

## Minnesota Stormwater Research Council – Project Update, August 2020

### Detecting phosphorus release from stormwater ponds to guide management and design

PI's John Gulliver and Jacques Finlay

**The primary goal of this project is to better understand and predict risk factors for stormwater ponds that can lead to degradation of pond function for phosphorus (P) retention.** Study efforts over the past year have included several field, laboratory, data analysis and synthesis tasks.

*Field and laboratory* tasks have included:

- **Continuous monitoring** in 15 ponds of water temperatures, depth, salinity, and wind speed above the water surface during summer and fall 2019;
- **Collection of water samples** (surface and hypolimnion) for phosphorus analysis and vertical profile measurements of dissolved oxygen, salinity, and temperature every 2-3 weeks in the 15 study ponds, as well at two times during the 2019 field season in a larger set of ponds ( $n = \sim 50$ ) chosen to include a broader range of pond characteristics (age, depth, size, sheltering, land use, etc.);
- **Measurement of P release from pond sediment cores** under simulated oxic and anoxic conditions in the laboratory for 5 ponds, and sediment chemistry analyzed in detail to characterize the P fractions and organic matter composition that directly influence the potential for P to release from the sediments.



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On-going *data analysis* and *synthesis* tasks have focused on developing predictive relationships for pond risk factors, and include:

- **Identification and quantification of risk factors**, including mixing events and stratification dynamics (from temperature data), fraction of pond sediments exposed to low-oxygen conditions, tree canopy/wind sheltering (using LiDAR data), duckweed cover (site visits and aerial photos), and sediment composition (phosphorus, organic matter);
- **Synthesis of pond data** from this and previous projects to predict TP concentrations as a function of potential risk factors (pond characteristics, dissolved oxygen, watershed factors);
- **Developing predictive equations for sediment P release** and pond P levels as a function of sediment P composition (a risk factor for ponds), with data from the five laboratory-studied ponds being combined with data previously collected to develop the regression equations.