

# **TEMPORAL, METEOROLOGICAL, AND CHEMICAL INFLUENCES ON PHOSPHORUS RELEASE FROM A NORTHERN TEMPERATE WETLAND**

## **Abstract**

Preliminary studies suggested that Rice Lake Wetland, Detroit Lakes, MN contributes significant amounts of phosphorus via a manmade ditch to a large recreational lake that is threatened by declining water quality. The objectives of this study were to describe the local hydrology, establish a generalized mass balance of phosphorus for the wetland, and define major factors that control phosphorus loading to the ditch system. Nested wells and piezometers were used to define local hydrology. In situ area velocity meters, automated water samplers, and multi parameter Sondes were used to measure stream dynamics at the inlet and outlet of the wetland. The movement of groundwater around the wetland is slow and tends towards stagnancy during high water due to gentle hydrologic gradients. Total and ortho phosphorus at the outlet of the wetland exceeded that of the inlet for 2004, (TP<sub>inlet</sub> 219 kg < TP<sub>outlet</sub> 441 kg and OP<sub>i</sub> 80 kg < OP<sub>o</sub> 211 kg) and 2005 (TP<sub>i</sub> 69 kg < TP<sub>o</sub> 1496 kg and OP<sub>i</sub> 36 kg < OP<sub>o</sub> 571 kg) for the months of July – September. Field observations, comparison of chemical characteristics, and quantities of flow from the inlet to the outlet suggested that there were large groundwater contributions from the wetland to the ditch. Fluctuations in hydrology had an impact on phosphorus loading to the ditch system. Rice Lake Wetland acts as a source of phosphorus to the ditch system and has the potential to release large pulses of phosphorus. Quantifying the amount of phosphorus contributed to the lake by the wetland and ditch systems, and understanding when and why these contributions occur will aid federal, state, and local agencies in determining an effective remediation strategy.