

Alberta Conservation Association
2021/22 Project Summary Report

Project Name: Conservation Potential of Fish Passage Barriers for Native Trout

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Partnerships

Alberta Environment and Parks

Fisheries and Oceans Canada – Canada Nature Fund

Fisheries and Oceans Canada – Habitat Stewardship Program Fund

Key Findings

- We completed barrier assessments in the Narraway River and Muskeg River watersheds to determine fish passage and invasion risk from non-native species.
- We ground-truthed 99 potential barriers in the Narraway River watershed and 14 in the Muskeg River watershed. We completed full assessments on 26 barriers in the Narraway River watershed and on two barriers in the Muskeg River watershed.
- Six barriers on four tributaries (Dinosaur, Stetson, Stinking, and Sulphur creeks) in the Narraway River watershed and one barrier on the Muskeg River have high native fish conservation potential.

Abstract

To effectively safeguard against extirpation of native fish species in Alberta, it is essential to protect native fish populations from hybridization and competition with invasive species.

In Alberta, several subpopulations of native fish remain protected from invasive species primarily because of waterfalls that impede upstream fish movement. Maintaining and isolating these populations from invasion is critical to the protection and persistence of native fish.

Cataloguing waterfalls is a necessary first step in determining where invasion can be managed. To determine where native fish refuge might still exist in the Narraway River and Muskeg River watersheds, we used Google Earth, Bing Maps, and aerial reconnaissance to identify 110 and 14 potential fish barrier locations in 2019 and 2020, respectively. Fieldwork was postponed until 2021 due to COVID-19 restrictions. We ground-truthed 99 potential barriers and completed full field assessments at 20 of the 99 potential barriers in the Narraway River watershed. We identified six barriers on four tributaries (Dinosaur, Stetson, Stinking, and Sulphur creeks) in the Narraway River watershed, with high conservation potential for native fish. We ground-truthed all 14 potential barriers and completed full assessments at two of the 14 potential barriers in the Muskeg River watershed. We identified one barrier with high conservation potential for native trout along the mainstem of the Muskeg River.

Introduction

Invasive species pose one of the greatest threats to Alberta's native fish species, through hybridization and competition that can lead to extirpation (ASRD and ACA 2009). These threats are partially mediated by the presence of natural fish-passage barriers, namely waterfalls, that impede upstream invasions. The presence of non-native fish species in the Narraway River and Muskeg River watersheds provides an opportunity to investigate the conservation potential of waterfalls to impede invasive fish movements, and potentially provide secure upstream refugia for threatened, native fish in the watersheds. The upper reaches of the Narraway River are assumed critical spawning habitat for bull trout (*Salvelinus confluentus*) (Tchir et al. 2002). However, non-native cutthroat trout (*Oncorhynchus clarkii lewisi*) and rainbow trout (*Oncorhynchus mykiss*) have been introduced and persist in Torrens River, Stetson Creek, and Two Lakes, all of which have connectivity to the Narraway River. The Muskeg River watershed upstream of Highway 40 is protected spawning and rearing habitat for bull trout (ASRD 2012). However, non-native rainbow trout and brook trout (*Salvelinus fontinalis*) are present in the Muskeg River (Rodtka and Judd 2015). Non-native cutthroat trout have had a negative impact on the spawning success of native bull trout in other watersheds, such as Pinto Lake (AEP 2017), and rainbow trout compete with bull trout for habitat and food sources (ASRD and ACA 2009). Thus, the primary objective of this project is to identify, measure, classify, and rank waterfalls to determine where native fish refuge might still exist in the Narraway River and Muskeg River

watersheds, and to identify key barriers that can aid in the management of invasive species encroachment.

Methods

We compiled waterfall data for the Narraway River and Muskeg River watersheds from Internet sources (e.g., World Waterfall Database 2019) and Government of Alberta (GOA 2019) spatial layers. We identified potential waterfall locations using Google Earth © (2019), Bing Maps © (2019 Microsoft), conversations with regional AEP biologists, and aerial reconnaissance. To best determine the efficacy of barriers to prevent fish passage across changing hydrologic regimes, we visited select barriers during spring freshet's high flows and autumn low flows to determine what fish size-ranges would be obstructed by barriers relative to flows, and fish swimming and leaping capabilities. We used the *Guide to Natural Fish Barrier Assessments* (Blackburn et al. 2021), to assess 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 (height, length, and slope) using a TruPulse 200X Laser Rangefinder, stream depths using measuring poles and sounding lines, water velocities using a HACH FH950 Handheld Flow Meter and Marsh-McBirney Flo-Mate-2000 Portable Flowmeter, and turbulence using a qualitative literature-based visual assessment method summarized in Blackburn et al. (2021).

