

## 2005 Maple Lake Water Quality Monitoring

In 2005, the Maple Lake District and the Red Lake Watershed District continued their partnership in conducting water quality monitoring within and around Maple Lake. The monitoring effort continued to focus upon three sites within the lake itself as well as the inlets and outlet of the lake. An extra site was added this year on Judicial Ditch 73 to determine the quality of water within the ditch at the (conceptual diversion) point where it turns south prior to flowing into Rydell National Wildlife Refuge.

During heavy rainfall events, sediment and organic matter is flushed from the Rydell NWR wetlands and into Maple Lake. This results in a brown plume that extends from the JD73 inlet into the lake. If, hypothetically, water was somehow diverted around Rydell National Wildlife Refuge the flushing of sediment and nutrients from the Rydell NWR wetlands could be minimized. The USFWS and Maple Lake District suggested looking into this option. The new JD73 monitoring site would be the most logical starting point for this diversion. The USFWS would like to reduce flow from Tamarack Lake and prevent fish passage from Maple Lake to Tamarack Lake in an effort to boost waterfowl production within the refuge. Sediment and nutrient concentrations from the JD73 monitoring site and site #53-I (JD-73 inlet to Maple Lake) will be compared to see if the water in JD73 is clean enough to have a positive effect upon water quality within the lake if it is diverted around Rydell NWR.

There were times when water quality within JD 73 was slightly better than the water quality at the Maple Lake inlet and times when it was slightly worse. So the sampling results are inconclusive so far. Since notable sediment and nutrient loading from the



Maple Lake inlet occurs after a significant rain, sampling should be targeted to occur after storm events. Not enough storm event sampling was conducted in 2005. One heavy rain (around 2 inches) occurred on August 26, 2005. Samples were collected on August 31 and showed a significant increase in total suspended solids and turbidity from the JD73 monitoring site to the 53-I inlet site, but the JD73 site had a higher total phosphorus and orthophosphorus concentrations.

This year's lake monitoring found water quality that was better than usual in the early summer. This clean water made the lake more attractive to swimmers than it has been in recent years. However, toward the middle of the summer, trophic state index scores (TSI scores) and amounts of algae began to rise.

