



Long-Term Depressional Wetland Monitoring Site: Prairie Lake

Prairie Lake is located in northwest Hennepin County. Since 1995, the Minnesota Pollution Control Agency (MPCA) has collected biological data from the wetland fringe of Prairie Lake to contribute towards the development of biological indicators and criteria for depressional wetlands. The Minnesota Department of Natural Resources (MDNR) conducted an inventory of this shallow lake in 1973, determining that the average depth was between four and five feet with a maximum depth of seven feet. The most abundant submerged plant species occurring at that time were: Flexuous naiad (*Najas flexilis*), Robbins' Pondweed (*Potamogeton robbinsii*), and Muskgrass (*Chara* sp.). No fish were observed during the

1973 survey; however, subsequent sampling by the MPCA has revealed the presence of Central Mudminnow (*Umbra limi*) and Brook Stickleback (*Culaea inconstans*) at this site.

Located within Crow Hassan Park Reserve this water body is completely surrounded by natural landscape comprised of native prairie (in various stages of restoration) and broadleaf forests. Human alteration within and surrounding the lake is limited to the periodic construction and maintenance of waterfowl nesting structures, utilization of hiking/horseback riding trails by park patrons, and periodic controlled burns in the adjacent prairie. Trumpeter swans are frequent visitors to this lake due to a successful swan reintroduction program conducted by the Three Rivers Park District.

Monitoring activities

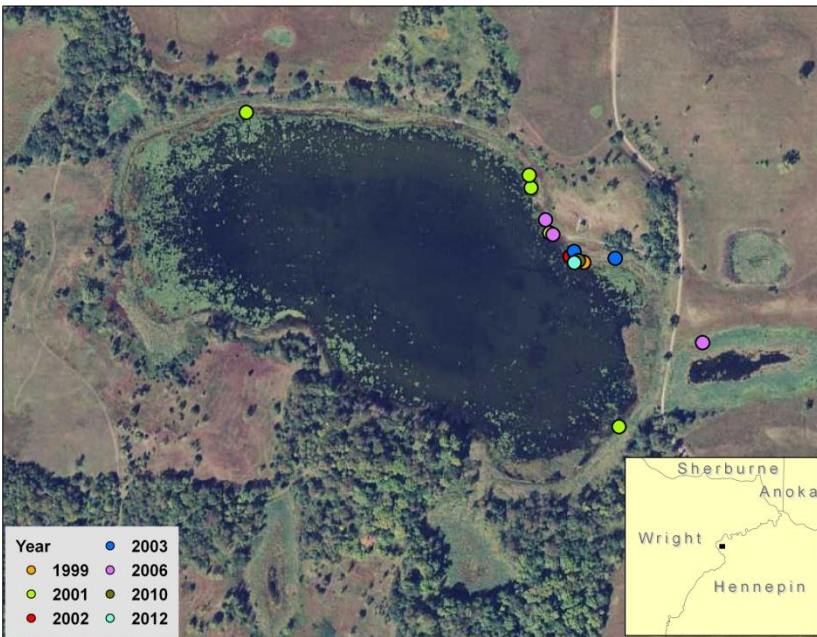
Prairie Lake has been monitored by the MPCA Biological Monitoring Unit since 1995. Plant, macroinvertebrate, and water quality sampling has occurred during the summer months of 1995, 1999, 2001, 2002, 2003, 2006, 2010, and 2012 (Figure 1). Macroinvertebrate sampling takes place in June, while plant sampling occurs in July. Water samples were typically collected during the macroinvertebrate visit, though supplemental water quality data (May-October) was also collected in 2008, 2009, and 2011.

Plant and macroinvertebrate sampling adheres to standard operating procedures (SOPs) in order to ensure data quality and comparability of results between wetlands and across years. These SOPs can be found on the MPCA wetland monitoring and assessment webpage (see Contact information).



