Bald Eagle Area Association Board Meeting

9/11/2023

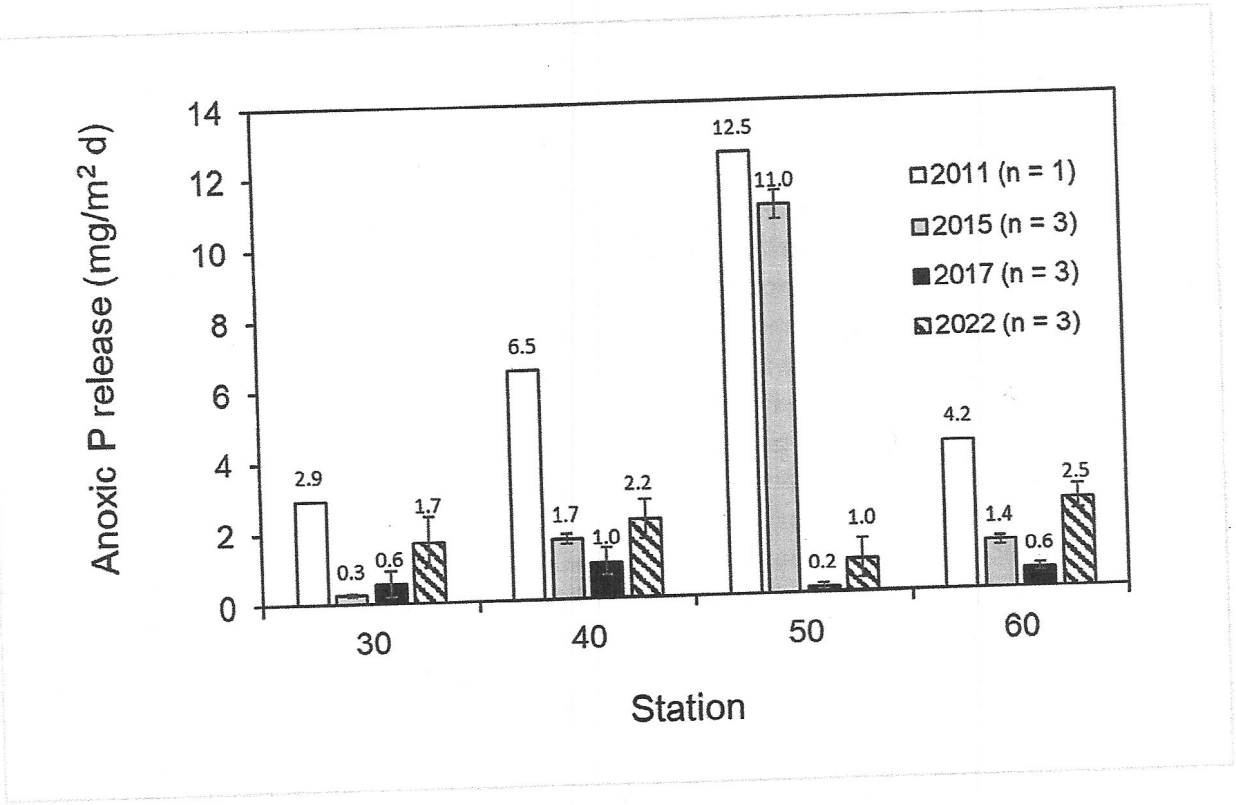
Rice Creek Watershed District - Notes and Data

