Alberta Conservation Association

2019/20 Project Summary Report

Project Name: ACA Fish Stocking Pond Rehabilitation

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Partnerships

Alberta Environment and Parks

Key Findings

- Rainbow Park Pond is hypereutrophic, with high total phosphorus (101 ± 37 µg/L).
- Rainbow Park Pond is a good candidate for alum treatment owing to its high buffering capacity that should allow it to withstand large fluctuations in pH.
- Alum treatment of Rainbow Park Pond will inactivate phosphorus, reduce primary productivity, and improve dissolved oxygen.

Abstract

Fishing pressure at ACA stocked ponds can exceed 2,000 h/ha in the summer months, indicating these ponds can be popular among anglers. However, our recent data suggests that some ponds may not be capable of supporting trout survival beyond mid-summer due to low dissolved oxygen (DO). Rainbow Park Pond is hypereutrophic (TP 101 ± 37 µg/L) and a good candidate for alum treatment owing to its high buffering capacity (alkalinity 132 ± 4 mg/L) able to withstand large fluctuations in pH. Alum treatment will reduce bioavailable phosphorus, thereby improving water quality and increasing DO concentration. Through alum jar tests, we

determined that a total of 25 mL (59.5g Al/liter solution) of alum per liter of pond water, applied over two treatments, maintained favourable water quality for fish and invertebrate survival (pH of 7.5, alkalinity of 72 mg/L) while significantly reducing total phosphorus (85% reduction).

Introduction

Alberta Conservation Association (ACA) stocks ponds throughout the province of Alberta as part of our Fish Stocking (FS) project. Several of ACA's stocked ponds are very popular angling destinations receiving >2,000 angler h/ha. Yet, our recent data suggest that some of these ponds may not be capable of supporting trout survival beyond mid-summer due to poor water quality, particularly low dissolved oxygen (DO) and temperature (Fitzsimmons and Keeling 2015). This is not surprising since most FS ponds tend to be shallow and enriched with nutrients. Aside from dredging these waterbodies, not much can be done to reduce water temperature for trout survival. However, low DO can be improved through minimizing in-situ phosphorus (P) availability through aluminum sulphate (alum) treatment. Alum inactivates water column P and pond sediment P, limiting primary productivity and biological oxygen demand (BOD), thereby improving DO and summer-long survival of fish. Rainbow Park Pond is being investigated for alum treatment because it is hypereutrophic and has a known history of low DO in the summer months.

Methods

We collected monthly, vertically integrated, composite water samples from three locations within Rainbow Park Pond that were analyzed, by a lab, for nutrient concentration, chlorophyll *a*, pH, and water hardness to evaluate the candidacy of the pond for alum treatment. We completed jar tests, in triplicate, to determine the maximum safe dose of alum that could be administered without adversely effecting aquatic life. Briefly, we added 20 mL and 25 mL of alum (59.5g Al/liter solution) to 1 L composite water samples taken from Rainbow Park Pond, collected in October, following the alkalinity method (Kennedy and Cooke 1983). We compared doses to determine which achieved maximum phosphorus precipitation while maintaining a pH >6, and a residual alkalinity ≥25%.

Results

Rainbow Park Pond exhibits high phosphorus concentrations (TP 101 ± 37 µg/L) and primary productivity (chlorophyll *a* 39.1 ± 33.1 µg/L), indicating it is hypereutrophic. Rainbow Park Pond is slightly basic (pH 8.07 ± 0.13) and alkaline (alkalinity 132 ± 4 mg/L) and is therefore able to be dosed with a high concentration of alum. Jar tests indicate that the maximum safe alum dose to address excessive nutrient load in Rainbow Park Pond is 25 mL (of a 59.5g Al/liter solution) of alum per liter of pond water.

Conclusions

Rainbow Park Pond is a good candidate for alum treatment because the high alkalinity/buffering capacity can accommodate a high concentration of alum dosing without having an adverse effect on pH. We will apply 25 mL of alum over two treatments. This will make for effective nutrient inactivation that will not harm the aquatic community or fishery and will lead to improved water quality and DO concentration. We will be working with Alberta Environment and Parks to secure permits to apply alum to Rainbow Park Pond.

Communications

N/A

Literature Cited

Cooke, G.D., E.B. Welch, A.B. Martin, D.G. Fulmer, J.B. Hyde, and G.D. Shrieve. 1993. Effectiveness of Al, Ca and Fe salts for control of internal loading in shallow and deep lakes. Hydrobiologia 253: 323-335.

Fitzsimmons, K., and B. Keeling. 2015. Survival of stocked trout and a creel based sport fishery assessment of 12 Alberta Conservation Association stocked ponds. Data Report, produced by the Alberta Conservation Association, Sherwood Park, Alberta, Canada. 25 pp + App.

Kennedy, R., and D. Cook. 1982. Control of lake phosphorus with aluminum sulfate: dose determination and application techniques. Journal of American Water Resources. 18(3): 389-395.

Photos

Rainbow Park Pond alum jar test (in triplicate). Alum is binding to biologically available nutrients, forming a floc, making the nutrients unavailable for plant growth. Photo: Troy Furukawa

Algal bloom in Rainbow Park Pond. Photo: ACA