

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

**Project Name:** Lake Aeration

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**Partnerships**

Alberta Fish & Game Association

Aquality Environmental Consulting Ltd.

Clear Hills County

County of Barrhead

County of Northern Lights

Edmonton Trout Fishing Club

Government of Alberta

Mercer Peace River Pulp Ltd.

Mountain View County

Municipal District of Bonnyville

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 23 waterbodies, thereby creating angling opportunities that would otherwise not exist.
- Expanded aeration project by the addition of Little Bear Lake and upgraded electrical infrastructure at Millers Lake.
- Installed additional subsurface diffusers in Kerbes Pond to increase efficacy of the existing open water aeration system and replaced the summertime windmill-driven diffusers at Hansens Reservoir with a more efficient electrically powered diffusers to mitigate recent summer algal blooms and fish kills.
- Created bathymetric maps for Kerbes Pond and Mitchell Lake.

## **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 2022/23, we aerated 23 waterbodies across the province, all of which successfully overwintered stocked trout without any reported fish kills. We conducted monthly summer dissolved oxygen and temperature monitoring at Beaver, Birch, Fiesta, and Winchell lakes, and Kerbes Pond. This year, we expanded the aeration project by the addition of Little Bear Lake and upgraded electrical infrastructure at Millers Lake. We added two subsurface diffusers to the existing open water aeration system at Kerbes Pond to increase effectiveness. We replaced the windmill-driven summertime diffusers at Hansens Reservoir with a more efficient electrically powered diffusers to mitigate recent summer algal blooms and fish kills. We completed bathymetric mapping for Kerbes Pond and Mitchell Lake.

## **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, 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. This method is 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 occurs during fall turnover, before ice formation, and runs up to two weeks until DO conditions are suitable for year-round fish survival. We use fall destratification for Spring Lake (NW) only.

During aeration, we monitor water quality at each waterbody by collecting monthly DO and temperature profiles at 1-metre intervals at multiple stations. In addition to winter water quality, we conduct summer DO and temperature profiles every three years on all lakes. 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 2022/23, we aerated 23 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 added two subsurface diffusers in Kerbes Pond to the existing four diffusers to increase efficacy of the existing open water aeration system. We also replaced the windmill-driven diffuser system at Hansen Reservoir with a more efficient electrically powered diffuser system to mitigate recent summer algal blooms and fish kills. The new diffuser system proved to be successful as water algal growth was minimal and fish survived during the open water season. We completed bathymetric mapping at Kerbes Pond and Mitchell Lake, upgraded electrical infrastructure at Millers Lake, and established one new financial and in-kind partnership with the Municipal District of Bonnyville to support the new Little Bear Lake aeration project.

Table 1. Characteristics of ACA aerated lakes, 2022/23.

Waterbody	Legal Location	Aeration Technique	No. of Aerators	Size (ha)	Max. Depth (m)	Winter Angling?
<b>Northwest Region</b>						
Cecil Thompson Pond	SW-23-083-21-W5M	Surface	1	1	4	Yes
East Dollar Lake	SE-18/NW-08-073-21-W5M	Surface	1	6	8.5	Yes
West Dollar Lake	SE-18/NW-08-073-21-W5M	Surface	2	7	4.5	Yes
Figure Eight Lake	NE-20-084-25-W5M	Surface	3	39	6.5	Yes
Spring Lake (NW) <sup>1</sup>	SE-23-075-11-W6M	Diffuser	1	32	24	Yes
Sulphur Lake	NW-07-089-02-W6M	Surface	4	53	8.5	Yes
Swan Lake	SE-13-070-26-W5M	Surface	10	140	6	Yes
<b>Northeast Region</b>						
Millers Lake	SW-08-053-19-W5M	Surface	2	36	7	Yes
Muir Lake	NW-32-053-27-W4M	Surface	3	29	6	No
Peanut Lake	NE-15-058-03-W5M	Surface	2	28	13	Yes
Radway Pond <sup>2</sup>	SE-31-058-20-W4M	Diffuser	3	1	6	Yes
Spring Lake (NE)	SW-30-052-01-W5M	Surface	4	69	9	Yes
Hasse Lake	NE-14-052-02-W5M	Surface	7	90	9.5	Yes
Little Bear Lake	SW-19-064-02-W4M	Surface	6	48	12.2	Yes
<b>Central Region</b>						
Beaver Lake	NE/SE-16-035-06-W5M	Surface	3	31	9.5	No
Birch Lake	NW-18-035-06-W5M	Surface	2	29	9.5	Yes
Fiesta Lake	NE-12-035-06-W5M	Surface	2	7	7	No
Hansens Reservoir	SE-29-038-03-W5M	Surface	2	6	4	Yes
Ironside Pond	SW-07-038-07-W5M	Surface	1	3	13	No
Mitchell Lake	NE-25-037-08-W5M	Surface	2	18	7.5	Yes
Winchell Lake	NW-02-029-05-W5M	Surface	2	5		Yes
Kerbes Pond <sup>2</sup>	NE-19-036-20-W4M	Diffuser	4	3.5	6	No
<b>Southern Region</b>						
Coleman Fish & Game Pond	SW-24-008-05-W5M	Surface	1	3	4.5	Yes

<sup>1</sup> Fall destratification

<sup>2</sup> Summer aeration

## Conclusions

We aerated 23 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. We added additional subsurface diffusers to increase the efficacy of the diffuser aeration systems at two of our sites.

## Communications

- Posted public service advertisements in local and regional newspapers, and [www.ab-conservation.com](http://www.ab-conservation.com), warning public about thin ice and open water conditions during winter aeration operations (October–April).
- Hasse 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 artedii*) 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. Bubble plume created by an air diffuser used to destratify Spring Lake (NW region) during fall turnover. Photo: Dave Jackson



Photo 2. Safety fence and signage installation at Beaver Lake. Photo: Andrew Clough



Photo 3. ACA staff installing surface aerators at Birch Lake. Photo: Andrew Clough