

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

Project Name: Fish Pond Rehabilitation

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Partnerships

Alberta Environment and Protected Areas

Saddle Hills County

Westlock County

Key Findings

- Long-term diffuser aeration of Shell True North Pond during spring-fall open water periods is improving year-round dissolved oxygen concentration and extending fishing opportunity into winter months.
- After five years of discussions, Rainbow Park Pond has been approved for a pilot alum treatment under the *Environmental Protection and Enhancement Act*. The pilot treatment project will occur in June 2023.
- Four ponds that are part of the alum treatment study design experienced prolonged, low dissolved oxygen concentrations (<1 mg/L) in both open water and under ice conditions.

Abstract

Fishing pressure at Alberta Conservation Association (ACA) stocked ponds can exceed 2,000 h/ha in the summer months, indicating these ponds can be popular among anglers. However, some of these ponds may not be capable of supporting trout survival beyond mid-summer due to low dissolved oxygen (DO). Therefore, we are investigating two techniques to improve water quality and DO concentrations in these ponds to increase angler opportunity: diffuse aeration

during the open water season (spring-fall) and alum treatment. We have aerated Shell True North Pond during the open water season for the past five years and continue to improve DO concentration deeper into the water column and during winter months with each year. In 2022/23, we secured permits to conduct a pilot alum treatment study at Rainbow Park Pond. We retrieved dataloggers from four ponds installed in the fall of 2022. All four ponds experienced prolonged low DO concentrations (<1 mg/L) throughout the 2021/22 winter. Rainbow Park Pond will be treated with alum in June 2023 and will be studied to determine if alum can improve water quality and overwintering DO concentration.

Introduction

Alberta Conservation Association (ACA) stocks ponds throughout Alberta as part of our Fish Stocking (FS) Project. Several of ACA's stocked ponds are very popular angling destinations receiving >2,000 angler h/ha. Yet, our recent data suggest that some FS ponds may not be capable of supporting trout survival beyond mid-summer due to poor water quality, particularly due to low dissolved oxygen (DO) and high temperature (Fitzsimmons and Keeling 2016). This is not surprising since most FS ponds tend to be shallow and enriched with nutrients. Therefore, we are investigating two techniques to improve water quality and DO concentrations in FS ponds to increase angler opportunity: diffuse aeration during the open water season and alum treatment.

Long term, diffuse aeration during the open water season can improve DO concentration by increasing bacteria and microbial activity. The increase in activity enhances the amount and rate at which decomposed organic matter is consumed and reduced by bacteria. The reduction in decomposing material, in turn, reduces the amount of DO consumed from the waterbody and improves water quality. However, this is a long-term process that requires several years of operation.

It is well documented that alum inactivates water column phosphorus (P) and pond sediment P, limiting primary productivity and reducing biochemical oxygen demand (BOD), thereby improving summer DO and summer-long fish survival (Cooke et al. 1993). However, it is unclear whether alum treatment can improve winter DO concentrations. We are using a before-after-control-impact (BACI) study design with four ponds, including Rainbow Park Pond

(formerly Westlock Pond), to determine if alum treatment can improve both overall water quality and overwintering DO in ACA stocked ponds with marginal trout habitat.

Methods

We aerated Shell True North Pond, from May to October, using four aeration diffusers. We collected monthly DO concentration profiles using a handheld YSI from three locations to determine if DO concentration, particularly deeper in the water column, is improving.

We held several discussions with Alberta Environment and Protected Areas (EPA) to obtain the appropriate permits to treat Rainbow Park Pond with alum. We retrieved data loggers installed to collect hourly DO and temperature profiles from 1 m water depth within four ponds (Rainbow Park Pond, Daysland Pond, Heritage Lake, and Lamont Pond). Data was collected from October 2021 to May 2022.

Results

Open water aeration in Shell True North Pond is showing a progressive year over year increase in DO to greater depths and under ice DO concentration (Figure 1). Under ice DO concentrations have increased by >4 mg/L in the top 4 m of the water column from pre-treatment in 2018 to 2022.

