Update: Soluble Reactive Phosphorous Reduction Project at Wetland 639

WENCK

Brian Kallio
November 14, 2019

Wetland 639 Filter Box Project

Shingle Creek Watershed Commission

November 14, 2019

- Project Background and Purpose
- Filter Box Construction
- Sampling and Monitoring
- Data Summary
- What’s Next?

Why are we doing this project?

- Upper Twin Lake TMDL for high phosphorous
- Wetland 639 has been identified as a source of Phosphorous to Upper Twin Lake
- Reducing the Phosphorous from Wetland 639 will reduce the load to Upper Twin Lake
- Our goal is to identify alternatives to remove phosphorous from wetlands like Wetland 639

EAST METRO

State finds 56% of Minnesota's lakes and streams are 'impaired'

A popular stretch of the St. Croix River was found to be contaminated with phosphorus.

By Jennifer Bjorhus Star Tribune | NOVEMBER 13, 2019 — 6:51AM

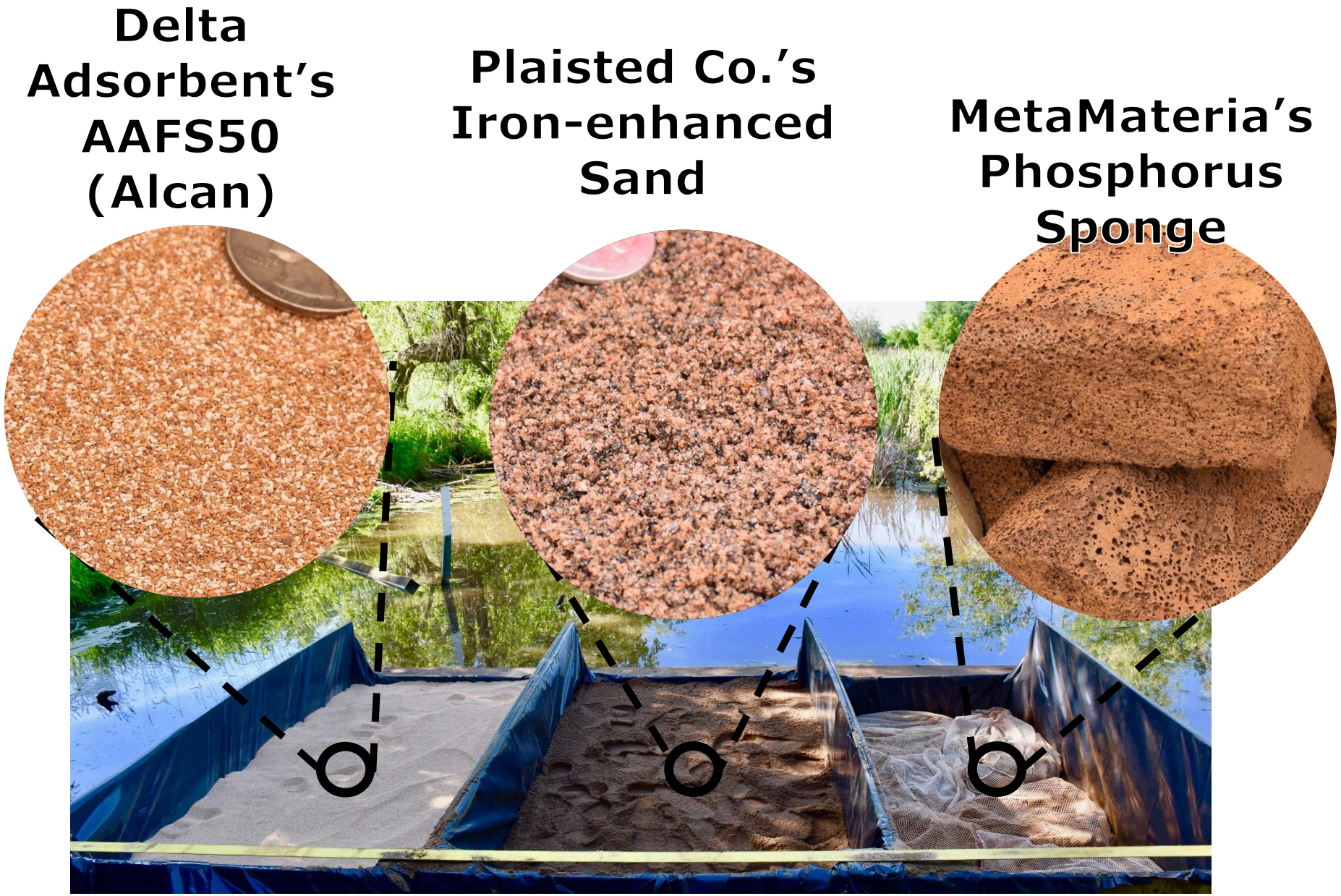
DAVID JOLES – STAR TRIBUNE

A boat cruising the St. Croix River is seen from the St. Croix River bridge in Stillwater in 2018

Certain wetlands have high dissolved Phosphorous

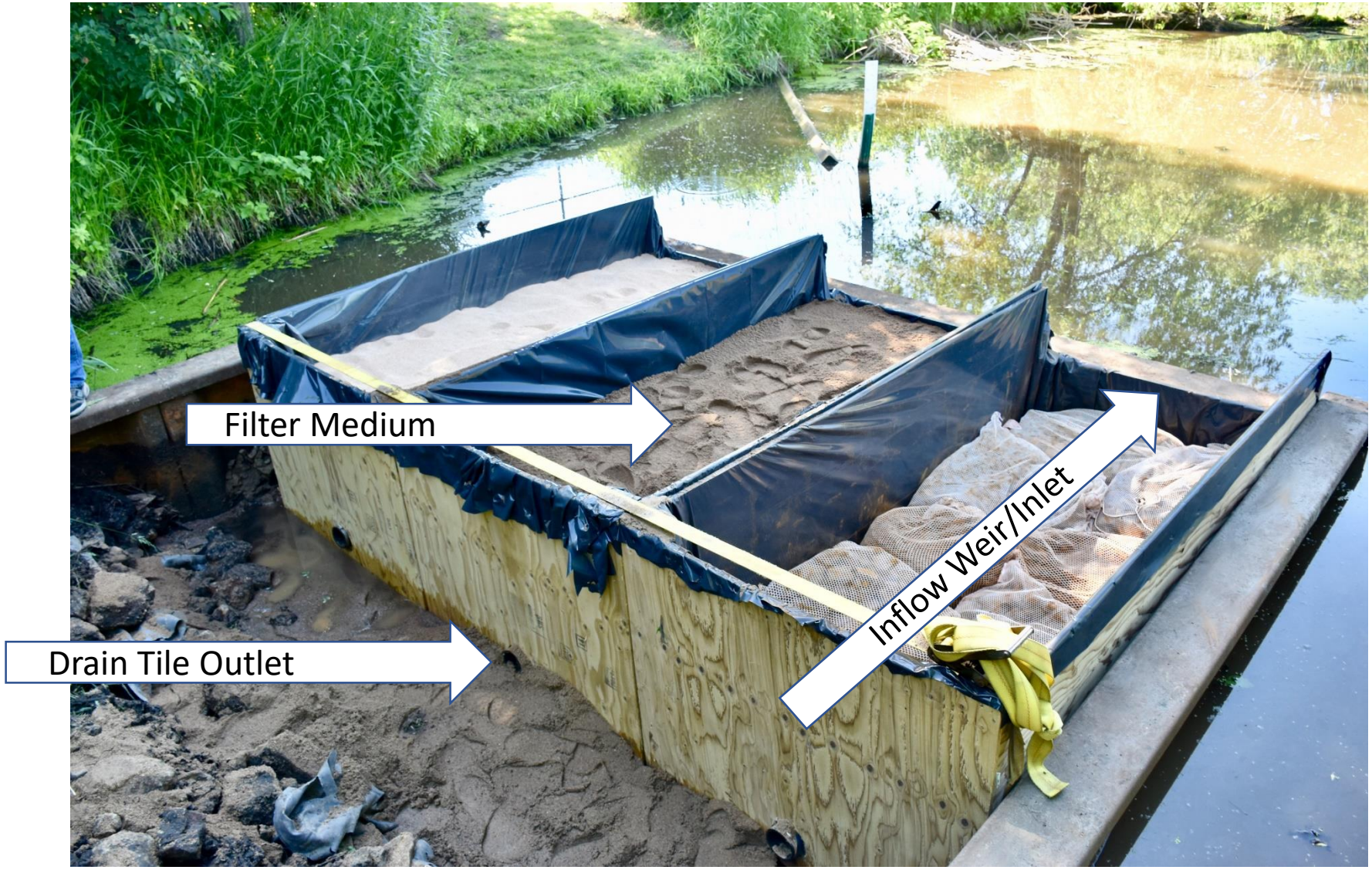
- Wetland sediments can release dissolved Phosphorous– especially if the water has low oxygen

