

Alberta Conservation Association 2016/17 Project Summary Report

Project Name: Lake Aeration

Fisheries Program Manager: Peter Aku

Project Leaders: Troy Furukawa, Brad Hurkett, Dave Jackson and Chad Judd

Primary ACA staff on project:

Andrew Clough, Troy Furukawa, Brendan Ganton, John Hallett, Brad Hurkett, Dave Jackson, Chad Judd, Nikita Lebedynski, Jim Potter, Logan Redman, Britt Schmidt, Scott Seward and Ken Wright

Partnerships

Access Pipelines
Alberta Environment and Parks
Daishowa-Marubeni International Ltd.
Edmonton Trout Fishing Club
Edson Forest Products
Fisheries and Oceans Canada
Fisheries Enhancement Society of Alberta
Municipal District of Greenview No. 16
Northern Sunrise County
Radway Lions Club
Spring Lake Campground
Thorhild County
Trout Unlimited Canada – Oldman River Chapter
Village of Spring Lake

Key Findings

- Aeration helped maintain dissolved oxygen levels suitable for year-round survival of stocked trout in 18 lakes, thereby creating angling opportunities that would otherwise not exist.
- All winter aeration lakes successfully overwintered fish with no mortalities.
- We expanded our aeration program by adding Police Outpost Lake as an aerated waterbody.
- We upgraded aeration infrastructure at Sulphur Lake and Radway Pond.
- We continued to work with Mountain View County and the Municipal District of Greenview toward developing aeration facilities at Winchell and West Dollar lakes, respectively.

Introduction

Alberta Conservation Association's (ACA) aeration program uses lake aeration to provide Albertans with recreational angling in lakes and ponds where such fishing opportunities are otherwise limited. Aerated waterbodies are shallow and eutrophic, experience prolonged ice cover, and are susceptible to summer and winter fish kills. Lakes prone to winterkill are 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). Similarly, lakes prone to summerkill are a result of the interaction between high surface temperatures and low hypolimnetic DO levels (Aku et al. 1997). Our primary objective is to develop and maintain lake habitats to promote year-round survival of sport fish in stocked waterbodies by maintaining DO concentrations at or above 3 mg/L.

Methods

We use two aeration techniques to promote fish survival: 1) mechanical surface aeration during winter months and 2) diffuser point-release aeration for summer aeration and fall destratification. Mechanical surface aerators are used before and during winter (October to April), when prolonged ice and snow conditions exist. Surface aerators oxygenate and destratify lakes by pumping warm water from the bottom of the lake to a fountain on the surface. Atmospheric oxygen absorption also occurs through the open water created and maintained by the aerator. Point-release aerators use a subsurface bubble diffuser connected by an air hose to an onshore air compressor to circulate and destratify the water column, thereby increasing DO levels and creating uniform thermal and oxygen gradients in the water column. During aerator operations, we visit each site regularly per ACA's Winter Lake Aeration Public Warning and Protection Procedures Protocol to monitor equipment functionality and compliance with public safety stipulations. We also measure DO and temperature profiles at 1 m intervals using an YSI© optic sensor at multiple stations.

Results

In 2016/17, we aerated 18 waterbodies (Table 1), all of which successfully overwintered fish with no mortalities; DO concentrations remained above 3 mg/L in most cases. New developments in the aeration program this year included the following:

- Started winter aeration at Police Outpost Lake with partnership funding from the Oldman River Chapter of Trout Unlimited Canada.
- Replaced the aging power generator at Sulphur Lake with partnership funding from Fisheries and Oceans Canada.
- Completed shoreline trenching at Radway Fish Pond to bury line from the shore-based air compressors to the pond, which permitted us to run point-release aerators during summer months.
- Started winter aeration at Hansen's Reservoir with one mechanical surface aerator powered by a propane generator.
- Continued to work with Mountain View County and the Municipal District of Greenview toward developing aeration facilities at Winchell and West Dollar lakes, respectively.

Table 1. Location and size of waterbodies and aeration application used in Alberta Conservation Association's aeration program in 2016/17.

| Waterbody | Legal location | Aerator application | Size (ha) | Winter angling? |
|----------------------------|-----------------------|---------------------------------------|------------------|------------------------|
| Northwest Region | | | | |
| Figure Eight Lake | NE-20-084-25-W5 | Surface (winter) | 38.6 | yes |
| Swan Lake | 18-070-25-W5 | Surface (winter) | 140 | yes |
| Sulphur Lake | NW-07-089-02-W6 | Surface (winter) | 53.4 | yes |
| East Dollar Lake | NW-08-073-21-W5 | Surface (winter) | 5.6 | yes |
| Spring Lake | NE/SE-23-075-11-W6 | Surface (fall destrat)* | 32.1 | yes |
| Cecil Thompson Pond | SW-23-083-21-W5 | Surface (winter) | 0.8 | yes |
| Radway Fish Pond | SW-32-058-20-W4 | Surface (winter) Diffuser (summer) | 1.5 | yes |
| Northeast Region | | | | |
| Muir Lake | NW-32-053-27-W4 | Surface (winter) | 29 | no |
| Spring Lake (Stony Plain) | SE-30-052-01-W5 | Surface (winter) | 69.2 | yes |
| Millers Lake | SW-08-053-19-W5 | Surface (winter) | 35.6 | yes |
| Central Region | | | | |
| Beaver Lake | NE/SE-16-035-06-W5 | Surface (winter) | 31 | no |
| Mitchell Lake | Located in Red Deer | Surface (winter) | 18 | yes |
| Ironside Pond | SW-07-038-07-W5 | Surface (winter) | 3.3 | no |
| Fiesta Lake | NE-12-035-06-W5 | Surface (winter) | 7.1 | no |
| Hansen's Reservoir | SE-29-038-03-W5 | Surface (winter) | 5.7 | yes |
| Birch Lake | SW-19-035-06-W5 | Surface (winter) | 28.8 | yes |
| Southern Region | | | | |
| Coleman Fish and Game Pond | SW-24-008-05-W5 | Surface (winter) | 3.4 | yes |
| Police Outpost Lake | NE/NW-06-001-26-W4 | Surface (winter) | 97.8 | no |

*Fall destratification

Conclusions

While mechanical surface aeration remains a very cost-effective and proven technique to maintain DO concentrations suitable for overwintering sport fish, it does, however, create unsafe ice conditions and open water that pose risks to public safety. To increase public safety in areas affected by aeration, we have implemented a Winter Lake Aeration Public Warning and Protection Procedures Protocol that will be strictly followed when aerators are running.

Several of the projects would not have been possible without partnership contributions. We continue to investigate and develop new aeration opportunities.

Communications

- Dr. Todd Zimmerling, President & CEO of ACA, published an article on ACA winter lake aeration operating protocols in *The Mountaineer* (Rocky Mountain House) in spring 2016.
- Posted monthly and sub-monthly (November – April) public service advertisements in local and regional newspapers, and websites (www.ab-conservation.com and www.mywildalberta.com) warning public about thin-ice and open-water conditions during winter aeration operations.

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



Mechanical surface aerator and perimeter fence installed at Ironside Pond. Photo: Chad Judd



Warning sign and perimeter fence used to inform the public about unsafe ice conditions at Muir Lake. Photo: Troy Furukawa