Results

We ground-truthed 99 barrier locations in the Narraway River watershed and completed a total of 20 barrier assessments, consisting of 38 individual barrier features on six waterbodies (Table 1). We ground-truthed 14 barrier locations in the Muskeg River watershed and completed a total of two barrier assessments, consisting of three individual barrier features on the Muskeg River.

Table 1. Summary of barriers assessed in the Narraway River and Muskeg River watersheds, June 2019 – October 2021.

Number barriers ground-truthed	HUC 8 watershed	Waterbodies assessed	Barriers to fish passage
99	Narraway River watershed	Torrens River	0
		Lick Creek	0
		Stinking Creek	1
		Dinosaur Creek	2
		Stetson Creek	2
		Sulphur Creek	1
14	Muskeg River watershed	Muskeg River	1

We identified six barriers on four tributaries (Dinosaur, Stetson, Stinking, and Sulphur creeks) in the Narraway River watershed (Figure 1) and one barrier along the mainstem of the Muskeg River with high native fish conservation potential (Figure 2).

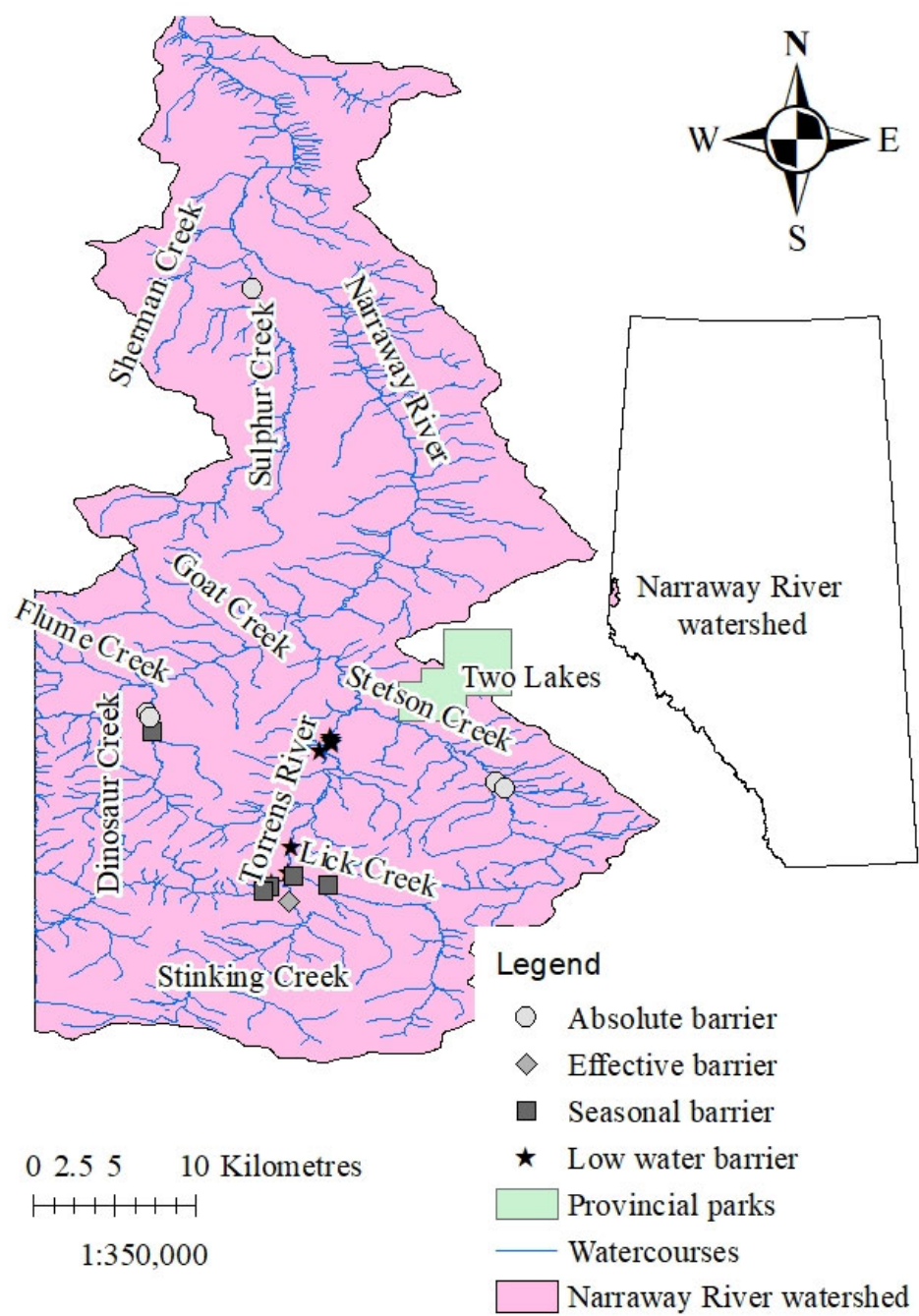


Figure 1. Narraway River watershed study area and barrier locations. Inset is a map of Alberta.