- Monitoring shows that Wetland 639 discharges high dissolved Phosphorous to Upper Twin Lake


Delta Adsorbent's AAFS50 (Alcan)
Plaisted Co.'s Iron-enhanced Sand
MetaMateria's Phosphorus Sponge

Filter Box Construction

June 26-28, 2019



Finished Construction

Monitoring and Measurements

Above Average 2019 Rainfall

The Results may look different in more “normal” year

Rainy summer led to much higher water levels and flows than a typical year

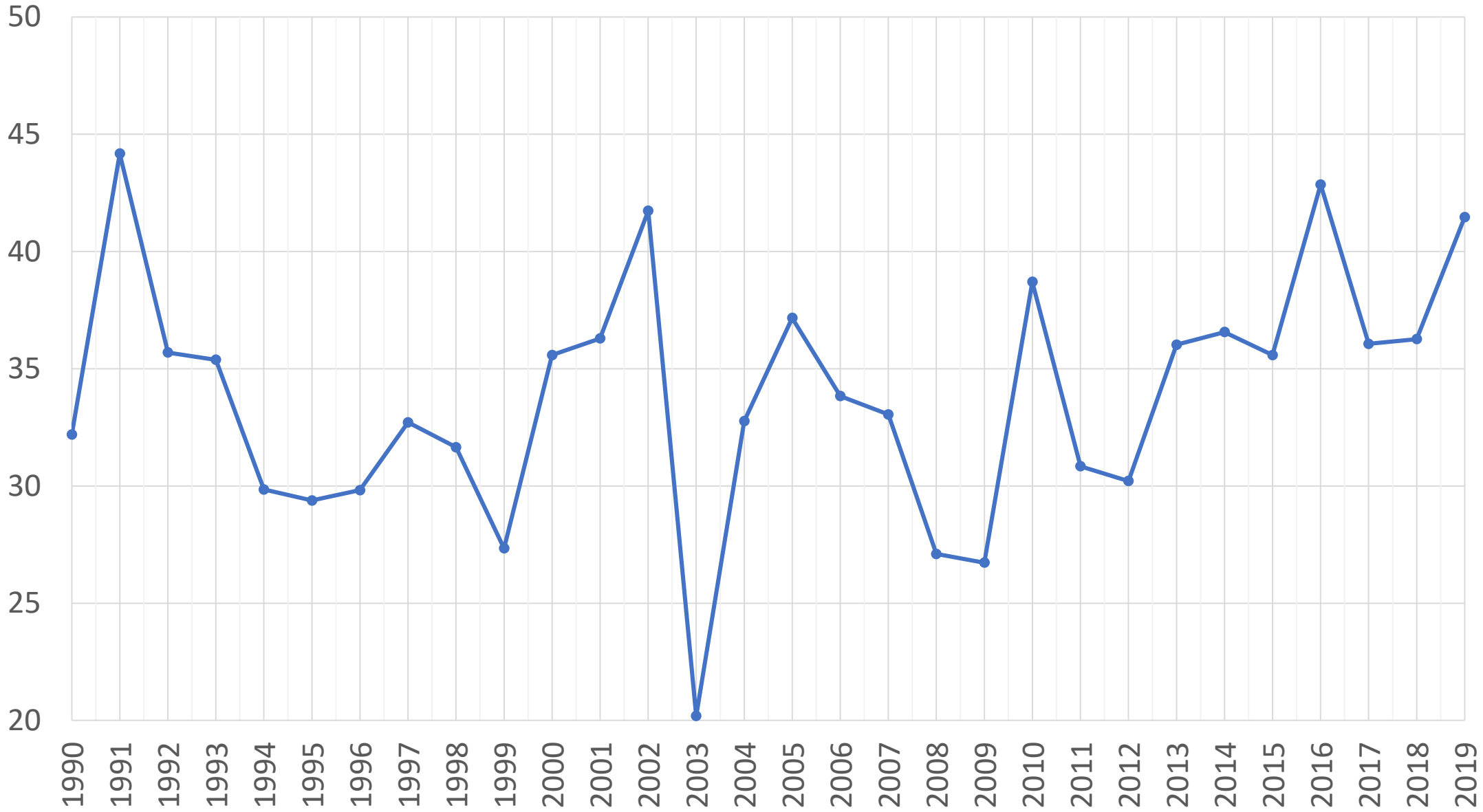
Only a small fraction of the total discharge was treated because wetland discharges frequently bypassed the filters.