Site Information

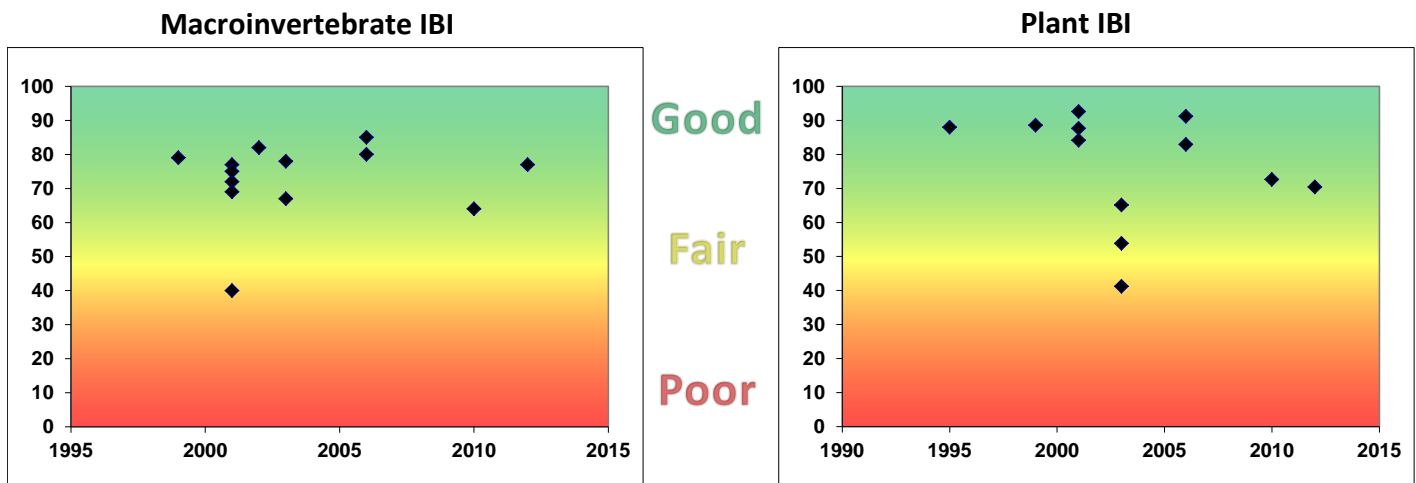
County: Hennepin: Size: 36 acres
Ecoregion: Mixed Wood Plains
DNR ID#: 27-0177-00



The purpose of biological monitoring is to evaluate the condition or ecological integrity of water bodies. The MPCA uses a plant and macroinvertebrate index of biological integrity (IBI) to evaluate depressional wetland condition. These two indicators determine whether a wetland is in good, fair, or poor condition by comparing its IBI score to the distribution of scores from least-disturbed, reference wetlands within the same ecoregion. Each IBI consists of 10 attributes of the community (called ‘metrics’) that respond in a predictable manner to human disturbance. Examples of commonly used metrics include: total taxa richness, percentage of tolerant taxa, and vascular plant genera richness.

Figure 1. Aquatic macroinvertebrate sampling locations

Monitoring Results



With the exception of one sample collected in 2001, Prairie Lake consistently had “good” invert IBI scores, indicative of a healthy aquatic macroinvertebrate community. The diversity of dragonfly and damselfly larvae in this wetland is particularly noteworthy. It is not understood why one sample produced such a low IBI score but the generally consistent scores between 70 and 80 suggest that it is probably an outlier. An analysis of this IBI data set found no significant trend over the period of 1999 to 2012 (outlier not included).

Plant IBI scores yielded similar results with the majority above 80, while in 2003 all three samples yielded relatively low IBI scores. However, these low scores may reflect regional-scale effects or represent temporal variability of the IBI rather than a real change in condition. With IBI scores back above 80, the 2006 plant community assessments support this proposed explanation. An analysis of this IBI data set found no significant trend over the period of 1999 to 2012.

