

**Alberta Conservation Association**  
**2022/23 Project Summary Report**

**Project Name:** Westslope Cutthroat Trout Range Expansion

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**Partnerships**

Alberta Environment and Protected Areas

Alberta Native Trout Collaborative

Fisheries and Oceans Canada through the Canada Nature Fund

**Key Findings**

- We assessed 22 high mountain lakes for westslope cutthroat trout range expansion potential, ten of which support westslope cutthroat trout, four support golden trout, three support rainbow trout, one supports brook trout, and four with unknown fish assemblages.
- We estimated angler effort at 14 high mountain lakes using remote trail cameras. Total effort was highest at Rawson Lake and Carnarvon Lake whereas effort by lake area was highest at Picklejar Lake 4 and Carnarvon Lake.

**Abstract**

Recovery of westslope cutthroat trout (WSCT) in Alberta requires recolonization and expansion of their range, which is currently 5% of the historical distribution. Since 2018, we have been adapting a framework originally developed for bull trout into a framework for WSCT range expansion feasibility in Alberta, into watersheds that are secure from invasion, above barriers.

Across the WSCT range, many watersheds are fed directly or indirectly by headwater lakes, where thermal habitat is promising for WSCT survival, but overwintering and spawning potential remain key uncertainties. Since WSCT are almost exclusively stream spawners, we assessed lake outlets for suitable spawning substrates, and performed littoral habitat surveys to investigate rare shoal spawning potential at over 20 high mountain lakes. Since upwellings are thought to create stable winter refuge areas by inhibiting below-ice freezing, we also tested new methods to evaluate overwintering and spawning potential using thermal infrared drones to detect upwellings. We used remote camera surveys to estimate angler use at high mountain lakes containing WSCT. Of the 14 high mountain lakes we assessed for angler effort, total observed anglers and total estimated angler effort were highest at Rawson Lake, whereas estimated angler effort by lake area was the highest at Picklejar Lake 4. Conversely, Commonwealth Lake had the lowest number of observed anglers, total estimated angler effort, and estimated angler effort by lake area. In 2023, we will complete estimates of angler use at the four remaining lakes, complete analyses, and catalogue lake suitability information including outlet and littoral survey data, drone survey footage for detecting upwellings, outlet and lake profile temperature data, and environmental DNA results.

## **Introduction**

Recovery of westslope cutthroat trout (WSCT) in Alberta requires recolonization and expansion of their range, which is currently 5% of the historical distribution. Since 2018, we have been adapting a framework originally developed for bull trout (Galloway et al. 2016), to assess the suitability of conservation stocking of WSCT in above-barrier watersheds secure from invasion. Across the WSCT range, many such watersheds are fed directly or indirectly by headwater lakes, where thermal habitat quality is typically suitable for WSCT survival, but overwintering and spawning potential remain key uncertainties of habitat complexity that require further investigation.

Less is known about overwintering behaviours and requirements of WSCT; however, winter habitat stability is thought to be a key factor (Benson 2019) with evidence suggesting upwellings may create stable winter refuge areas (Tremblay et al. 2013) by inhibiting below-ice freezing cycles. Angler use at high mountain lakes has also been uncertain due to high costs and logistical

challenges associated with remote angler surveys; however, remote camera surveys have proven a suitable alternative for estimating relative angler use. In 2022, we broadened range expansion feasibility assessments to include high mountain headwater lakes and their outlet channels to assess spawning and overwintering habitat variables for WSCT and estimate current angler use relative to access difficulty and species presence.

## **Methods**

We assessed 22 high mountain lakes across the current WSCT range with varying degrees of angler access. Ten of the lakes support WSCT, four support golden trout, three support rainbow trout, one supports brook trout, and four were considered fishless or with unknown fish assemblages. Lakes included both put-and-take fisheries and those with self-reproducing populations of WSCT, as well as similar trout species like California golden trout to serve as analogues for assessing WSCT habitat suitability. We assessed lake outlets for suitable spawning substrates, and performed littoral habitat surveys to investigate rare shoal spawning potential. We collected environmental DNA (eDNA) to test for invasive species in stocking records, and species that are native to the watershed. We installed trail cameras at select study lakes and estimated summer angling effort (h and h/ha) from photos. We bootstrapped total anglers observed in the camera field-of-view to estimate total angler hours (Newton et al. 2013), which we expanded to the whole lake area to calculate total hours and hours/ha. In addition, we monitored summer stream outlet temperatures with Hobo Pendant loggers, as well as lake profile temperatures using daisy chains of three pendant loggers. We assessed new methods to evaluate overwintering and spawning potential using thermal infrared drones to detect upwellings and areas of temperature heterogeneity (Dugdale et al. 2019).

## **Results**

Of the 14 lakes monitored with cameras, we have completed estimates of angler effort on the ten that support WSCT. Total angler effort ranged from 1.7 hours at Commonwealth Lake to 1,387 hours at Rawson Lake (Table 1 and Figure 1). Standardized by lake area, angling effort ranged from 0.1 hours/ha at Commonwealth Lake to 320 hours/ha at Picklejar Lake 4. The total number of anglers counted ranged from 2 to 942 anglers at Commonwealth and Rawson lakes repetitively. In 2023, we will complete estimates of angler use at the four remaining lakes,

complete analyses, and catalogue lake suitability information including outlet and littoral survey data, drone survey footage for detecting upwellings, outlet and lake profile temperature data, and eDNA results.