Even though the outlets are submerged and flows bypassed the filters, water continued to pass through the filters

The filters were completely saturated for the majority of the monitoring period.

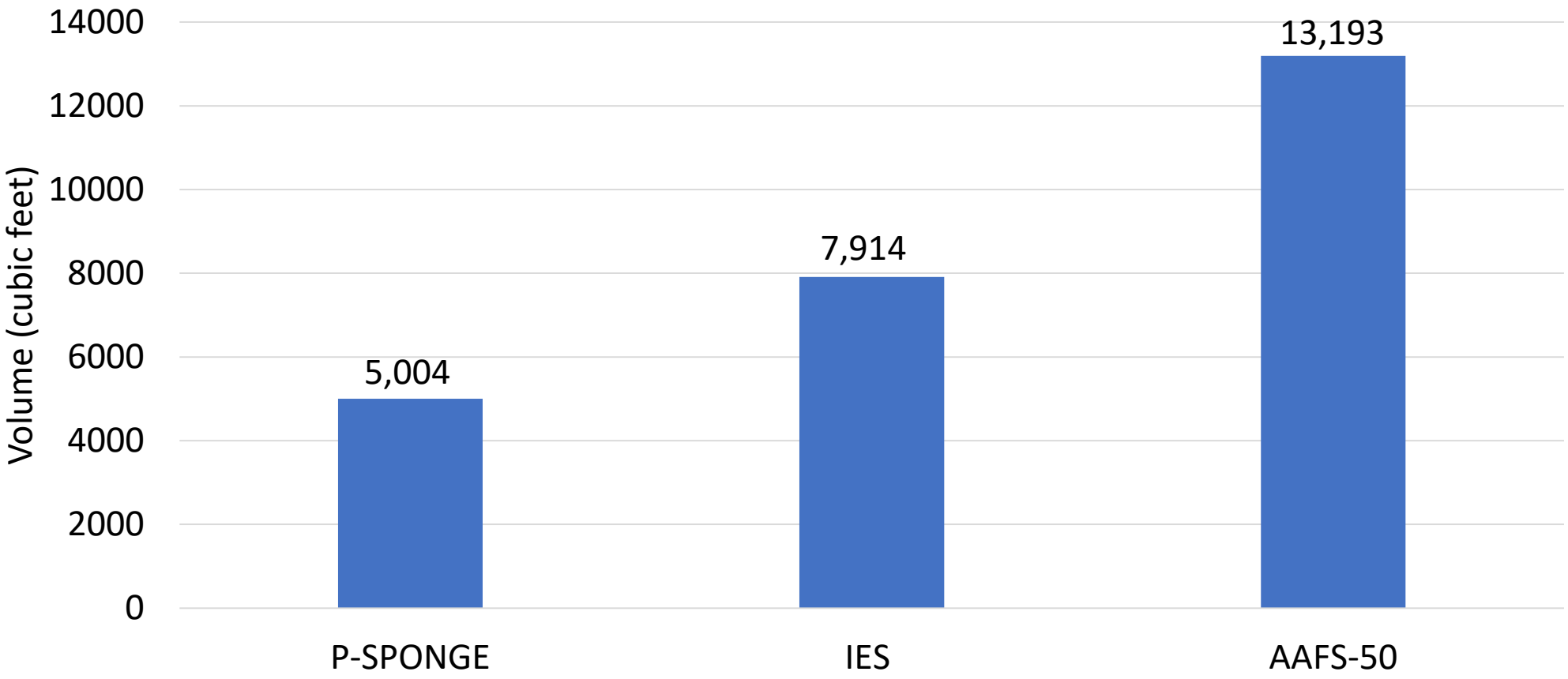
Flow rate did not seem to vary significantly with changes in water levels.