The high quality of the biological communities in Prairie Lake as well as the relative stability of these conditions support the concept of this site serving as a reference for depressional wetlands in the Mixed Wood Plains ecoregion of Minnesota. In other words, without the presence of immediate and significant human impacts, these are the conditions we can expect to find in this type of water body.

Water Chemistry

The surface water chemistry of Prairie Lake has remained relatively stable from 1995 to 2012. Chloride concentrations have consistently been below two mg/L and are frequently below the detection limit of one mg/L, indicating that this water body is well-isolated from urban runoff. In comparison, chloride typically exceeds 50 mg/L in lakes and wetlands that receive significant runoff from upland areas treated with de-icing compounds during the winter. The aquatic life water quality standard for chloride in lakes and wetlands is 230 mg/L. The exceptionally low chloride values in this water body are well within the criteria established for the protection of aquatic life with further evidence of this provided by the plant and macroinvertebrate IBI scores.

The 1973 MDNR survey noted exceptional water clarity in this lake. Turbidity measured from 1995 to 2006 ranged from 1.2 to 3.6 NTU, well below the 25 NTU aquatic life water quality standard, indicating that the clarity of this water body is still good. In 2007, the MPCA began using a transparency tube (analogous to the Secchi disk used in lakes) to measure water clarity in wetlands. From 2009 to 2012, water clarity dipped below one m (i.e., the length of the tube) only once in 2009. The clarity of Prairie Lake allows a diverse community of submerged aquatic plants to exist throughout much of its basin.

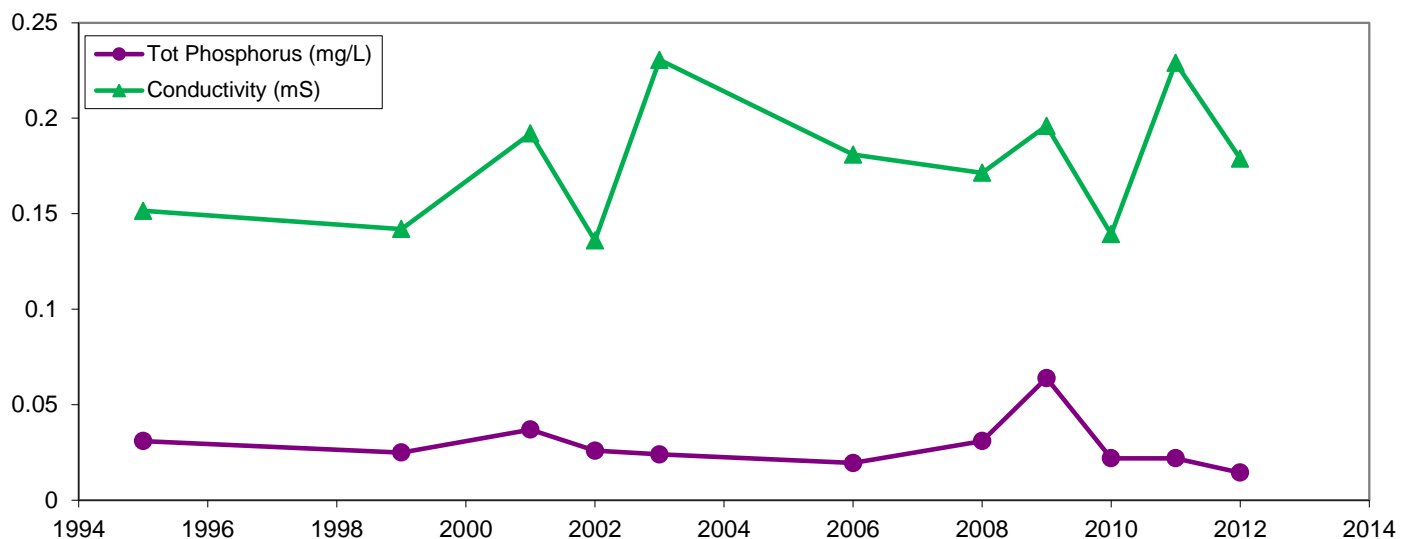
Given the clarity of the water column and abundance of submerged plants it is no surprise that daytime dissolved oxygen concentrations typically exceed 10 mg/L in this wetland. Dissolved oxygen was 5.2 mg/L shortly after sunrise on the one occasion it was measured this early, indicating that there is sufficient oxygen for aquatic organisms over the entire daily cycle.

