

**Alberta Conservation Association
2020/21 Project Summary Report**

Project Name: Hasse Lake Fisheries Restoration

Fisheries Program Manager: Peter Aku

Project Leader: Brad Hurkett

Primary ACA staff on project: Troy Furukawa and Brad Hurkett

Partnerships

Alberta Environment and Parks

Alberta Fish & Game Association

Belair Industries Corp

Fortis Alberta

North Saskatchewan Watershed Alliance

Parkland County

Parkland County Alternative Land Use Services Program

RPB Industries

Trout Unlimited Canada – Northern Light Fly Fishers

Key Findings

- We commenced winter aeration at Hasse Lake in October 2020 to support stocked trout and restore sport fishery at the lake.
- AEP stocked Hasse Lake with 10,000 fish, consisting of 7,500 rainbow trout and 2,500 tiger trout, eight years after the lake was last stocked.
- Stocked trout grew very fast, doubling in size from 20 cm in the spring to 40 cm by fall.
- In contrast to previous winters when much of the water column was anoxic under the ice, during the 2020/21 winter aeration period, under-ice oxygen was high throughout much of the water column.

- No fish kills were reported during winter months, indicating that aeration enabled the lake to successfully overwinter fish.

Abstract

In recent decades, changes in watershed land use have resulted in increased nutrient runoff, particularly phosphorus, into Hasse Lake that has led to frequent noxious algal blooms (especially blue-green cyanobacteria blooms), poor oxygen conditions, and fish kills. Recurring summer and winter fish kills have decimated what used to be a popular stocked sport fishery, and there has been no recreational fishery on the lake since 2012. In the summer of 2015, ACA initiated a project with the primary focus of working with local community groups and landowners in the watershed to reduce nutrient loading to the lake, improve water quality, and restore the recreational fishery. Since project inception, we engaged in various activities, including surveys to characterize existing fish community composition (if any), monitoring summer and winter water quality, riparian zone protection, public outreach, and generating pertinent information leading to removal of fecal coliform advisories on the lake by Alberta Health Services. In 2020, we extended electrical power to the lake, installed aeration infrastructure, and commenced winter aeration in October, deploying seven surface aerators that operated all winter. In partnership, AEP stocked Hasse Lake with 10,000 fish consisting of 7,500 rainbow trout and 2,500 tiger trout, eight years after the lake was last stocked. Stocked trout grew very fast, doubling in size from 20 cm in the spring to 40 cm by fall. Summer dissolved oxygen (DO) remained above 3 mg/L within most of the water column in Hasse Lake, with corresponding temperatures generally below 21°C and adequate for trout survival. Summer DO and temperature ranges in Hasse Lake were similar to those at two nearby winter-aerated lakes. In contrast to previous winters when much of the water column in Hasse Lake was anoxic under the ice, during the 2020/21 winter aeration period, under-ice DO was high throughout much of the water column, remaining largely above 3 mg/L. No fish kills were reported, indicating that our winter aeration enabled the lake to successfully overwinter fish.

Introduction

In recent decades, changes in watershed land use have resulted in increased nutrient runoff, particularly phosphorus, that has led to water quality degradation in many Alberta lakes, including Hasse Lake. High productivity, frequent noxious algal blooms (particularly blue-green algae), and resultant poor oxygen conditions have led to recurring summer and winter fish kills in Hasse Lake that has decimated what used to be a vibrant and popular recreational fishery, and there has been no recreational fishery on the lake since 2012. Death and decomposition of dense algal blooms increase biological oxygen demand in the waterbody, resulting in a low dissolved oxygen (DO) concentration that can lead to low fish survival. In the summer of 2015, Alberta Conservation Association (ACA) initiated the Hasse Lake fisheries restoration project, with the primary focus of working with local community groups and landowners in the watershed to reduce nutrient loading to the lake, improve water quality, and restore the recreational fishery. Core partners include Parkland County, the Parkland County Alternative Land Use Services Program (ALUS), North Saskatchewan Watershed Alliance, and Northern Light Fly Fishers. Since project inception, our partnership has accomplished the following:

1. *Documentation of existing fish community.* During the summer of 2015, we conducted surveys to characterize existing fish community in the lake. Our results indicate that current fish community consists predominantly of fathead minnows and a few brook sticklebacks; we found no large-bodied fish species in the lake.
2. *Monitored summer and winter water quality conditions.* Nutrient levels were high, characterizing the lake as eutrophic to hypereutrophic, and algal bloom were prevalent. The average summer total phosphorus concentrations range was 42-159 µg/L and chlorophylla at 24-52 µg/L. In the summer, DO concentrations were typically low (<3 mg/L) below 3m, while in the winter, much of the water column was anoxic under the ice by mid-February.
3. *Outreach activities with landowners.* Participated in outreach activities and provided technical guidance, coordination, and delivery of on-the-ground restoration activities throughout the watershed.

