Alberta Conservation Association

2021/22 Project Summary Report

Project Name: Lake Aeration

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Partnerships

Alberta Fish & Game Association
Alberta Environment and Parks
Clear Hills County
County of Northern Lights
Edmonton Trout Fishing Club
Mercer Peace River Pulp Ltd.
Mountain View County
Municipal District of Greenview No. 16
Northern Lights Fly Fishers - Trout Unlimited Canada
Northern Sunrise County
Parkland County
Saddle Hills County
Thorhild County
West Fraser – Edson Forest Products

Key Findings

- Aeration helped maintain dissolved oxygen levels suitable for year-round survival of stocked trout in 22 waterbodies, thereby creating angling opportunities that would otherwise not exist.
- Expanded aeration project by the addition of Peanut Lake, upgraded electrical infrastructure at Muir Lake and Coleman Fish and Game Pond, and installed additional subsurface diffuser equipment at Kerbes Pond.

Abstract

We use lake aeration as a fisheries management technique to provide Albertans with diverse recreational angling opportunities in areas of the province where such opportunities would be otherwise limited. Aerated waterbodies are typically shallow, eutrophic, experience prolonged ice cover, and are prone to summer and winter fish kills. Using aeration, we maintained dissolved oxygen levels above 3 mg/L to promote year-round survival and availability of larger fish to anglers. In 2021/22, we aerated 22 waterbodies across the province, all of which successfully overwintered stocked trout without any reported fish kills. This year, we expanded the aeration project by the addition of Peanut Lake, upgraded electrical infrastructure at Muir Lake and Coleman Fish and Game Pond, and installed additional subsurface diffusers at Kerbes Pond.

Introduction

Alberta Conservation Association (ACA) uses lake aeration to provide Albertans with recreational angling in areas of the province where such fishing opportunities are otherwise limited. Aerated waterbodies are typically shallow and eutrophic, experience prolonged ice cover, and are susceptible to summer and winter fish kills. Winterkill is a result of the interplay of low hypolimnetic dissolved oxygen (DO) levels, low photosynthetic oxygen production, and high biological oxygen demand (Miller and Mackay 1996). In contrast, summerkill is a result of the interaction between high surface temperatures and low hypolimnetic DO levels (Aku et al. 1997). Our primary objective is to promote year-round survival of stocked trout in the lakes we aerate by maintaining DO concentrations at or above 3 mg/L.

Methods

We use three aeration techniques to promote fish survival: 1) mechanical surface aeration during winter months, 2) diffuser aeration, and 3) fall destratification.

Mechanical surface aerators are used during winter (October – April), when prolonged ice and snow conditions exist. Surface aerators oxygenate through mixing and agitating caused by pumping water through a fountain on the surface. Additional atmospheric oxygen absorption occurs through the polynya (open water) created and maintained by the aerator.

Diffuser aeration consists of subsurface diffusers connected by air hoses to onshore air compressors are used to circulate and destratify the water column, thereby increasing DO levels and creating uniform thermal and oxygen gradients in the water column during the open-water period (May – September).

Fall destratification is like diffuser aeration, except this method uses larger subsurface diffusers that require greater air flow to circulate the water column in the fall to increase suitable DO levels to overwinter fish; fall destratification runs for up to two weeks following fall turnover, before ice formation. During aeration, we monitor water quality at each waterbody by collecting monthly DO and temperature profiles at 1-meter intervals at multiple stations. During winter, we visit each site regularly as per ACA's Winter Lake Aeration Public Warning and Protection Procedures Protocol to monitor equipment functionality and record compliance with public safety liability requirements.

Results

In 2021/22, we aerated 22 waterbodies, all of which maintained DO concentrations above 3 mg/L and successfully overwintered fish (Table 1). During winter aeration, we followed ACA's Winter Lake Aeration Public Warning and Protection Procedures Protocol at each site to mitigate the hazards associated with winter aeration to ensure public safety. This year, we upgraded electrical infrastructure at Muir Lake and Coleman Fish and Game Pond, and installed additional subsurface diffusers to the existing open-water aeration system at Kerbes Pond. We established one new financial and in-kind partnership with the County of Barrhead to support the Peanut Lake aeration project.

Table 1. Location and size of waterbodies and aeration technique used in ACA's aeration project in 2021/22.

