Background

- Marion Reservoir suffers from annual Harmful Algal Blooms (HABs).
- HABs are fueled by excess nutrients (Nitrogen & Phosphorus) that enter lakes from runoff.
- Therefore, reducing nutrients helps reduce HABs.

Objective

Here, we tested whether biochar can bind nutrients in aquatic systems.

Fig. 1: Stand /Mixers

Fig. 2: biochar sock under construction

Fig. 3: Completed sock

Methods

- We used twelve 1L stand mixers with Marion water (Fig 1).
- Aliquots of biochar weighed, placed on a cloth (fig 2) and tightly bound with zip ties (fig 3).
- 4 treatments with 3 replicates each: Control | 10mg | 15mg | 20mg
- Bags placed into respective 1L jars and stirred for 24 hours
- Sampled for Total Nitrogen (TN), Total Phosphorus (TP), Orthophosphorus (Ortho P) at 0, 1, and
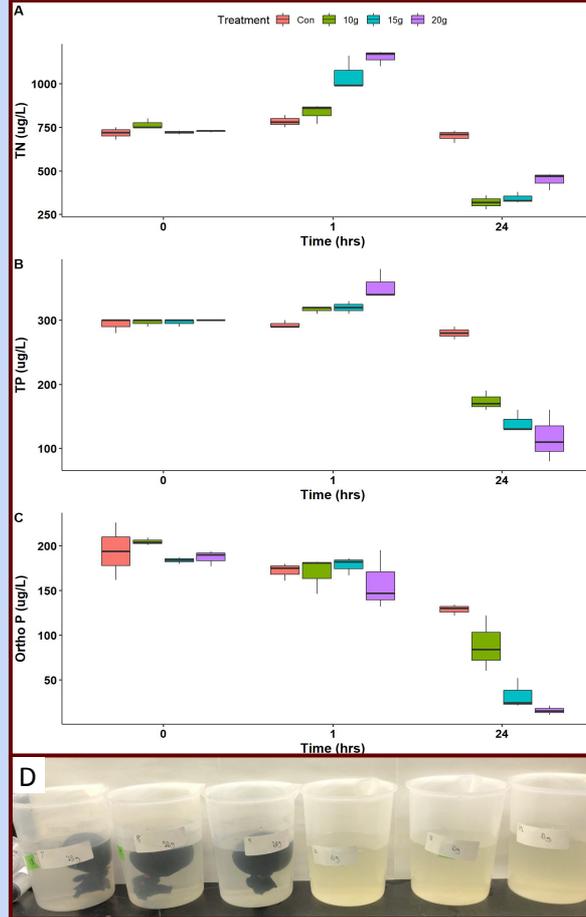- Samples analyzed at KSU's soil testing lab.

Fig. 4: TN, TP, and Ortho P at 0, 1, and 24 hours for each treatment. Jars treated with biochar visually improved water clarity, 20 g shown for reference (D).

Results

- Biochar treatment led to an initial increase in TN and TP (Fig. 3A and B), likely due to elements present within the biochar itself.
- By 24 hours, however, TN and TP were significantly ($p < 0.05$) lower in all biochar treatments compared to the control.
- Dissolved OP was also significantly lower than the control in 15g and 20g treatments, but not the 10g treatment (Fig. 3C)

Conclusions and Future

Although biochar initially leaches particular N and P, by 24 hours the biochar treatments were successful at removing significant amounts of TN and TP from Marion source water.

Dissolved P fractions were more difficult to remove with biochar, indicating that relatively more biochar is needed to remove dissolved P compared to particle bound P.

Biochar seems capable of reducing nutrients in aquatic systems; however, retrieving and storing nutrient-laden biochar will require future logistical planning.

Future research could examine how modified biochars compare to non-modified biochars.

References and more information: