Alberta Conservation Association

2022/23 Project Summary Report

Project Name: Oxygen-Temperature Trends in the Beaverlodge-Redwillow River Watershed

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Partnerships

Alberta Environment and Protected Areas
Beaverlodge River Arctic Grayling Society
County of Grande Prairie
Mighty Peace Watershed Alliance
TC Energy

Key Findings

- Of the 61 sites where temperature loggers were deployed, mean August water temperature was optimal for Arctic grayling (7.5–17°C) at 18 sites, avoidance (17–20°C) at 14 sites and stressed (20–25°C) at three sites.
- Portions of Steeprock Creek, a known historical Arctic grayling spawning tributary, were dry by mid-August.
- A lack of continuous water flow throughout the year may limit grayling recovery in the Beaverlodge watershed.

Abstract

Arctic grayling were historically abundant in the Beaverlodge and Redwillow River watersheds but have been extirpated from the Beaverlodge watershed since the mid-1990s and are thought to be in decline in the Redwillow River watershed. Alberta Conservation Association (ACA) has been working in the Beaverlodge watershed since 2004 to improve riparian health and water

quality in hopes of bringing Arctic grayling back to the watershed. To determine if riparian health improvements have improved water quality for Arctic grayling re-introductions, we installed 61 temperature loggers and 11 dissolved oxygen loggers to assess the spatial and temporal oxygen and temperature patterns in the Beaverlodge and Redwillow River watersheds. We noted 18 temperature logger sites with no water at time of removal in October. Mean August water temperature fell into three thermal categories for Arctic grayling: optimal (7.5–17°C) at 18 sites, avoidance (17–20°C) at 14 sites, and stressed (20–25°C) at three sites. Water temperature and water quantity may be limiting Arctic grayling recovery in Beaverlodge River watershed.

Introduction

The Beaverlodge and Redwillow watersheds historically supported some of the highest reported Arctic grayling (*Thymallus arcticus*) spawning runs in all of Alberta (Lucko 1993). However, the last documented capture of an Arctic grayling in the Beaverlodge River watershed was in 1994 and they are now listed as functionally extirpated (Cahill 2015). The Redwillow River watershed Arctic grayling population is the last remaining population of Arctic grayling in the Beaverlodge watershed but is also thought to be in decline (Cahill 2015). Poor water quality, habitat degradation, altered stream flows, and barriers to fish movement are cited as a few of several reasons for the extirpation of the Arctic grayling from the Beaverlodge River (AECOM 2009, Carl et al. 1992). Since 2004, the Beaverlodge Riparian Conservation project has worked to improve riparian health by delivering remediation projects to improve water quality and fish habitat in the Beaverlodge River and its tributaries. The improvements in riparian health achieved through the riparian remediation projects are meant to aid in restoring Arctic grayling to the Beaverlodge River watershed. The goal of this study is to assess the spatial and temporal oxygen and temperature patterns in the Beaverlodge and Redwillow River watersheds to determine the suitability of the Beaverlodge River watershed to support Arctic grayling reintroduction.

Methods

We created a GIS-derived list of stream crossing locations in the Beaverlodge and Redwillow River watersheds, and suggestions from regional biologist, to install HOBO Pendant MX water temperature loggers and CME minidot loggers in easy-to-access locations. We deployed 61

temperature loggers and 11 dissolved oxygen (DO) loggers throughout the Beaverlodge and Redwillow River watersheds, at varying elevations, to collect summer water temperatures and summer/winter DO concentrations.

Temperature loggers monitored water temperature from late June 2022 to mid-October 2022. DO loggers will monitor summer/winter DO from mid-August 2022 to mid-April 2023. We assigned mean August water temperature to one of four thermal categories for Arctic grayling based on available literature (optimal: 7.5–17°C, avoidance: 17–20°C, stressed: 20–25°C, and death: >25°C) (Lohr et al. 1996).

Results

We retrieved data from 60 of the 61 temperature logger locations, while one logger was not recovered. Data integrity was maintained in 35 of the 61 sites. At the remaining 26 sites, temperature loggers were out of water for parts of August and data integrity was compromised and therefore not used in assessing stream temperature. Loggers were out of water at eight sites due to poor placement, while the remaining 18 sites had no water at time of removal. Mean August water temperature fell into three of the four thermal categories for Arctic grayling: optimal (7.5–17°C) at 18 sites, avoidance (17–20°C) at 14 sites and stressed (20–25°C) at three sites. (Figure 1). Portions of Steeprock Creek, a historical spawning area for Arctic grayling, were dry by mid-August.