Waterbody	Legal location	Aeration technique	No. of aerators	Size (ha)	Max. depth (m)	Winter angling?	Whirling disease risk zone
Northwest Region							
Cecil Thompson Pond	SW-23-083-21-W5M	Surface	1	1	4	Yes	1 (White)
East Dollar Lake	SE-18/NW-08-073-21-W5M	Surface	1	6	8.5	Yes	2 (Yellow)
West Dollar Lake	SE-18/NW-08-073-21-W5M	Surface	2	7	4.5	Yes	2 (Yellow)
Figure Eight Lake	NE-20-084-25-W5M	Surface	3	39	6.5	Yes	1 (White)
Spring Lake (NW)[1]	SE-23-075-11-W6M	Diffuser	1	32	24	Yes	2 (Yellow)
Sulphur Lake	NW-07-089-02-W6M	Surface	4	53	8.5	Yes	1 (White)
Swan Lake	SE-13-070-26-W5M	Surface	10	140	6	Yes	2 (Yellow)
Northeast Region							
Millers Lake	SW-08-053-19-W5M	Surface	2	36	7	Yes	2 (Yellow)
Muir Lake	NW-32-053-27-W4M	Surface	3	29	6	No	2 (Yellow)
Peanut Lake	NE-15-58-3-W5M	Surface	2	28	13	Yes	2 (Yellow)
Radway Fish Pond[2]	SE-31-058-20-W4M	Diffuser	3	1	6	Yes	1 (White)
Spring Lake (NE)	SW-30-052-01-W5M	Surface	4	69	9	Yes	2 (Yellow)
Hasse Lake	NE-14-52-02-W5M	Surface	7	90	9.5	Yes	2 (Yellow)
Central Region							
Beaver Lake	NE/SE-16-035-06-W5M	Surface	3	31	9.5	No	3 (Red)
Birch Lake	NW-18-035-06-W5M	Surface	2	29	9.5	Yes	3 (Red)
Fiesta Lake	NE-12-035-06-W5M	Surface	2	7	7	No	3 (Red)
Hansens Reservoir	SE-29-038-03-W5M	Surface	2	6	4	Yes	2 (Yellow)
Ironside Pond	SW-07-038-07-W5M	Surface	1	3	13	No	3 (Red)
Mitchell Lake	NE-25-037-08-W5M	Surface	2	18	7.5	Yes	3 (Red)
Winchell Lake	NW-02-029-05-W5M	Surface	2	5		Yes	3 (Red)
Kerbes Pond[1 and 2]	NE-19-036-20-W4M	Diffuser	4	3.5	6	No	1 (White)
Southern Region							
Coleman Fish and Game Pond	SW-24-008-05-W5M	Surface	1	3	4.5	Yes	3 (Red)

[1]Fall destratification

[2]Summer aeration

Conclusions

We aerated 22 waterbodies, all of which maintain DO concentrations above 3 mg/L and successfully overwintered fish. We maintained public safety at aerated sites through strict adherence to the provincial Winter Lake Aeration Public Warning and Protection Procedures Protocol. We expanded the aeration project with the addition of one new waterbody and established one new financial and in-kind partnership to support the new project.

Communications

- Posted public service advertisements in local and regional newspapers, and www.ab-conservation.com warning public about thin ice and open-water conditions during winter aeration operations (October – April).
- Peanut Lake Aeration project was featured in Let's Get Outdoors in December.

Literature Cited

Aku, P.M.K., L.G. Rudstam, and W.M. Tonn. 1997. Impact of hypolimnetic oxygen injection on the vertical distributions of cisco (*Coregonus artedi*) in Amisk Lake, Alberta. *Canadian Journal of Fisheries and Aquatic Sciences* 54: 2182–2195.

Miller, T.G., and W.C. Mackay. 1996. A comparison of mechanical surface aeration and point release air injection used to prevent winterkill in Alberta. Second annual progress report on winter lake aeration. Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada. 64 pp.

Photos

Photo 1. Dissolved oxygen monitoring and safety site inspection at Coleman Fish and Game Pond. Photo: Logan Redman

Photo 2. Safety fence and signage installed at Peanut Lake. Photo: Troy Furukawa

Photo 3. ACA staff drilling safety fence post holes at Millers Lake. Photo: Troy Furukawa