Alberta Conservation Association
2008/09 Project Summary Report

Project name: *Lake Aeration Program*

Fisheries and Aquatic Program Manager: Peter Aku

Project leader: Trevor Council

Primary ACA staff on this project (including seasonals): Ken Wright, Dave Jackson, Mike Jokinen, Corey Rasmussen, Chad Judd, Kelly Hooey, Diana Rung, and Brad Taylor.

Partnerships

Alberta Fish & Game Association
Alberta Sustainable Resource Development, Fish & Wildlife Division
Alberta Tourism, Parks and Recreation
Canadian Forest Products Ltd.
Conoco Philips
County of Stettler
Daishowa Marubeni International Ltd.
Moonshine Lake Provincial Park
Northern Sunrise County
TAQA North (formerly PrimeWest Energy)
Shell Canada Tay River Environmental Enhancement Fund (TREE Fund)
Town of Fairview
Volunteer Stewards
Weyerhaeuser Canada Ltd.
TransCanada

Key findings

- The Lake Aeration Program created and enhanced angling opportunities that would otherwise not exist.
- Adequate dissolved oxygen concentrations (above 3.0 mg/L) were maintained in all water bodies thereby ensuring year-round survival of trout in all ACA aerated lakes; there were no reported winterkills or summerkills.
- Permanent infrastructure was installed at Coleman Fish and Game Pond to enhance existing aeration.
- We initiated a new aeration project on Birch Lake.
- All winter-aerated water bodies successfully overwintered trout with no observed or reported winterkill.

Abstract

In an effort to promote year-round survival of sport fish in Alberta, the Alberta Conservation Association (ACA) aerated 17 shallow and productive water bodies prone to winterkill and summerkill. These water bodies naturally have high vegetative productivity which results in organic-rich sediments with elevated biological oxygen demand. The ACA utilized lake aeration to increase dissolved oxygen concentrations in an effort to enhance and maintain lake habitats, thereby creating and improving recreational angling opportunities. Mechanical surface aeration was used for winter aeration and a point-release system was used for fall destratification and summer circulation to maintain hypolimnetic oxygen concentrations at 3.0 mg/L or higher. Surface area of aerated water bodies ranged from 0.8 ha to 139.9 ha and the number of aerators per water body varied from 1 to 10 units. All winter-aerated water bodies successfully overwintered trout with no observed or reported winterkill. During the 2008-2009 period, DO concentrations remained above 3.0 mg/L in all water bodies thereby ensuring year-round survival of trout in all ACA aerated lakes; there were no reported winterkills or summerkills.

Introduction

The Alberta Conservation Association aerated 17 lakes and ponds stocked with trout (Table 1). Surface area of aerated water bodies ranged from 0.8 to 139.9 ha and the number of aerators per water body varied from 1 to 10 units. 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 an interplay of low photosynthetic oxygen production and high biological oxygen demand led to winterkills (Miller and Mackay 1996). Similarly, an interplay of high surface temperatures and low hypolimnetic DO during the summer results in summerkills (Aku et al. 1997). The ACA uses aeration as a fishery enhancement technique to maintain hypolimnetic DO concentrations in these lakes 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) and allow fish to live longer and grow larger. The primary objective of the program was to develop and maintain lake habitats that promote year-round survival of sport fish, thereby creating or enhancing recreational angling opportunities that would not have otherwise existed.

Table 1.....Location and size of ACA-aerated water bodies.

Region	Aerated Waterbody	Location	Size (ha)	Winter Angling
Northwest	Moonshine Lake	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
	Cecil Thompson Pond	SW 23-83-21 W5	0.8	yes
Northeast	Muir Lake	30, 31-53-27-W4	65.0	no
Southern	Boehlke's Pond	31-35-15 W4	9.2	yes
	Hansen's Reservoir	29-38-3 W5	5.7	yes
	Coleman Fish & Game Pond	SW 24-08-05 W5	3.4	yes
East Slopes	Beaver Lake	E 16-35-06 W5	31.0	no
	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

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 water body 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. Mechanical surface aeration has been studied and proven to be the most effective methods providing the best results (Miller 1996) for winter aeration, and point release systems have proven effective for mechanical destratification and circulation in the summer. During operation, we visited each lake monthly to ensure proper aerator function and to measure temperature and dissolved oxygen levels. Of the 17 water bodies listed in Table 1, one (Boehlke's Pond) received summer aeration only, two (Hansen's Reservoir and Beaver Lake) both summer and winter aeration, and all the rest received winter aeration only.

Results

During the 2008-2009 period, DO concentrations remained above 3.0 mg/L in all water bodies thereby ensuring year-round survival of trout in all ACA aerated lakes; there were no reported winterkills or summerkills. Permanent infrastructure was installed at Coleman Fish and Game Pond to enhance existing aeration. Partnerships were established and maintained 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 development was initiated at an alternate site, Birch Lake, southwest of the Village of Caroline.

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 water bodies throughout the province. As a result, the Lake Aeration Program created angling opportunities that would otherwise not exist. Several of the aeration projects would not be possible without partnership contributions. The ACA continued to investigate and develop new lake aeration opportunities as well as monitored existing lake aeration projects.

Communications

- Public notices were placed in local newspapers to notify the public of aeration activities and hazards related to these activities. These notices were sent out in November (ice-on period) and April (ice-off period). Signage was also placed at winter-aerated water bodies to warn the public about the danger of the thin ice conditions associated with lake aeration.
- Informative articles were posted in several newspapers.
- Staff presented the Lake Aeration Program to the Edmonton Chapter of Trout Unlimited.

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.

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.

Photos

East Dollar Lake (January 2009 showing warning sign on danger of thin ice associated with aeration. (Photo: David Jackson).

Sulphur Lake (October 2008) showing four aerator plumes. (Photo: David Jackson).

Angled brook trout from Sulphur Lake, October 2008. (Photo: David Jackson).

Local angler displaying 50-cm rainbow trout from Sulphur Lake. (Photo: David Jackson)

Six meter windmill aerators at Boehlke Pond. (Photo: Diana Rung)