

Comments on PLM's Bear Lake Management Plan

Alan Steinman, Ph.D.

1. I generally concur with PLM's assessment of Bear Lake's condition based on AWRI's data from 2022-2025. I must admit it's a bit strange reviewing their review of our data, but I will do my best to remain objective.

2. Their use of annual averages does mask some important trends worth noting:

a. the spring data show relatively little change over time; the modest decreases seen over time are mostly due to changes in summer;

b. the phosphorus concentrations in spring (20 to 40 ppb) are still high enough to stimulate algal blooms; the most likely reason for the summer blooms is temperature, not the additional phosphorus coming from internal loading. The internal loading certainly exacerbates the blooms but is likely **not** the causative factor.

c. Hypoxic conditions and wind-driven sediment resuspension are mentioned as reasons for internal P loading, which certainly are reasonable factors. If wake boards are common on Bear Lake, they also may be influencing sediment resuspension. As I am sure PLM is aware and may already have shared with you, the proposed Michigan Senate Bill 812 (SB 812) would limit wake-enhancing activities to waters at least 20 feet deep, which would exclude all of Bear Lake. Boating disturbances also may redistribute any application of a chemical inactivant, affecting their capacity to bind P in the sediment and prevent upward diffusion of phosphorus P.

3. It would have been useful to have seen data on the Phoslock/Eutrosorb applications in Fenners Ditch. Did the chemicals reduce phosphorus leaving the ditch and if so, by how much? Our 2024 report showed that internal P loading from sediments in the Ditch can be significant so chemical applications seem a reasonable solution. The question is whether the inactivant had an effect on P release.

4. Performance Indicators: these are all reasonable indicators

5. Management Strategies:

a. Priority 1: assuming a whole-lake chemical treatment is something the lake board wants and is willing to pay for, this sediment assessment makes sense. However,

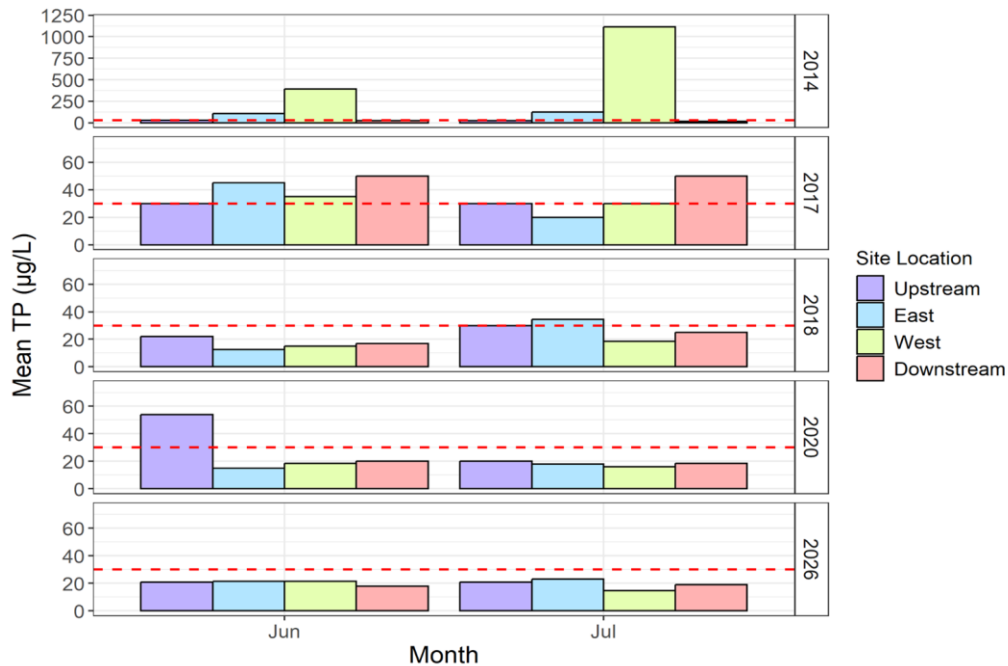
don't put the cart before the horse; if they are not willing to assume the cost, then this priority falls into the "nice to have but not critical" category.

b. Priority 2: continuing the water quality monitoring is a recommendation in our annual reports; we also recommended installation of a water quality sonde for continuous water quality monitoring to complement the monthly sampling we currently do.

c. Priority 3: I would like to see PLM's data on the chemical inactivation studies before commenting on additional work in Fenner's Ditch.

d. Priority 4: AWRI's storm flow data from 3 tributaries showed slightly worse water quality but not remarkably so compared to base flow data (2023 report). In contrast, in 2025 we measured the storm drain outflows after rain events; both nutrients and *E. coli* concentrations were extremely elevated compared to the lake mean. This suggests while nutrient and *E. coli* loads were high in the outfalls, their impact on the lake itself was small. Continued monitoring is warranted and as noted in both the AWRI and PLM reports, control measures should be considered where feasible.

e. Priority 5: the watershed protection actions make sense. It is worth noting that my summer intern, Lauren Elias, studied the water quality in the Willbrandt wetlands as her summer project. Her results were very encouraging and will be included as part of our annual report to the Bear Lake-Lake Board. I have included her total phosphorus data from the water column below. Note that the TP concentrations at all sites in 2026 were below the 30 ppb threshold and this is without the emergent vegetation returning due to high water levels. We anticipate after these ponds return to flow-through wetland status with a healthy mix of vegetation, their nutrient retention capacity will increase further, resulting in additional downstream water quality benefits.



f. Priority 6: the aquatic vegetation plan makes sense to me.

g. Priority 7: the waterfowl management plan makes sense to me.

h. Priority 8: these recommendations are all fine but I still recommend that a citizen survey be conducted to get a better understanding of what the community values regarding Bear Lake. This may help inform what the lake should be managed for and if there are differences among the citizens based on location, demographics, or interests. This has been proposed before by AWRI.

6. Monitoring Program. These elements all make sense to me. There may be additional “special add-ons” depending on changing conditions in the future, and consideration should be given, pending financial capacity, to installing a multi-probe sonde and conducting a watershed survey.