Yearly Rainfall Totals – New Hope, MN



Filtered Volume

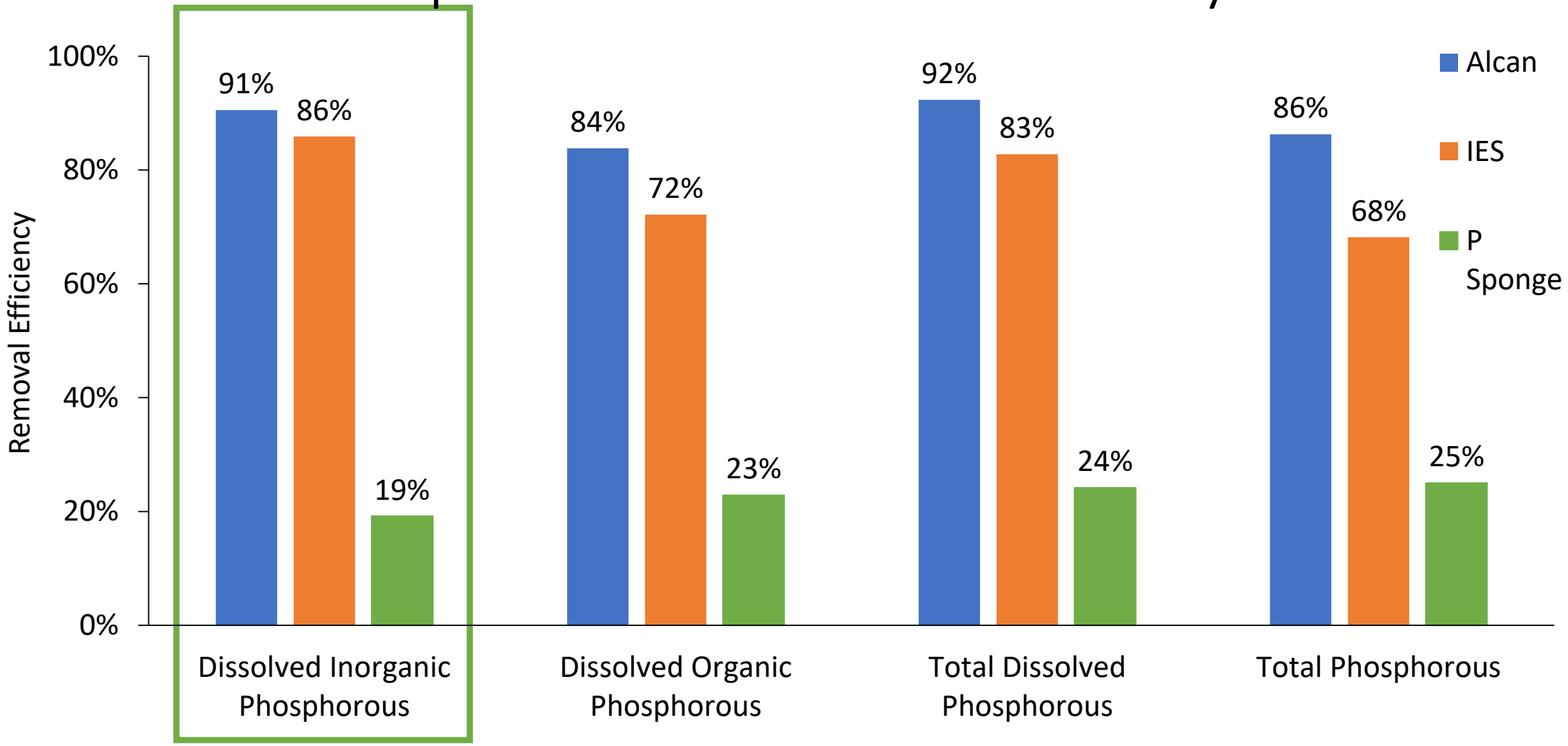
7/12/19-10/11/19



Monitoring

- Collected 16 sets of water samples throughout the summer. Samples were collected from the upstream pool, from the outlets to each of the 3 filter boxes, and from the downstream channel
- Samples were field screened for dissolved oxygen, pH, temperature, specific conductivity and ORP
- Laboratory samples were analyzed for Total Phosphorous, Total Dissolved Phosphorous, and Soluble Reactive Phosphorous (dissolved inorganic phosphorous).
- Selected samples were analyzed for Total Iron