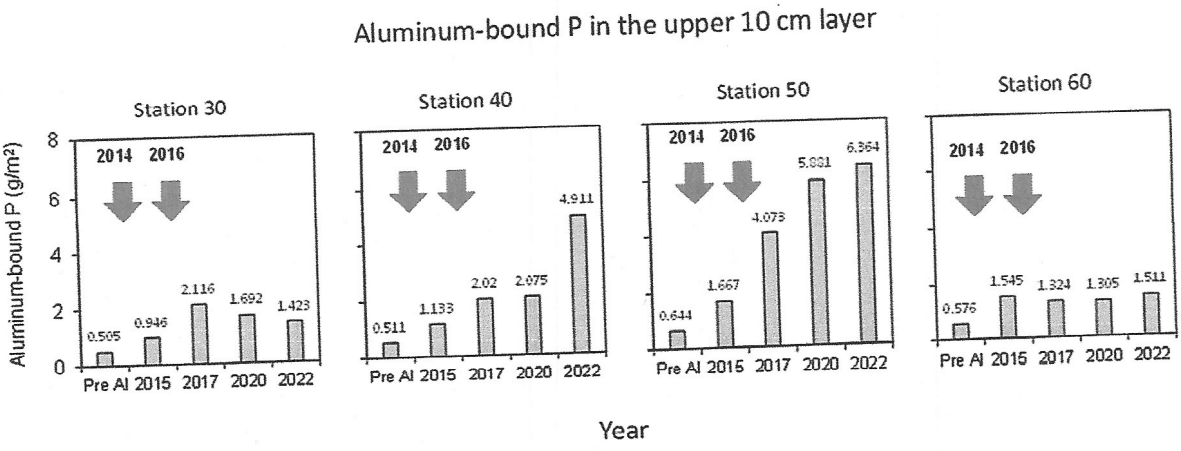
Take-home points:

- Water quality conditions remain good on Bald Eagle Lake, despite a "slip" in 2022. Phosphorus and algae remain lower than pre-alum levels, and Bald Eagle is set to be "delisted" (removed from the State's *Impaired Waters* list.
- The RCWD has completed several major "watershed" projects in recent years, with more to come:
    - Oneka Ridge Golf Course water reuse
    - Bald Eagle Iron Enhanced Sand Filter
    - Many neighborhood raingardens and filtration basins
    - [Upcoming] Judicial Ditch 1 Pond Retrofit (near Meehan Dr and Hwy 61)
- The Bald Eagle Water Management District (special tax district) remains in-place, but not actively collecting revenue. With some lead-time, revenue *could* be collected again, but only for **P**rojects explicitly identified in the Water Management District.
- On alum and internal loading: sediment monitoring data show that the alum treatment continues to be effective at reducing internal phosphorus loading. BUT, additional treatments in shallow areas could provide some additional benefit. The question? Does the benefit justify the cost. Unclear, and work continues. Notes on that topic below.

Results of the recent RCWD Alum 'Booster' Analysis (the technical stuff)

1. 6 years following the initial alum application (second treatment) are depressed at all sites collected in the application area. However, some recovery of release is occurring. The greatest recover is occurring in the shallowest application areas (stations 30 and 40) or shallow areas with the lighter dose (station 60).
2. These are also the stations where Al-P peaked and leveled off or decreased suggesting no additional biding of P and/or some sediment focusing occurred moving the Al-P to deeper areas of the lake.