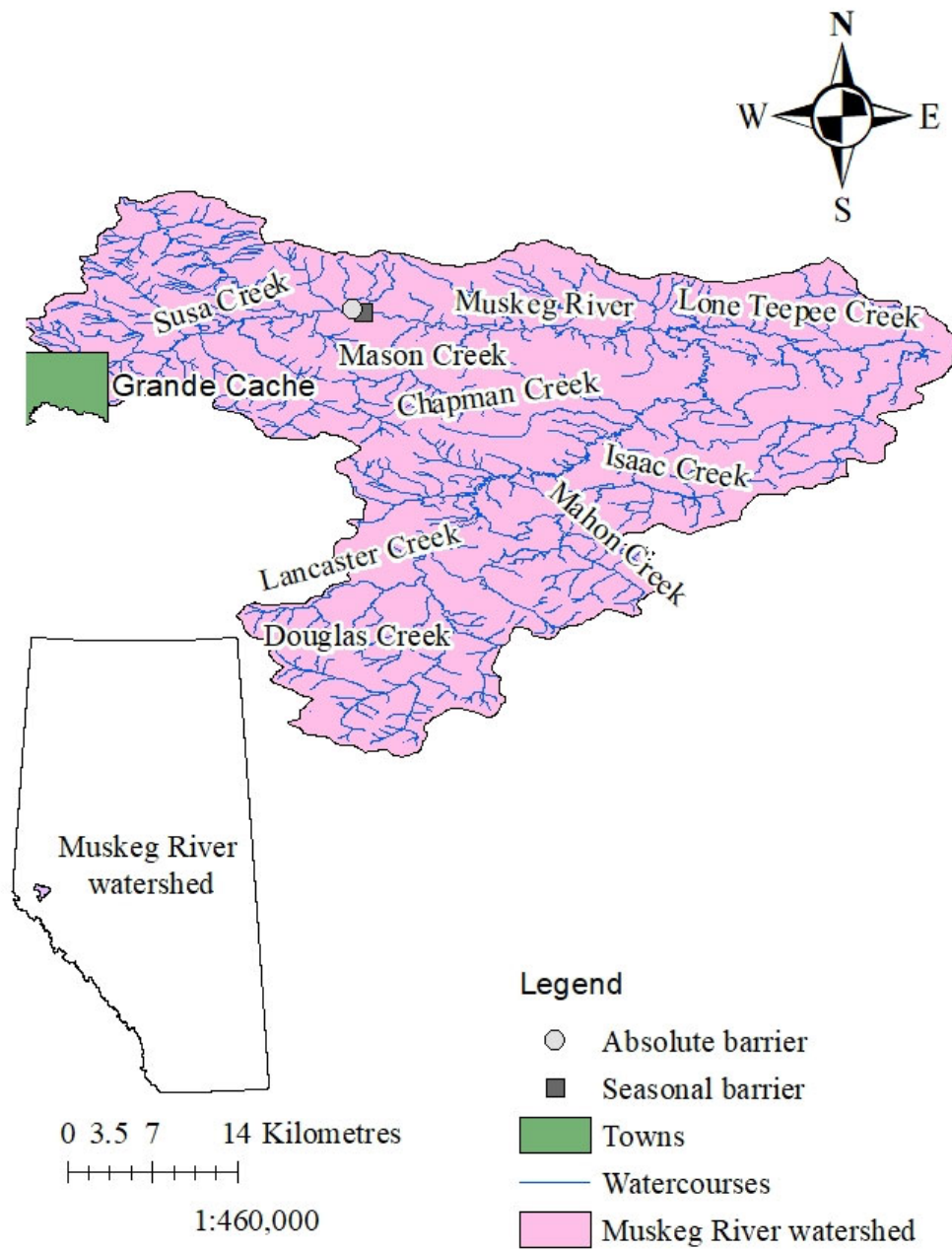


Figure 2. Muskeg River watershed study area and barrier locations. Inset is a map of Alberta.

Conclusions

Completion of barrier assessments in the Narraway River and Muskeg River watersheds has enabled scoring and ranking of barriers. We have identified six barriers on four tributaries in the Narraway River watershed and one barrier on the Muskeg River with high native fish conservation potential.

Communications

Not applicable

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Photos



Photo 1. Aerial reconnaissance of Stetson Creek Falls within the Narraway River watershed, Alberta. Photo: Nikita Lebedynski



Photo 2. ACA staff investigating a cascade on Torrens River, within the Narraway River watershed, Alberta. Photo: David Jackson



Photo 3. A large set of waterfalls on Stinking Creek, within the Narraway River watershed, Alberta, that were identified by AEP staff and communicated to ACA for assessment. Photo: Scott Seward