Fe and Mn as drivers of phosphorus availability in Missisquoi Bay: temporal dynamics and stratification patterns in the water column

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Abstract

Soluble reactive phosphorus (SRP) has been linked to occurrence of cyanobacterial blooms in Missisquoi Bay[i]. In laboratory studies, secondary phases of iron and manganese (oxy)hydroxides are known to adsorb SRP; anoxic, reducing environments change the oxidation state and sorption capacity of these metals, releasing bound SRP[ii]. Previous studies have demonstrated the key role of oxidized metals at the sediment-water interface in controlling sediment phosphorus releases, depending on redox conditions[iii]. Seasonal-scale monitoring of redox conditions and SRP and metal concentrations revealed a pattern of sediment nutrient fluxes tied to sediment redox conditions, which coincide with the late-season occurrence of cyanobacterial blooms.

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[i] Smith, Val H. and David W. Schindler. 2009. Eutrophication science: where do we go from here? *Trends in Ecology and Evolution 24(4): 201-207.*

[ii] Mayer, Timothy D. 1995. *Interactions of Phosphorus and Colloidal Iron Oxides in Model Solutions and Natural Waters*. Ph.D. Dissertation, University of Montana, Bozeman.

[iii] Smith, Lydia, Mary C. Watzin, and Gregory Druschel. 2011. Relating sediment phosphorus mobility to seasonal and diel redox fluctuations at the sediment-water interface in a eutrophic freshwater lake. *Limnology and Oceanography 56*(6): 2251-2264.