After five years of discussion, we obtained the necessary permits, under the *Environmental Protection and Enhancement Act* (EPEA), to treat Rainbow Park Pond with alum in June of 2023. Baseline data collection shows that Daysland, Heritage, Rainbow Park, and Lamont ponds all experienced prolonged low DO (<2.5 mg/L) or anoxic conditions over three to four months during the winter of 2021/22 (Figure 2). Previous years data showed similar anoxic conditions for short periods of time during open water months that may be impacting fish survival and angler opportunity.

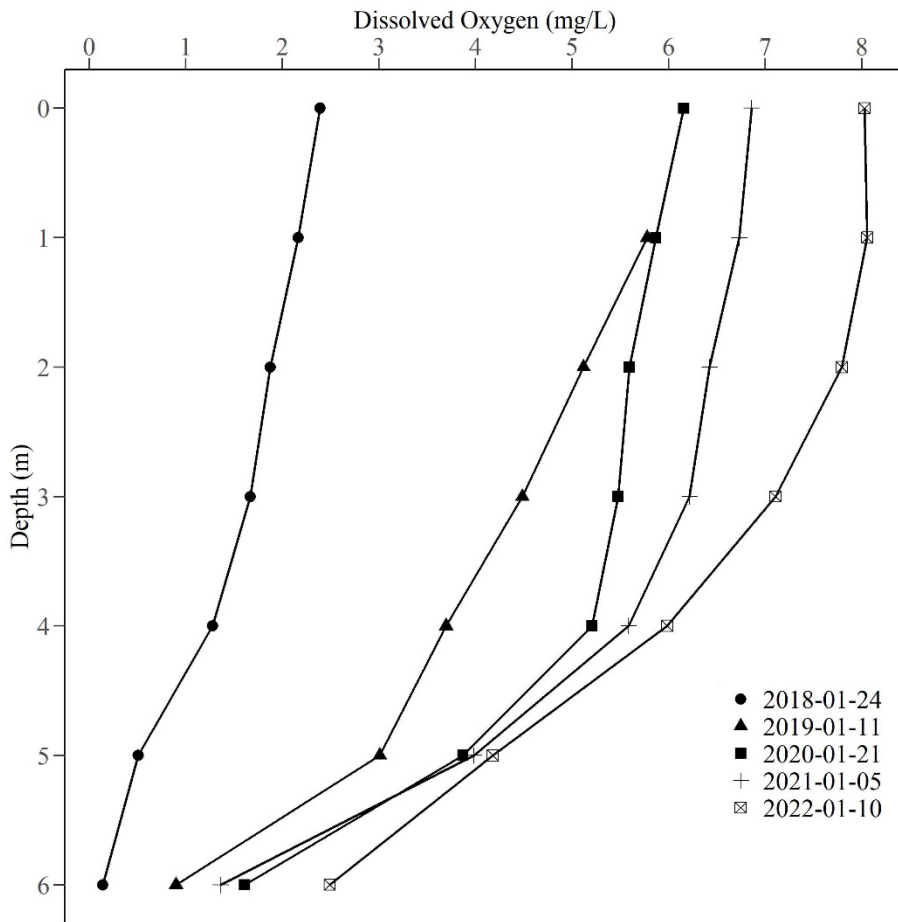


Figure 1. Dissolved oxygen concentrations (January 2018–2022) from Shell True North Pond. January 2018 represents pre-treatment conditions while subsequent years represent ongoing treatment.

