

**Alberta Conservation Association
2009/10 Project Summary Report**

Project Name: *Lake Aeration*

Fisheries Program Manager: Peter Aku

Project Leader: Trevor Council

Primary ACA staff on project:

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Partnerships

Alberta Fish & Game Association
Alberta Sustainable Resource Development, Fish and Wildlife Division
Alberta Tourism, Parks and Recreation
Braxxon Excavation
Canadian Forest Products Ltd.
Clearwater County
Conoco Philips
County of Stettler
Daishowa-Marubeni International Ltd.
Fisheries Enhancement Society
Northern Sunrise County
North Shore Environmental Consultants Ltd.
RTC Services Ltd.
Shell Canada Tay River Environmental Enhancement Fund (TREE Fund)
TAQA North (formerly PrimeWest Energy)
Town of Fairview
Village of Spring Lake
Volunteer Stewards
Weyerhaeuser Canada Ltd.
TransAlta

Key Findings

- The Lake Aeration projects created and enhanced angling opportunities that would otherwise not exist.
- Summer circulation conducted at Beaver Lake and Boehlke's Pond.

- Lake aeration infrastructure developed and aeration initiated at Birch Lake to enhance angling opportunities.
- All winter-aerated waterbodies successfully overwintered trout with no observed or reported winterkill, except for Moonshine Lake where a partial winterkill was reported.
- Added Birch and Spring lakes to the Lake Aeration program.

Introduction

Alberta Conservation Association (ACA) uses lake aeration as a fishery enhancement technique to ensure year-round survival of sport fish in waterbodies we stock with trout across the province, thereby creating or enhancing recreational angling opportunities. The aerated lakes are typically, shallow, eutrophic, experience prolonged ice and snow cover, and are prone to fish kills. Shallow depths, coupled with low hypolimnetic dissolved oxygen (DO) during winter, resulting from interplay of low photosynthetic oxygen production and high biological oxygen demand lead to winterkills (Miller and Mackay 1996). Similarly, interplay of high surface temperatures and low hypolimnetic DO during the summer results in summerkills (Aku et al. 1997). We use aeration to maintain hypolimnetic DO concentrations in these lakes at or above 3.0 mg/L in the winter and 5.0 mg/L in the summer. Maintaining DO concentrations at 3.0 mg/L or higher should ensure year-round survival of trout in these lakes (Fast 1994), allow fish to live longer, grow larger, and provide new and higher quality recreational opportunities for Alberta anglers.

Methods

Currently, we use two methods of aeration: mechanical surface aeration for winter aeration, and a point-release system for fall destratification and summer circulation. Mechanical surface aerators are used during periods of prolonged ice and snow cover (October to April). These aerators produce tiny droplets of water in a fountain-like spray adding oxygen to the waterbody via the open water created and maintained by the aerator. The point-release systems use a subsurface bubble diffuser connected to an onshore compressor or a windmill to circulate or de-stratify the water column, thereby enhancing oxygen levels and creating a uniform thermal and oxygen gradient throughout the affected area. During winter operation, we visited each lake monthly to ensure proper aerator function and to measure temperature and dissolved oxygen profiles.

Results

We aerated 19 lakes and ponds stocked with trout (Table 1). Surface area of aerated waterbodies ranged from 0.8 to 139.9 ha and the number of aerators per waterbody varied from one to ten units.

Table 1. Location and size of waterbodies aerated by Alberta Conservation Association.