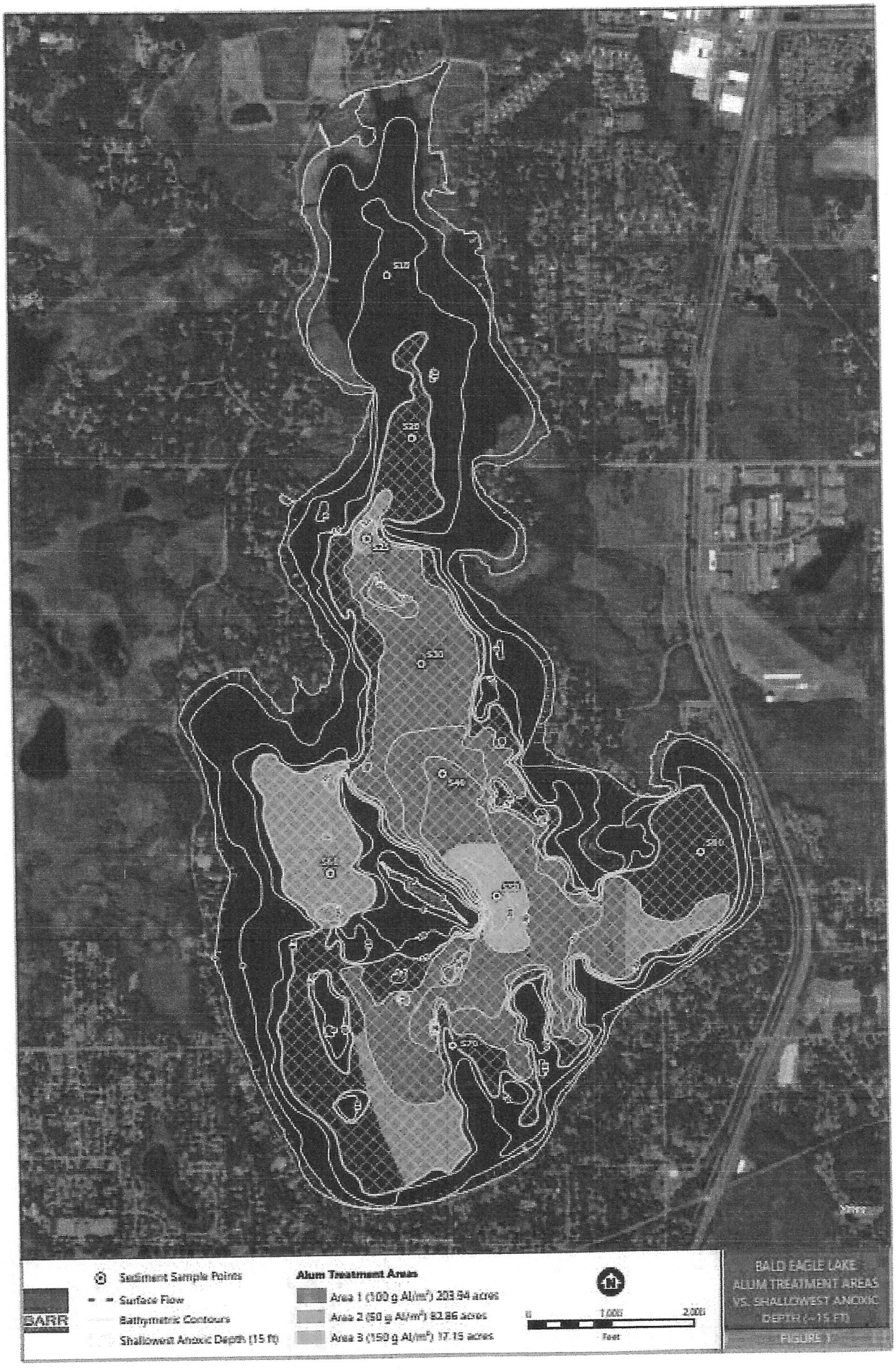




3. So the question is, are these shallower areas contributing to the degrading water quality in Bald Eagle Lake and if yes, to what extent?
4. Because we have many sample locations at various depths, we can estimate the overall P load coming from each contour range (0 to 5, 5 to 10, etc.) to assess the potential impact from these areas.
5. Using measured release rates from 2011, 2017, and 2022, we estimated the load coming from each contour range. 2011 represents the pre-alum baseline, 2017 immediately following the alum treatment, and 2022 current conditions.
    a. Prior to the alum treatment, the greatest proportion of the mass loading was coming from the 20 to 35 foot area of the lake because it's a much larger area than the deep spot which has a higher rate (81%; 593 kg P).
    b. P mass release was at its lowest immediately following the second half dose alum treatment recuing the contribution to 35 kg (12% of overall loading).
    c. In 2022, this depth zone recovered to 172 kg and 60% of the overall loading.
    d. It should be noted that the 15 to 20 foot contour area continued to contribute about 100 kg P in each of these years.
6. The conclusion is that the shallower areas where P binding has stopped or Al has moved, are now contributing more P back into the water column and could be contributing to water quality degradation (about 137 kg P).
7. So, then the question is whether this recovered load can explain all or the majority of water quality degradation.
8. Using the TMDL lake response model as a baseline, we modeled the three time periods to estimate the influence of the recovered loading to Bald Eagle Lake. The recovery is estimated to add about 3 ug/L TP to summer average concentrations. This suggests a relatively small influence but since watershed loading can be very difficult and expensive to achieve, is it worth addressing this load.