4. *Riparian zone protection.* Protected over 70% of riparian zone (shoreline) through on-the-ground restorative activities by landowners and local partners under the ALUS program, with the remainder having relatively health natural vegetation.
5. *Assisted in lifting fecal coliform advisory.* Prior to ACA involvement on Hasse Lake, Alberta Health Services (AHS) frequently issued a public advisory for *E. coli* contamination for the lake that discouraged recreational use. Our work helped determine that the lake *E. coli* originates primarily from avian rather than human sources, thereby posing little risk to humans. Consequently, AHS no longer issues a fecal coliform advisory for the lake.
6. *Identified cost-effective approach to fishery restoration.* We investigated the potential use of alum treatment and winter lake aeration as alternative ways to improve water quality and support year-round survival of stocked fish in the lake. Lake aeration emerged as the more cost-effective method.

With measures in place to reduce nutrient loading into the lake from surface runoff (i.e., riparian protection and ongoing restorative activities throughout the watershed), in 2020/21 we turned our efforts to improving in-lake water to re-establish a sport fishery on the lake using winter aeration. The objectives were to:

1. Work with AEP to conduct experimental summer put-and-take depletion stocking with rainbow trout while we work toward establishing aeration facilities at the lake. AEP was to conduct supplemental fall stocking with rainbow trout and tiger trout based on progress with installation of aeration facilities by ACA.
2. Work with various partners to develop lake aeration infrastructure by fall 2020 to support a year-round stocked fishery on the lake.

Methods

In May 2020, AEP conducted experimental stocking of the lake with 5,000 rainbow trout as initial steps toward re-establishing a recreational fishery on the lake. This was followed with an additional stocking of 2,500 each of rainbow and tiger trout in the fall of 2020.

We assessed water quality at Hasse Lake during both summer (May – September) and winter (December 2020 and March 2021) months using a handheld multi-parameter probe meter (YSI Professional Plus). We measured monthly profiles of DO, temperature, conductivity, and pH at three sampling locations and derived averages for each depth across the three sampling locations. We also conducted similar measurements at two nearby aerated lakes (Spring and Muir lakes) during the summer to compare with Hasse Lake; these lakes are aerated during winter but not in summer.

We worked with various partners to develop lake aeration infrastructure by fall 2020. We extended electrical power to the lakeshore and installed seven surface aerators that operated throughout winter.

Results

In the 2020, AEP stocked Hasse Lake with a total of 10,000 fish consisting of 7,500 rainbow trout and 2,500 tiger trout, eight years after the lake was last stocked. Data from AEP indicates that fish growth was fast, and trout stocked in the spring doubled in size by the fall from 20 cm to 40 cm. During the summer, DO remained above 3 mg/L within most of the water column (above 3 – 5 m depth) in Hasse Lake, with corresponding temperatures generally below 21°C and adequate for trout survival in the summer (Figure 1). Summer DO and temperature ranges in Hasse Lake were similar to those at two nearby lakes (Figure 1).