| Region | Aerated Waterbody | Location | Size (ha) | Winter Angling |
|-------------|--|--------------------------|-----------|----------------|
| Northwest | Moonshine Lake ^a | SW 32-79-08 W6 | 30.8 | yes |
| | Cummings Lake | SE 10-82-03 W6 | 26.9 | yes |
| | Figure Eight Lake | NE 20-84-25 W5 | 38.6 | yes |
| | Swan Lake | 13-70-26 W5, 18-70-25 W5 | 139.9 | yes |
| | Sulphur Lake | NW 07-89-02 W6 | 53.4 | yes |
| | East Dollar Lake | NW 08-73-21 W5 | 5.6 | yes |
| | Spring Lake | SE 23-75-11 W6 | 32.1 | yes |
| Northeast | Cecil Thompson Pond | SW 23-83-21 W5 | 0.8 | yes |
| | Muir Lake | 30, 31-53-27 W4 | 29.0 | no |
| | Spring Lake ^b (Stony Plain) | 30-52-01 W5 | 69.2 | yes |
| | Boehlke's Pond | 31-35-15 W4 | 9.2 | yes |
| Southern | Hansen's Reservoir | 29-38-3 W5 | 5.7 | yes |
| | Coleman Fish & Game Pond | SW 24-08-05 W5 | 3.4 | yes |
| | Beaver Lake | E 16-35-06 W5 | 31.0 | no |
| East Slopes | Mitchell Lake | NE 25-37-08 W5 | 18.0 | yes |
| | Ironside Pond | SW 07-38-07 W5 | 3.3 | no |
| | Fiesta Lake | NE 12-35-6 W5 | 7.1 | no |
| | Millers Lake | SW 08-53-19 W5 | 35.6 | yes |
| | Birch Lake ^c | 18-35-6 W5 | 28.8 | yes |

^aNo longer part of ACA aeration. Managed by Alberta Tourism, Parks and Recreation beginning November 2009.

^bSpring Lake aeration project was adopted and added to the Lake Aeration Program in November 2009.

^cBirch Lake aeration infrastructure was developed and initiated in December 2009.

All ACA winter-aerated waterbodies successfully overwintered trout with no observed or reported winterkill, except for Moonshine Lake where a partial winterkill was observed. Generally, late winter dissolved oxygen levels were maintained between 2.9 mg/L and 6.9 mg/L down to 3 m below the surface. We conducted summer circulation at Beaver Lake and Boehlke's Pond to prevent thermal and dissolved oxygen stratification which, in turn, could lead to summerkill. We established and maintained partnerships to assist with costs associated with the development and maintenance of all lake aeration projects. The development of lake aeration at Blindtrail Lake has been delayed due to close proximity of a sour gas well and the related access issues. As a result, lake aeration infrastructure was developed and initiated at an alternate site, Birch Lake, southwest of the Village of Caroline. We added Birch and Spring (west of Stony Plain) lakes to the program in 2009.

Conclusions

Lake aeration continued to create, maintain and enhance recreational angling opportunities for Albertans by ensuring the year-round survival of trout in several stocked waterbodies throughout the province. As a result, our Lake Aeration projects created angling opportunities that would otherwise not exist. Several of the aeration projects would not be possible without partnership contributions. We continued to investigate and develop new lake aeration opportunities, as well as monitor existing lake aeration projects.

Communications

- Public service advertisements (PSA) in local newspapers to notify the public of aeration activities and hazards related to these activities. We sent PSAs out in November (ice-on period) and April (ice-off period). We also placed signage at winter-aerated waterbodies to warn the public about the danger of thin ice conditions associated with lake aeration. In November/December 2009, we placed additional signage and flagging tape around the “polynya” to further identify the hazards of thin ice associated with lake aeration.
- Presentation on Lake Aeration activities to the Swan Lake Enhancement Society in Tupper, British Columbia.
- Partnership agreement developed with the Village of Spring Lake to continue aeration of Spring Lake (west of Stony Plain).

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.
- Fast, A.W. 1994. Winterkill prevention in lakes and ponds using artificial aeration. *Reviews in Fisheries Science* 2: 23-77.
- 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. 64 pp.

List of Photos: (photos 1 to 5)



Aerial view of East Dollar Lake aeration project. (Photo: Dave Jackson)



Winter dissolved oxygen sampling in Beaver Lake. (Photo: Kelly Hooley)



East Dollar Lake aeration project in November 2009. (Photo: Dave Jackson)



A full parking lot at the Fiesta Lake aeration project. (Photo: Kevin Gardiner)



Initiation of lake aeration at Sulphur Lake in October 2009. (Photo: Dave Jackson)