## Maple Lake Monitoring Sites

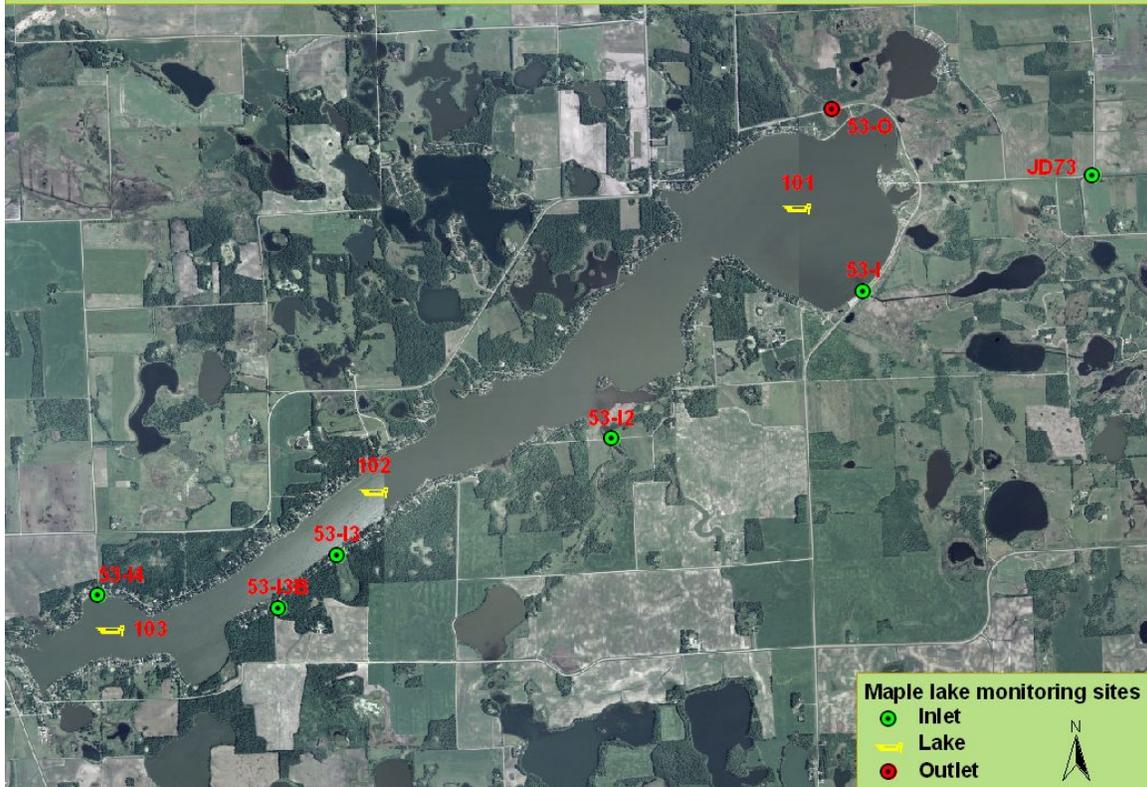
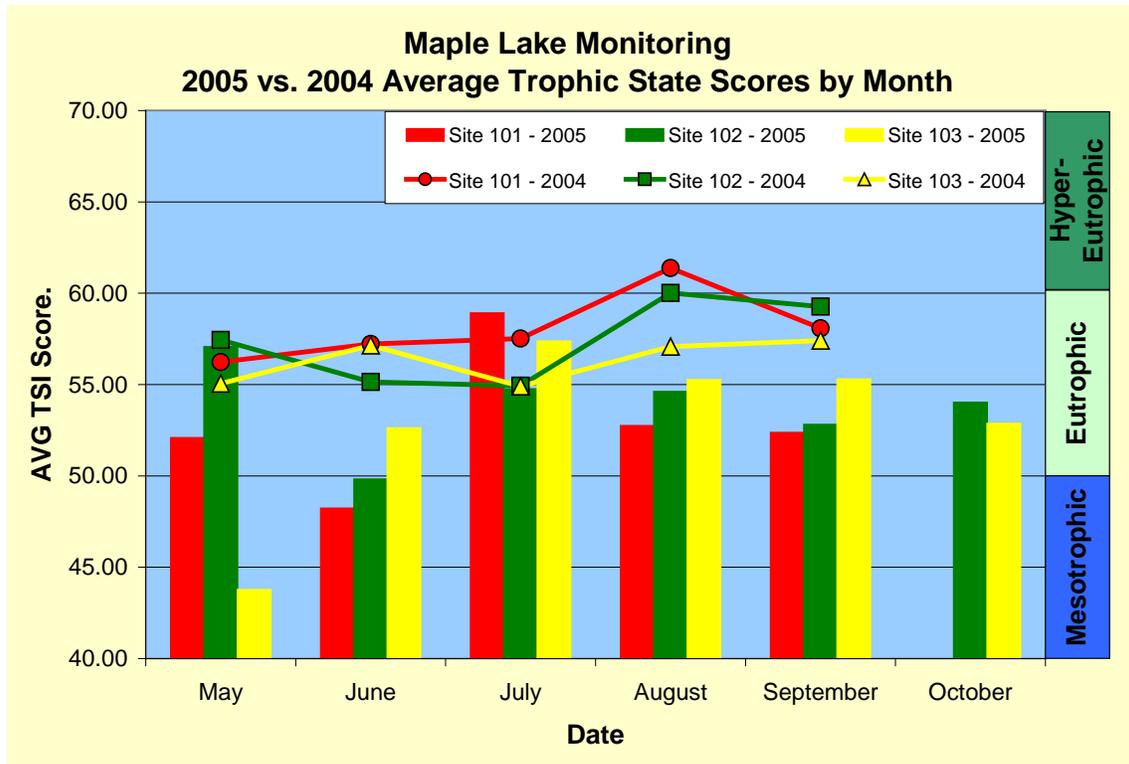


Figure 1. Maple Lake Area 2005 Monitoring Sites

The lake was eutrophic (excess nutrients – cloudy water) throughout the 2004 sampling, but actually improved down to the upper mesotrophic range (moderate levels of nutrients – fairly clear water) in June of 2005. Although the TSI level spiked to 58.91 in July, the summer average TSI score significantly improved from 2004 (58.09) to 2005 (52.87).

Even though it was much worse than other months in 2005, July's water quality was in line with the average July TSI score from all the years the lake has been monitored.



A spike in Maple Lake TSI scores that occurred July 2005 could have been caused by warmer overall temperatures of late summer. An increase (as observed by a local resident) in recreational use of the lake (jet skis, speedboats) could also have had an effect upon the water quality in the lake. This is because much of the lake is shallow enough for bottom sediment to be disturbed by the wakes of watercraft.

A 1994 U.S. Army Corps of Engineers Study found that silt substrates could be put into suspension by boat traffic down to a depth of 6 feet. Another study, *Power Boats on Shallow Lakes: a Brief Summary of Literature and Experience on Lake Mohegan* by O. Wright et al, shows that water and sediment can be stirred-up by boat engines as deep as 18 feet with a 100 horsepower motor and up to 15 feet with a 50 horsepower motor. According to the MN DNR Lake Map for Maple Lake, 14 feet is the maximum depth in the lake, with the exception of a couple holes that reach 18 feet. So, an increase in recreational use, independent of storms or runoff events, would seemingly have a direct impact upon water quality within Maple Lake by increasing the amount of sediment that is stirred-up from the bottom of the lake and creating a situation of internal nutrient loading. Monitoring results from the main inlet and outlet of Maple Lake support this theory. More suspended sediment was leaving the lake in July than entering the lake. Further evidence of a link between water quality and recreational use is the fact that, during the July sampling run, TSI scores were higher at the sites that are nearest to the lake's two public accesses when compared to the site in the middle of the lake.