Release Rate Measurements	Average Internal TP Load (2020/2021) (kg)	Watershed TP Load (from TMDL) (kg)	Model Predicted In-Lake TP Conc. (ug/L)	Model Predicted In-Lake Chlorophyll-a Conc. (ug/L)
2011	619	1,029	64	28
2017	82		51	24
2022	224		54	25

9. We used sediment chemistry from 2022 to develop cost estimates for treating the 20 to 30 foot contour. Doses were similar to 2011 since redox P did not change. The lack of change in redox P is difficult to interpret and may be a result of analytical techniques rather than true iron bound P concentrations. Regardless, this approach suggests an additional alum treatment in those areas could be as much as $800,000.
10. Other strategies could be employed as the watershed load is addressed. Multiple light doses in these areas every 2 to 4 years could maintain a fresh alum layer on the shallow areas and keep sediment P release low. Because floc formation is best above 25 g Al/m2, these applications may cost as much as $200,000.


Sediment Sample Points
Surface Flow
Bathymetric Contours
Shallowest Anoxic Depth (15 ft)
Alum Treatment Areas
Area 1 (100 g Al/m²) 203.54 acres
Area 2 (50 g Al/m²) 82.86 acres
Area 3 (150 g Al/m²) 17.15 acres
0
1,000
2,000
Feet
SARR
BALD EAGLE LAKE
ALUM TREATMENT AREAS
VS. SHALLOWEST ANOXIC
DEPTH (~15 FT)
FIGURE 1

5.3.1 Bald Eagle Lake Water Management District

In 2010, the RCWD established the Bald Eagle Lake Water Management District (BEL-WMD). Bald Eagle Lake is a 1,012-acre lake in portions of Ramsey, Washington, and Anoka Counties. Bald Eagle Lake was the subject of a 2003 Lake Management Plan (LMP) sponsored by the Bald Eagle Area Association (BEAA) in partnership with other organizations. The Bald Eagle Lake LMP identifies water quality issues that impact the lake including stormwater management, watershed, and in-lake factors as well as potential projects necessary to remedy the issues. A subsequent Total Maximum Daily Load Study on Bald Eagle Lake (2012) further refined nutrient loading sources and identified specific nutrient reduction projects.

The Bald Eagle Lake LMP and TMDL identify a variety of projects required to manage and improve water quality within the lake. Ongoing expenditures are necessary to address in-lake, watershed, and shoreline sources of phosphorus and sediment including, but not limited to:

- Curlyleaf pondweed (*Potamogeton crispus*) control;
- Common carp (*Cyprinus carpio*) control;
- Native habitat protection;
- Shoreland restoration and stabilization;
- Surveys and inventories, including but not limited to, aquatic plant monitoring and fish populations;
- Aluminum sulfate or other tools for managing sediment-phosphorus release; and
- Stormwater management and treatment.

Projects will be selected and implemented annually through a separate work plan and budget that will be incorporated into the District's annual work plan and budget process, including a public notice and hearing. The BEAA will be included in the development of these annual work plan and budgets.

Area Included: The area included in the BEL WMD is limited to riparian properties and those properties that have deeded access to Bald Eagle Lake, as shown in **Figure 5-1**.