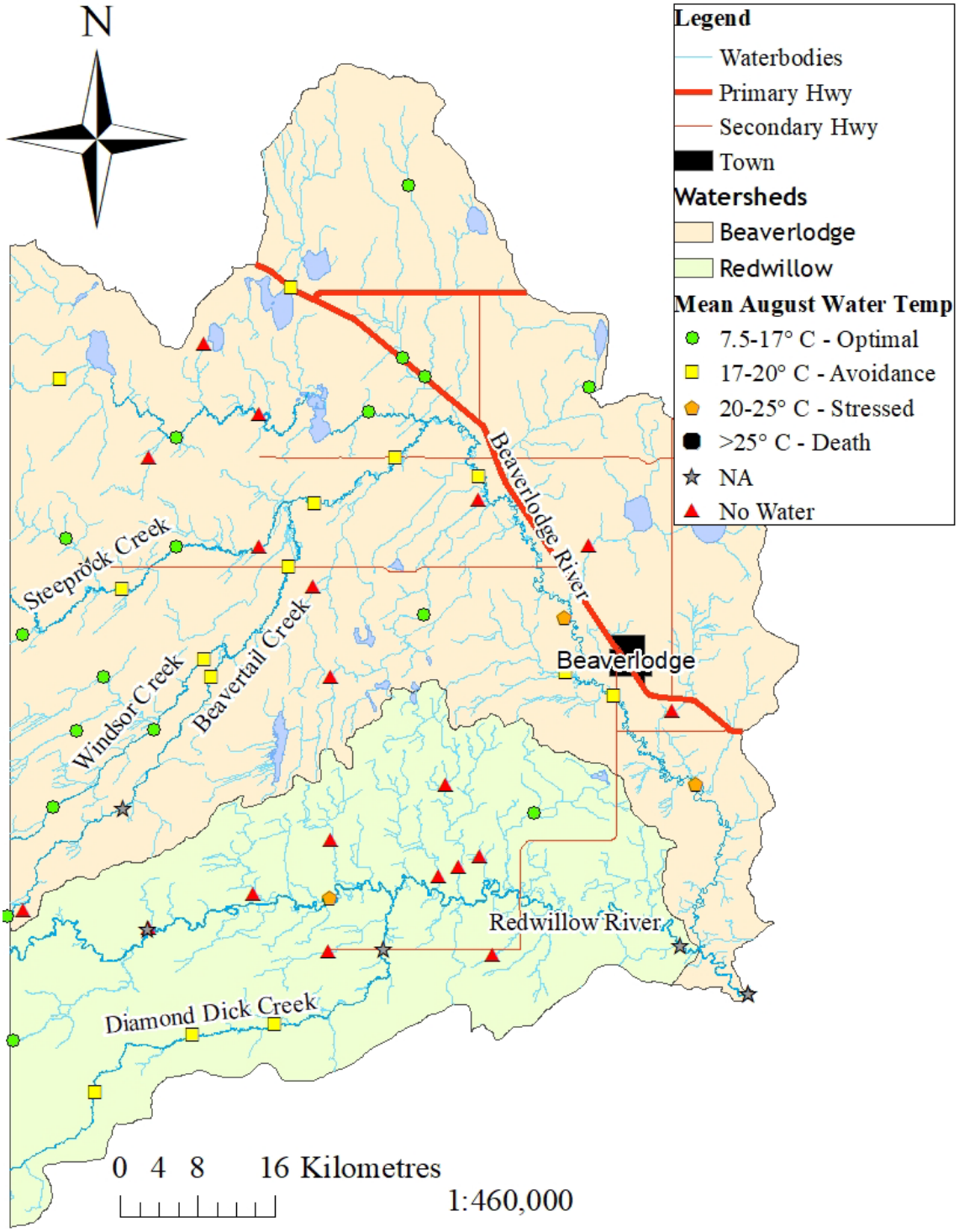

Figure 1. Beaverlodge and Redwillow River watershed temperature logger locations, mean August water temperature, and flow conditions at time of logger removal in October 2022.

Conclusions

Water temperature and water quantity may be limiting Arctic grayling habitat in the Beaverlodge River watershed. Over one third of sites experienced high summer water temperature (>20°C) or were dry. Portions of Steeprock Creek, a historical spawning area for Arctic grayling, were dry and reduced habitat availability. An Instream Flow Needs assessment is required to determine how much water is required to protect riparian ecosystems, fisheries habitat, water quality, and channel morphology. Thermal refuge may be available in the upper reaches of Windsor Creek, but further investigation is required to determine habitat suitability.

Communications

Not applicable

Literature Cited

AECOM. 2009. *Redwillow Watershed: An overview of the history and present status of fish populations and fish habitat and recommendations for restoration*. Report prepared for Alberta Sustainable Resource Development, Grande Prairie, AB. 269pp.

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Lohr, S., P. Byorth, C. Kaya, and W. Dwyer. 1996. High-temperature tolerances of fluvial Arctic grayling and comparisons with summer river temperatures of the Big Hole River, Montana. *Transactions of the American Fisheries Society* 125: 933-939.

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Photos

Photos 1a & 1b. Steeprock Creek, a known historical spawning tributary for Arctic grayling; June 21 with adequate flow for Arctic grayling survival and inadequate flow on August 15, 2022. Photos: Taylor Lund

Photo 2. Beaverlodge River with dry sections, bank sluffing, and heavy siltation. Photo: Scott Seward

Photo 3. Redwillow River in low flow conditions during October 2022. Photo: Scott Seward