Table 1. Estimated angler effort and total angler counts at high mountain study lakes

<b>Lake</b>	<b>Total Angling Hours</b>	<b>Angling Hours/ha</b>	<b>Total Angler Count</b>	<b>Surface Area</b>
Rawson	1,387 (1,259–1,519)	76 (66–83)	942	18.4
Carnarvon	802 (664–955)	124 (103–147)	163	6.4
Chester	573 (496–654)	113 (98–129)	363	5.1
Picklejar 4	457 (404–510)	320 (284–357)	552	1.5
Picklejar 2	228 (196–262)	77 (66–88)	349	3
Burstall Upper	36 (19–56)	4 (2–6)	23	9.3
Burstall Lower	8 (0–18)	1 (0–2)	4	5
Picklejar 1	6.8 (1.4–13.7)	3 (1–7)	5	2.1
Picklejar 3	3.6 (0–9.8)	3 (0–9)	3	1.1
Commonwealth	1.7 (0–4.2)	0.1 (0–2)	2	1.8

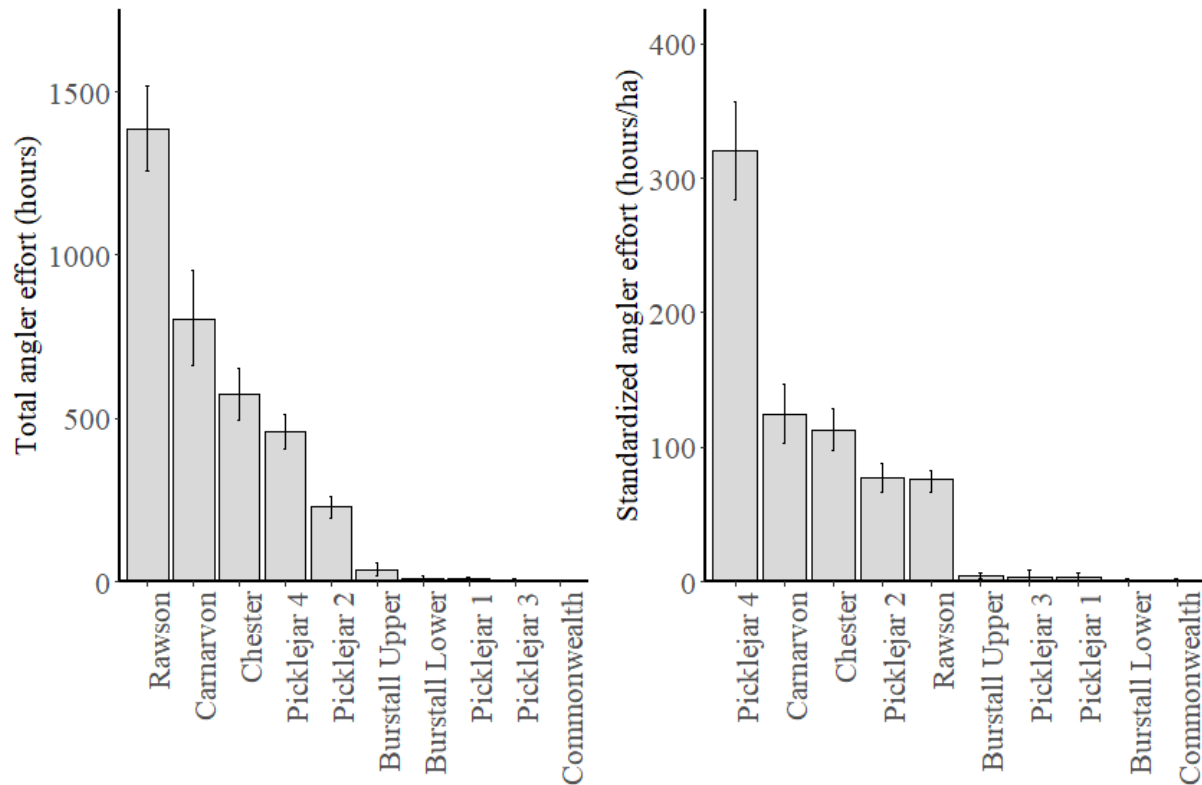


Figure 1. Estimated angler effort in hours and hours/ha at high mountain study lakes, 2022. Error bars indicate 95% confidence intervals.

## Conclusions

Of the 14 high mountain lakes we assessed for angler effort, total observed anglers and total estimated angler effort were highest at Rawson Lake, whereas estimated angler effort by lake area was the highest at Picklejar Lake 4. Commonwealth Lake had the lowest number of observed anglers, total estimated angler effort, and estimated angler effort by lake area.

## Communications

- Presented an overview of methods to federal, provincial, and US state scientists, researchers, and NGOs at the Alberta Native Trout Recovery Science Workshop, in Kananaskis, Alberta.

## Literature Cited

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## Photos



Photo 1. Westslope cutthroat trout in the Rawson Lake outlet stream. Photo: Kevin Fitzsimmons



Photo 2. Remote trail camera at Chester Lake. Photo: Kevin Fitzsimmons





Photo 3. Alberta Conservation Association crew Lindsay Dowbush and Kevin Fitzsimmons performing littoral survey on Rawson Lake. Photo: Erin Vandermarel



Photo 4. Alberta Conservation Association crew Mike Jokinen and Abigail Doerksen collecting environmental DNA water samples near the outlet of Lys Lake. Photo: Jason Blackburn