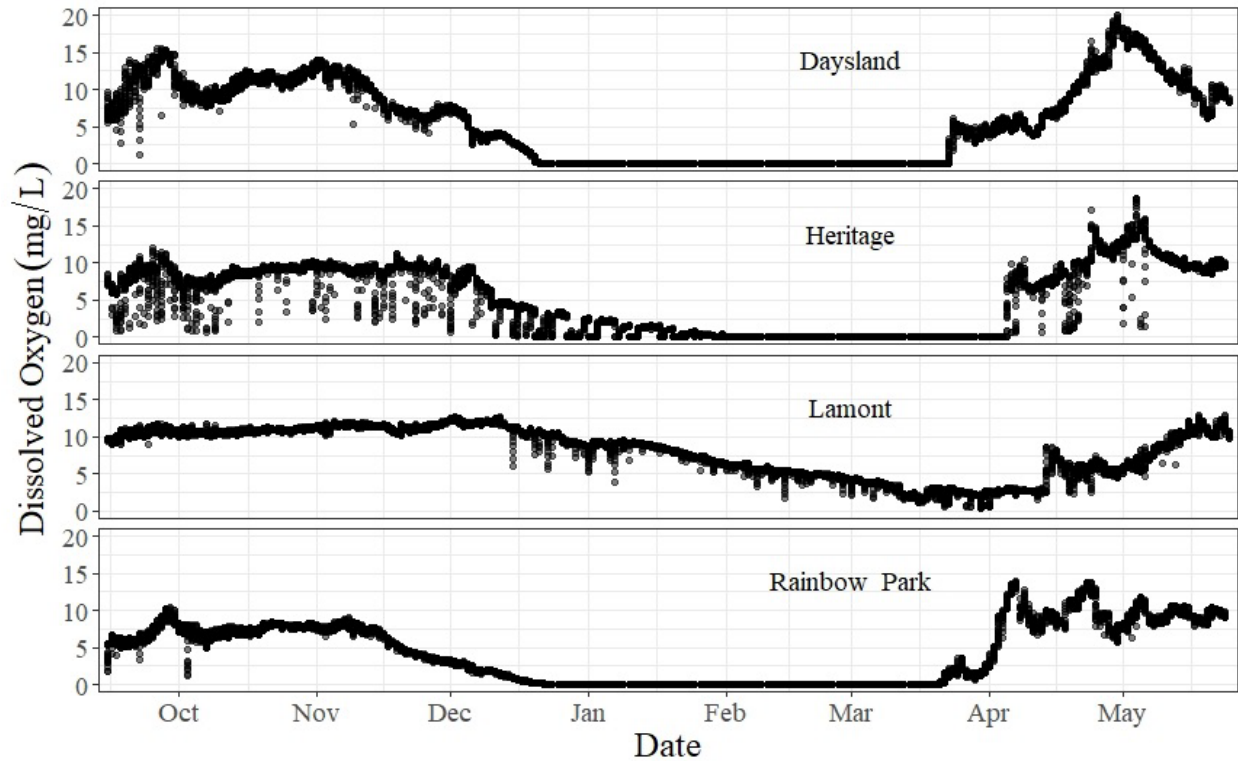


Figure 2. Dissolved oxygen concentrations (October–May 2021/22) recorded hourly with dataloggers, at 1 m water depth, from four ACA stocked ponds.

Conclusions

Most FS ponds tend to be shallow and enriched with nutrients, impacting water quality and trout survival. Two methods of improving water quality and DO show promise. Diffuser aeration during the open water season is effectively improving water quality and DO concentration in Shell True North Pond. Rainbow Park Pond was approved for alum treatment under the EPEA. As such, we will evaluate alum treatment to improve summer and winter water quality and DO concentration in Rainbow Park Pond in the coming year.

Communications

As per EPEA’s requirement for public consultation, we post a public notice of activity in Westlock News to allow for statements of concern to be filed against our proposal to treat Rainbow Park Pond with alum.

Literature Cited

Cooke, G.D., E.B. Welch, A.B. Martin, D.G. Fulmer, J.B. Hyde, and G.D. Shrieve. 1993.

Effectiveness of Al, Ca and Fe salts for control of internal loading in shallow and deep lakes. *Hydrobiologia* 253: 323-335.

Fitzsimmons, K. and B. Keeling. 2016. *Stocked Trout Survival and Camera-based Angler Survey*

at Selected ACA Stocked Ponds. Data Report, D-2016-106, produced by. Alberta Conservation Association, Sherwood Park, Alberta, Canada. 25 pp + appendices.

Photos



Photo 1. Datalogger removal from Lamont Pond. Photo: Lindsay Dowbush



Photo 2. Under ice dissolved oxygen sampling on Shell True North Pond.
Photo: David Jackson