Phosphorous Removal Efficiency

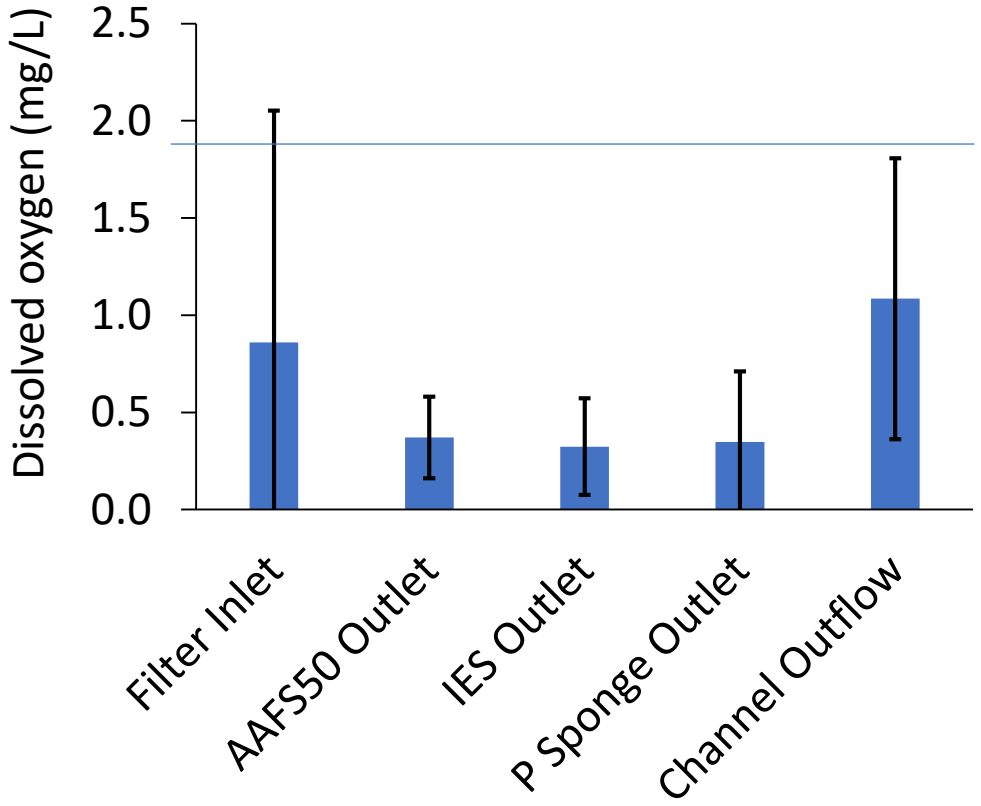


Removal Efficiency = $(P_{in}-P_{out})/P_{in}x100$

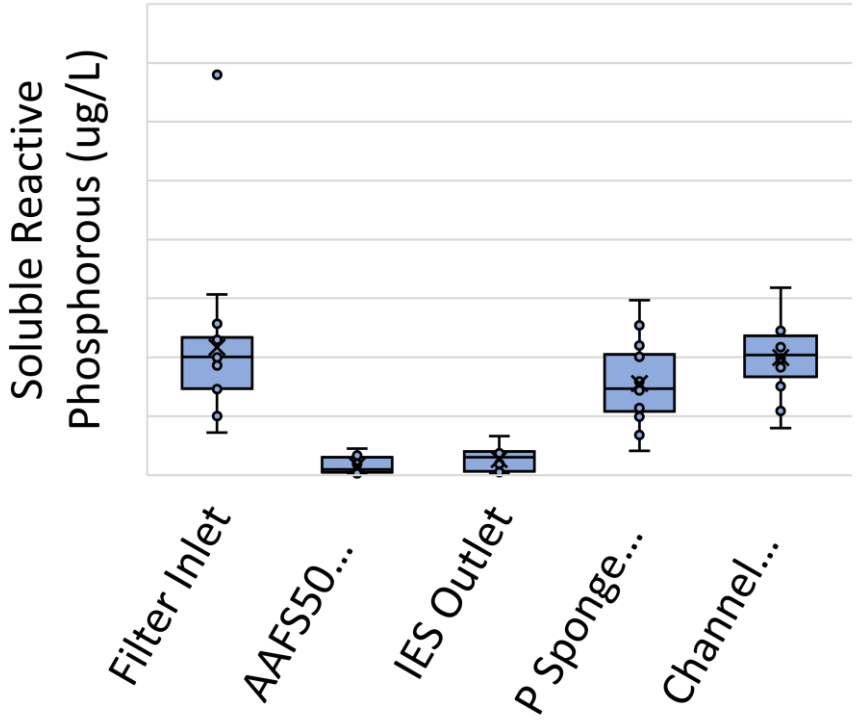
Based on average of 16 samples collected

