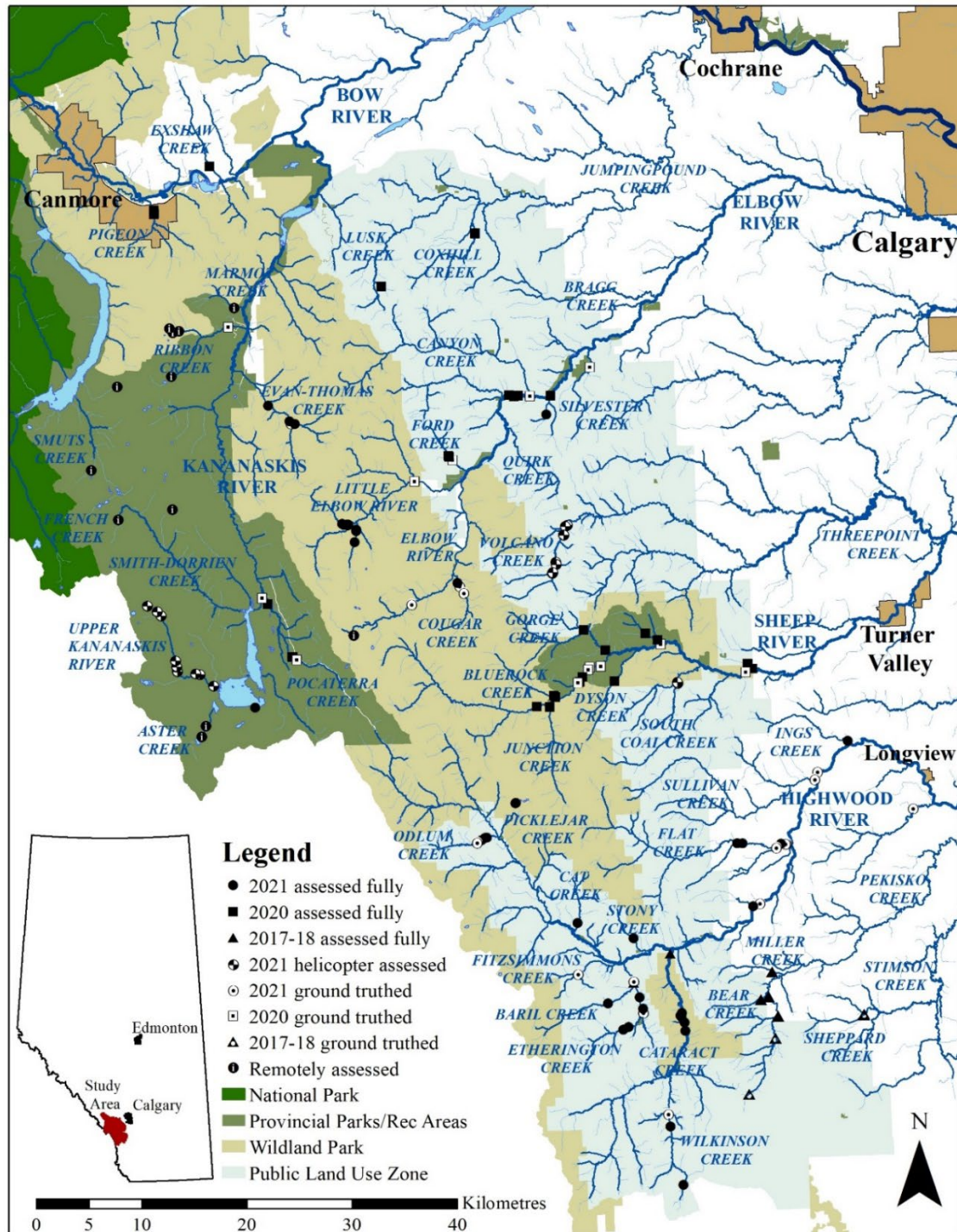

Figure 1.   Study area map of waterfall barriers evaluated by year in the Bow River watershed, 2017 – 2021.

Table 1.   Summary of barriers evaluated in the Bow River watershed, 2017 – 2021

Locations Evaluated	Streams Evaluated	HUC 8 Watersheds	Assessment Years
45	20	Highwood River	2021, 2018, 2017
31	13	Sheep River	2021, 2020
27	11	Kananaskis River	2021, 2020
27	10	Elbow River	2021, 2020
3	2	Jumpingpound Creek	2020
2	2	Spray Lakes River	2021
4	1	Bow River and Ghost Reservoir	2020
139	59		

Conclusions

Active recovery and recolonization of WSCT is essential to their continued persistence in Alberta. Completion of barrier assessments in the Bow River watershed, and across the majority of the WSCT range, has now enabled scoring and ranking of barriers, and ranking of secure habitat reaches to inform future reintroduction efforts.

Communications

Not applicable

Literature Cited

Blackburn J., B. Hurkett, and L. Redman. 2020. *Guide to Waterfall Fish Barrier Assessment*. Alberta Conservation Association. Sherwood Park, AB. 41 pp. + appendices and field manual.

Fisheries and Oceans Canada (DFO). 2014. *Recovery Strategy for the Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*), Alberta populations in Canada*. Species at Risk Act Recovery Strategy Series. Adoption or Incorporation under Section 44 of SARA. Fisheries and Oceans Canada, Ottawa. iv + 28 pp + Appendices.

Photos

Photo 1.   Examining a complex cascade flowing through rock formation on a tributary to Little Elbow River. Photo: Jason Blackburn

Photo 2.   Crew preparing to measure velocity in a chute barrier on Ings Creek.
            Photo: Jason Blackburn

Photo 3.   Crew using a laser rangefinder to measure height of a plunge waterfall on Etherington Creek. Photo: Jason Blackburn

Photo 4.   Impassible fish leaping barrier on lower Cougar Creek. Photo: Jason Blackburn