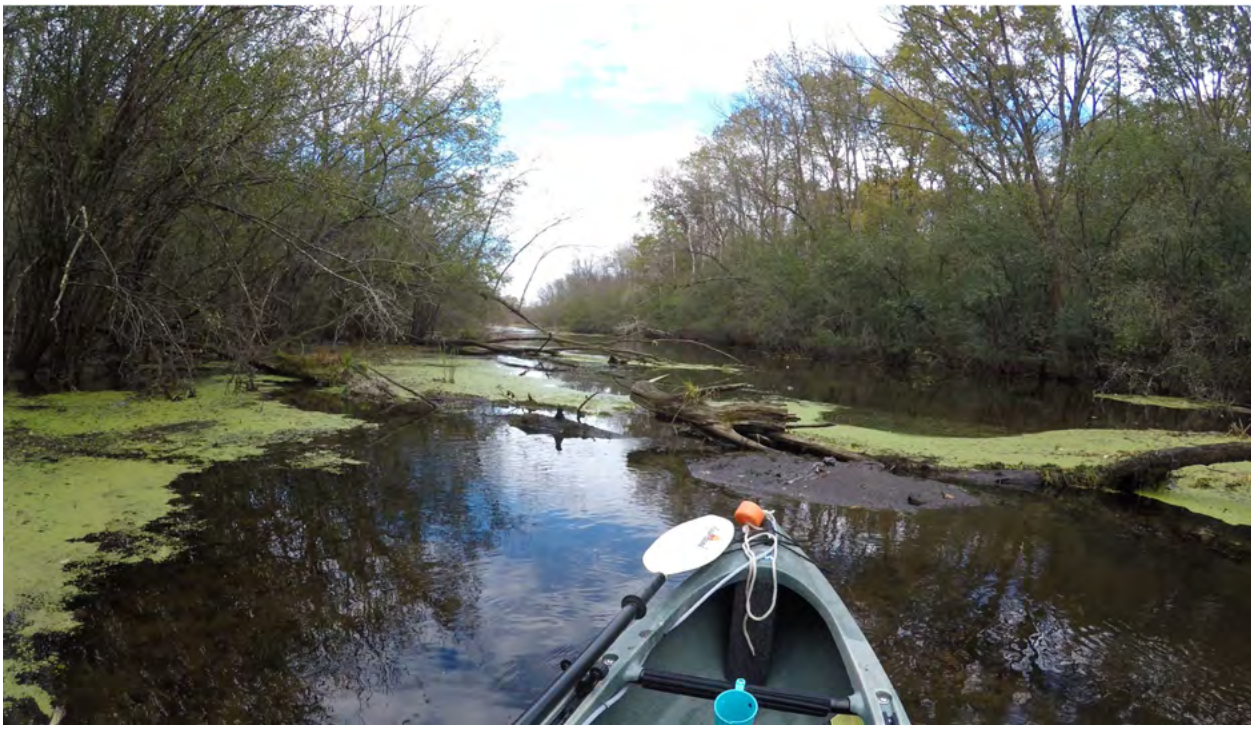
UPPER OCONOMOWOC RIVER NUTRIENT AND SEDIMENT STUDY

EXECUTIVE SUMMARY



The North Lake Management District (District) is concerned that phosphorus and sediment carried from the Upper Oconomowoc River watershed contributes to water quality issues that express themselves in both the Upper Oconomowoc River (the River) and North Lake (the Lake). This problem was accentuated when sediment detained in upstream millponds was remobilized due to historical dam failures, dam removal (Funk's dam in 1992), and dam replacement (Monches dam in 2013) incidences. The District entered into an agreement with the Southeastern Wisconsin Regional Planning Commission (Commission) to evaluate River phosphorus and sediment sources, transport, and accumulation as well as concepts that would help reduce phosphorus and sediment loading to North Lake. This agreement was made possible with financial support from the Wisconsin Department of Natural Resources (WDNR) River Planning Grant.

As part of this study, the Commission completed an on-the-River field survey from Monches dam to North Lake during fall 2018 to examine streambank erosion, water depths, sediment depths and distribution, and general river morphology. Highlights of Commission observations, analyses, modelling results, and opportunities to reduce pollutant loading to North Lake are summarized below:

- No failed or excessively eroding streambanks were observed in this 3.6 mile stretch of the River immediately upstream of the Lake. Therefore, streambank erosion from this reach is not a likely significant source of sediment transported into North Lake.

- Much less soft sediment (approximately 6,750 cubic yards) was present in the River's bed during 2018 versus 2013, demonstrating improved instream conditions. However, this indicates that, on average, about 1,350 cubic yards per year of soft sediment and associated nutrients have been transported into North Lake from this section of the River over this five year period. This likely contributed to degrading Lake water quality. This estimate does not account for known simultaneous ongoing loads contributing from upstream sources, so the average actual annual sediment loads into North Lake during this time period were higher than this estimate.