Total Phosphorous Is Reduced, Even in Low Oxygen Environment

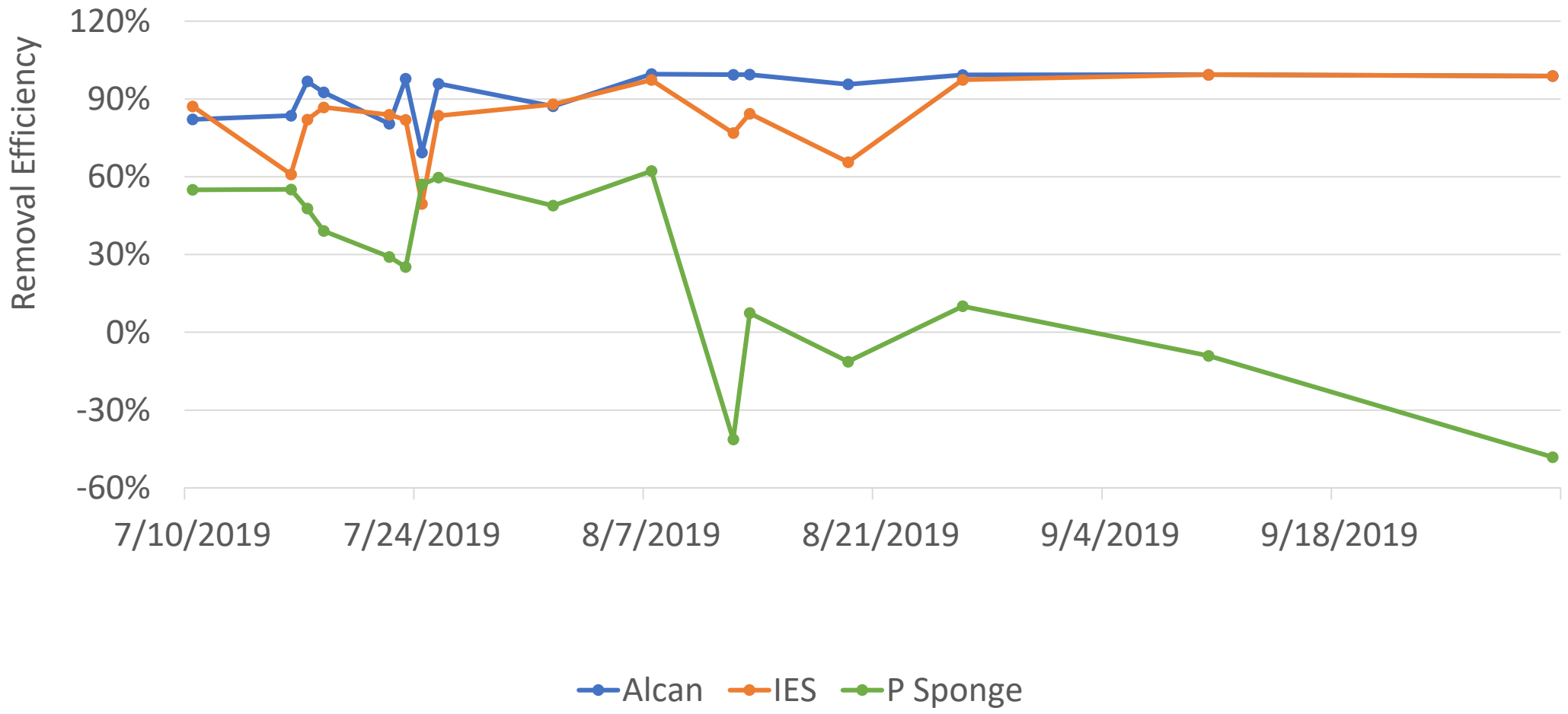
Dissolved Oxygen <2.0 mg/L can be considered anoxic



Soluble Reactive Phosphorous



Total Dissolved Phosphorous Removal Efficiency Over Time



Project Funding

- Section 319 Grant $72,170
- Commission.....$52,510
- Total Budget.....$124,680

What Next?

- Continue to monitor the same parameters in 2020
- Clean sediment and debris collected on the filters to prepare for 2020 operation
- Collect samples of the filter media on July 11, 2020, to test for 1-year phosphorous saturation and estimated remaining life
- Explore larger scale opportunities to apply the technology
- Consider plans for implementation for Cherokee Wetland

Summary

- The filters successfully removed dissolved phosphorous, with reductions of up to 92% and 83% by the Alcan and IES media in 2019.
- The technology worked but would need to be applied on a much larger scale to reach the 100 pounds per year goal.
- 2019 was a unique year based on rainfall totals. There have been years when the wetland rarely discharges and the wetland nearly continuously discharged this year.
- Data may look different in a year with closer to “normal” rainfall.

Questions?