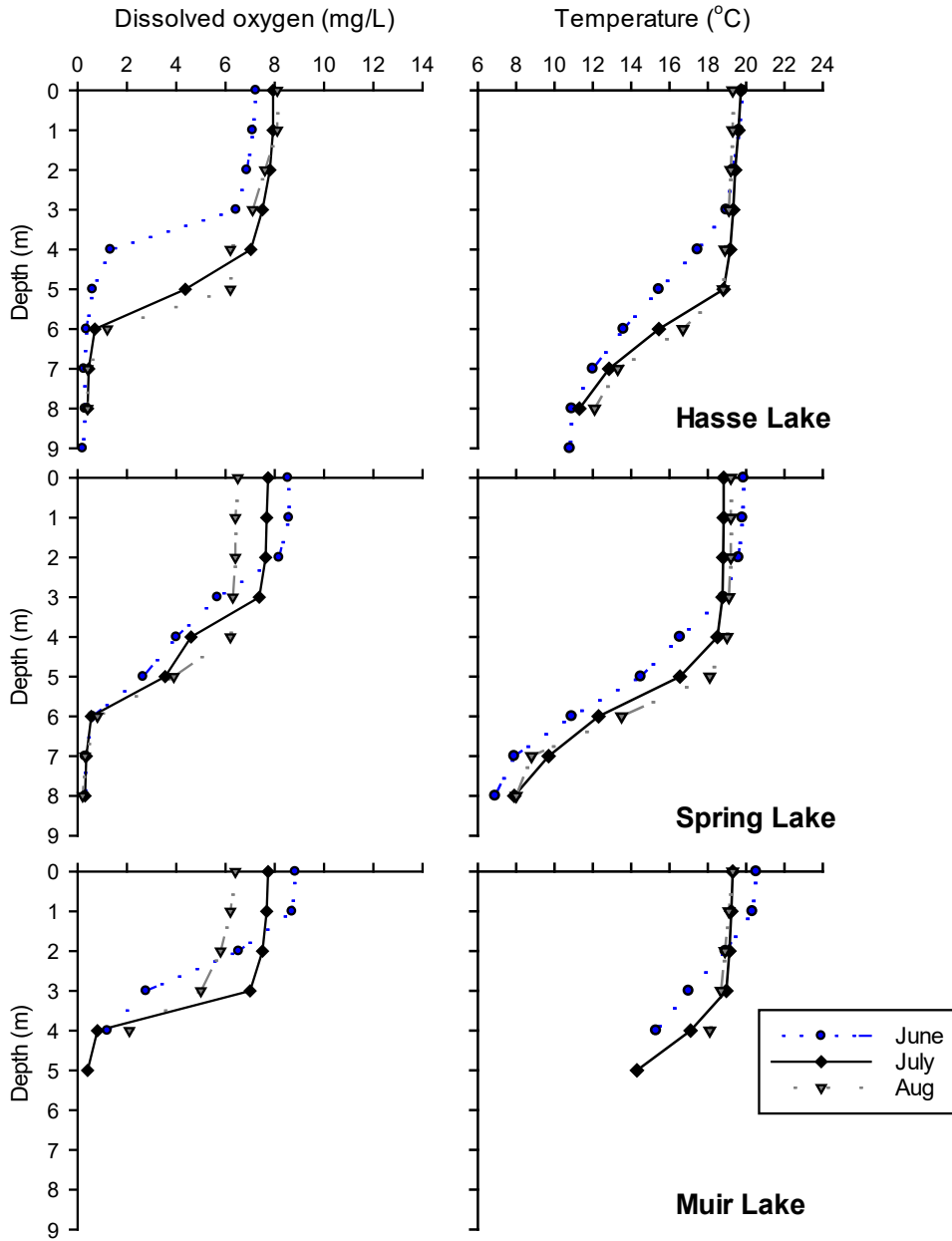


Figure 1. Summer dissolved oxygen and temperature profiles at Hasse, Spring, and Muir lake, 2020.

We commenced winter aeration in October 2020, deploying seven aerators that operated all winter. In contrast to previous winters when much of the water column in Hasse Lake was anoxic under the ice, during the 2020/21 winter aeration period, under-ice DO was high throughout much of the water column, remaining largely above 3 mg/L (Figure 2). No fish kills

were reported, indicating that our winter aeration enabled the lake to successfully overwinter fish.

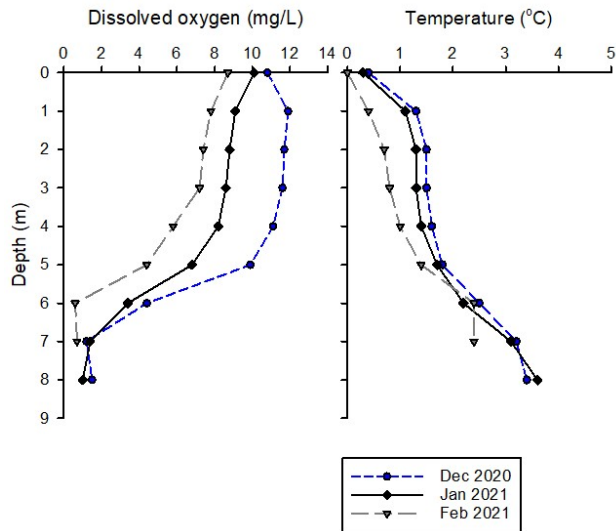


Figure 2. Dissolved oxygen and temperature profiles from Hasse Lake during 2010/21 winter aeration.

Conclusions

With the plans in place to protect the riparian zone and reduce nutrient loading in surface runoff to the lake, we turned our efforts to improving in-lake water quality to aid re-establishment of a sport fishery on the lake. In 2020, Hasse Lake was stocked with 10,000 fish, consisting of 7,500 rainbow trout and 2,500 tiger trout, eight years after the lake was last stocked. We commenced winter aeration in October to enable overwintering of stocked trout. In contrast to previous winters when much of the water column was anoxic under the ice, during the 2020/21 winter aeration period, under-ice DO was high throughout much of the water column. No fish kills were reported during winter months, indicating that aeration enabled the lake to successfully overwinter fish.

Photos



Surface aerators operating on Hasse Lake, 9 January 2021. Photo: Peter Aku.



Public ice fishing on Hasse Lake, 9 January 2021. Photo: Peter Aku