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- The North Lake inlet area—where the Upper Oconomowoc River discharges into the Lake—contained significantly more sediment in 2018 than during 2004. This has led to a loss in navigable water depths in the northern portion of the lake, after accounting for differences in Lake water surface elevations between these dates.

- Water quality monitoring data from the Upper Oconomowoc River reveal that the River's phosphorus concentrations often exceed State standards of 0.075 milligrams per liter and increased precipitation correlates with higher River phosphorus concentrations and loads. However, the proportion of exceedances of the State standard are substantially reduced from 57.6 percent above Friess Lake to 16.1 percent below Friess Lake to Monches millpond, and further reduced to 11.6 percent downstream of Monches millpond. These monitoring results support sediment and phosphorus load reductions estimated by modeling results and demonstrate how effective these upstream lakes are at capturing pollutants and protecting North Lake.

- North Lake has had long-term water quality problems that likely have been worsened by excessive loading of sediments and nutrients from past dam related events. Most notably, the partial removal of Funk's dam in 1992 combined with high rainfall events in 1993 was associated with a dramatic decrease in water quality conditions in North Lake. However, it was not possible to establish a direct water quality response to any other specific dam failure, removal, or dam replacement event with available data. Nevertheless, Commission staff have determined positively correlated relationships between increased precipitation and associated river discharge with increased total phosphorus trophic state index (TSI) values for North Lake, Friess Lake, and Little Friess Lake. This relationship demonstrates that higher precipitation events are negatively affecting summer water quality conditions in these waterbodies. This relationship combined with known increases in total precipitation and frequency of larger rainfall events (equal to or greater than one inch) throughout Southeastern Wisconsin, indicates that changing precipitation patterns is an important driver of water quality conditions in these Lakes.

- Using models, Commission staff estimate that slightly more than 8,500 cubic yards of sediment and almost 14,000 pounds of phosphorus are likely contributed to waterbodies tributary to North Lake each year under current land use conditions. However, the River flows through several lakes and reservoirs. These quiescent water bodies likely trap almost half (about 44 percent) of the sediment and phosphorus load transported to the Lake. Therefore, only about 4,800 cubic yards of sediment and 8,235 pounds of phosphorus are likely entering the Lake each year, with the balance retained by upstream lakes and reservoirs. These lakes and reservoirs provide a valuable protective service to North Lake.

- Using models, it was estimated that nearly two-thirds of the sediment entering North Lake enters through the mouth of the Upper Oconomowoc River in the Lake's northeastern corner. The greatest percent contributions of the total sediment and phosphorus loads contributing to North Lake are estimated to come from among five subbasins (listed in decreasing order): Mason Creek (25.3 percent), Funk's Dam (21.5 percent), Little Oconomowoc River (13.1 percent), Flynn Creek (12.3 percent), and Monches Millpond (10.4 percent). The Mason Creek's impairments and detailed recommendations to reduce pollutant loads and improve water quality are well documented (see SEWRPC Community Assistance Planning Report No. 321: *Mason Creek Watershed Protection Plan*). Therefore, this report focuses on the remaining top four subbasins as key areas to effectively address the highest loading areas (or approximately 57 percent of the total load) contributing to North Lake.

- Numerous opportunities exist to trap or detain sediment in and along the River, an action that would prevent sediment and phosphorus from entering the Lake. These opportunities include dredging and/or sediment capture management measures particularly within the Monches millpond and former Funk's dam impoundment sites along the River. Dredging at the boat launch area at the River's mouth could also help detain sediment in a conveniently accessible area, would help avoid resuspension of sediment by boats, and could enhance overall navigation opportunities. Furthermore, restoring natural stream morphology, particularly in ditched reaches within Flynn Creek, Lake Keesus Tributary, and the Little Oconomowoc River could help recover water quality benefits provided by active and functioning floodplains.

- Many opportunities are available to work with landowners and other partners to address numerous high priority parcels identified in this report and/or Critical Source Areas identified by the Oconomowoc Watershed Protection Program (OWPP) within the watershed upstream of the Lake. Implementing management measures would reduce sediment and nutrient loads reaching the River and ultimately the Lake. In addition to conservation practices such as riparian buffers, harvestable buffers, and cover crops, the District should pursue and support projects that:

    - Are consistent with ongoing goals and objectives of the OWPP/Adaptive Management Plan

    - Promote educational practices that help reduce pollutant loading

    - Actively support producer-led initiatives that encourage conservation practices, especially on high priority parcels