Final Report for Bullhead Lake Grant LPT63219

Covering 2020-2021

Background

In 2019, the Bullhead Lake Advancement Association, Inc (BLAA) was awarded a surface water grant (LPT63219) to conduct an Alum Treatment Feasibility Study for Bullhead Lake in Manitowoc County, to span the period of April 15, 2019 to June 30, 2021. Onterra, LLC. was contracted to perform grant administration and conduct much of the work, including water quality and sediment core analysis, data analysis and dosing strategy, and alum treatment plan development.

In January 2020 Onterra completed the Alum Feasibility Study report that concluded an alum treatment would not provide adequate benefit to the lake at this time. Watershed modeling points to record-high rainfalls and resultant phosphorus flushing from wetlands as major contributes to external loading; enough to explain increases in growing season phosphorus concentrations. Data also shows that there is significant bottom release of phosphorus, but it stays mainly within the hypolimnion and settles back into the bottom over winter. There is uncertainty if this phosphorus loading pattern will persist under more widely varying weather patterns. This information is summarized in the final report from Onterra dated Jan. 20, 2020.

Because an alum treatment was not recommended, grant funds allocated for developing an alum treatment plan were approved for use to perform additional data collection from the watershed and to purchase a dissolved oxygen meter. The highest priority items were early spring and late fall phosphorus and dissolved oxygen levels while other data included phosphorus samples from various sites in the watershed and an estimation of lake level changes. The rest of this report summarizes accomplishments, challenges, and future steps.

Accomplishments and Challenges

As documented in the Alum Feasibility Study Final Report submitted by Onterra, additional data collection would support more robust modeling results, a re-analysis for alum treatment consideration and allow for a more detailed assessment of watershed phosphorus sources. Highest priority data are early spring and late fall phosphorus and dissolved oxygen. To measure dissolved oxygen, the lake association purchased a proSOLO dissolved oxygen and temperature meter. This model has the integrated calibration, such that calibration is not necessary. The original grant amendment indicated that calibration logs would be uploaded to SWIMS, but there are no calibration logs for this newest meter.

Phosphorus Measures in the Lake

1. Deep hole: Ice-out samples in 2020 were not collected because the State Lab of Hygiene was not processing samples during the early COVID period. Deep hole samples were collected as part of the CLMN in June, July and August (51, 50 and 66 ug/l, respectively). An October sample was collected as part of the grant, but the lab slip was not updated, indicating that it was collected in July. This October 25 sample showed a value of 184 ug/l. Water column dissolved oxygen (D.O.) and temperature profile data are available in SWIMS.

Phosphorus Measures in the Watershed

There is the potential to obtain some phosphorus loading data from the watershed through a combination of phosphorus samples and changes in lake level. To that end, watershed sampling sites were determined and aimed to be sampled after significant rain events. There were fewer large rains in 2020 and sampling was done after one of them (July 10). It was a challenge to collect "clean" samples because of sediment at each sampling site, so results should be interpreted with caution. Results are:

a. ID# 10053884	East drain tile of NW field	322 ug/l
b. ID# 10053885	North culvert north of the lake	1050 ug/l
c. ID# 10053885	North drain tile north of the lake	3560 ug/l
d. ID# 10053887	North marsh creek flowing into lake	1650 ug/l

Lake level:

Measuring water levels using a staff gauge could help determine the water level that initiates wetland flooding. The aim was to have a staff gauge installed and removed each year by a certified surveyor. Materials for the staff gauge were purchased and all surveyors within 45 minutes of Bullhead Lake recommended by Manitowoc county were contacted about performing the installation and removal. None had any interest in performing this work. It seems that no surveyors in the area have any background with these gauges and did not want to spend the time to learn the installation and removal process (or get into the water).

Algae Phosphorus Content

Though not supported by the grant, we sent two samples of algae to the UW Soil and Forage Analysis Lab (Marshfield, WI) for phosphorus content. The samples came from algae removed from the lake by mechanical harvesting.

July sample	2.8 lbs/ton
August sample	1 lb/ton

<u>Future steps</u>

1. Bullhead lake district will continue to obtain ice-out and late fall phosphorus and dissolved oxygen levels in addition to standard CLMN monitoring.
2. If clean watershed samples can be collected, additional testing may be performed. Without lake level changes, this data would be more informative about source than lake impacts.
3. Bullhead Lake District has purchased a pocket colorimeter for phosphate sampling. We will test the colorimeter against lab results to determine accuracy and use the colorimeter to at least monitor trends in lake phosphorus levels going forward.