

P Speciation in Sediments of the Minnesota River Basin

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Abstract. Sediments are a dominant P reservoir in a variety of aquatic ecosystems and play a critical role in governing dissolved P concentrations. We assess how P properties of the sediments change as they move downstream from the Greater Blue Earth River Basin to the Minnesota/Mississippi confluence. In this study, we analyzed bed load and suspended sediments for equilibrium phosphorus concentration (EPC0), their potential to desorb soluble P, and P sequential extraction fractions. Results showed that sediment samples have higher total P concentration than the P concentration in soils from the surrounding area, thus indicating some P adsorption from river waters. After correcting for particle enrichment, some sediment samples showed higher concentrations of inorganic P downstream than upstream of the WWTPs. Sequential fractionation showed a predominance of calcium-bound P in bed load sediments. Finally, a comparison of the EPC0 values showed that the majority of sediments are acting as a source of P, particularly during low flow periods. We synthesize these results in the context of historical sediment P in Lake Pepin and how sediments from various sources in the Minnesota River Basin may have contributed to this P.