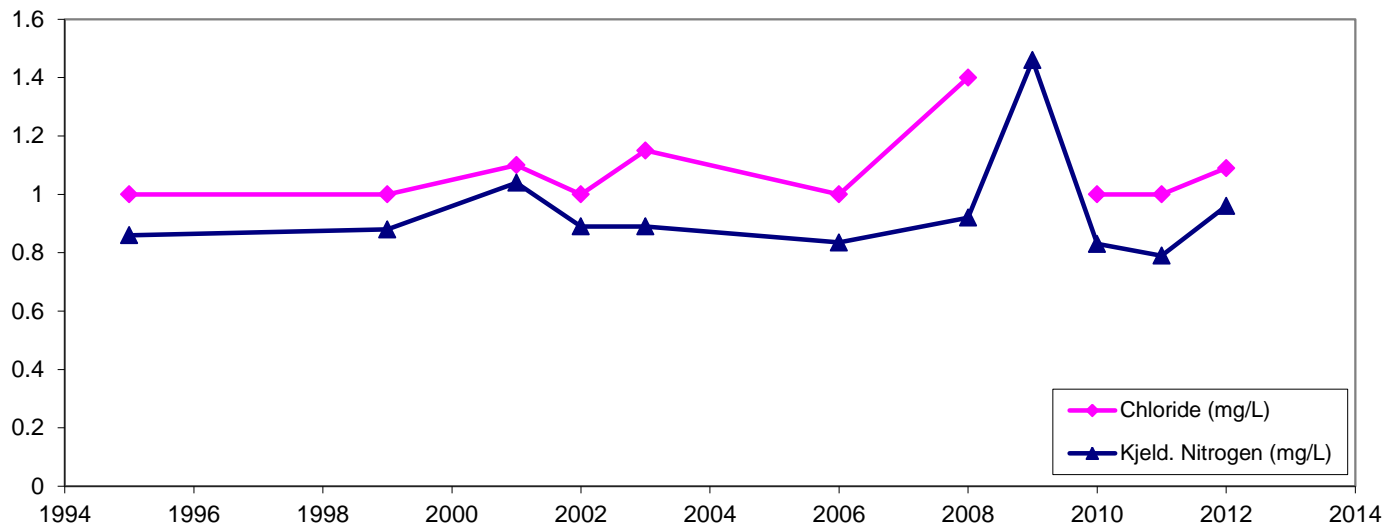
June total phosphorus concentrations typically haven't exceeded 0.050 mg/L over the period of 1995 to 2012. Total Kjeldahl nitrogen (organic N + ammonia N) has largely remained below one mg/L and nitrate + nitrite nitrogen has been below detection in all samples the MPCA has collected from this water body. These low nutrient concentrations are contributing to the maintenance of the clear-water, aquatic plant-dominated status of this shallow lake.

The concentration of sulfate has always been below detection at this site. The detection limit for sulfate analysis was five mg/L 2001-2005 and lowered to one mg/L 2006-2012.

Trends

Water chemistry data were analyzed for trends over the period of 1995 to 2012 using the Seasonal Kendall Test for Trends (only June data displayed below). Total phosphorus exhibited a significant declining trend over this period. None of the other variables exhibited a significant trend at the 95 percent confidence level.





Contact Information

For more information on wetland monitoring in Minnesota, go to the MPCA wetland monitoring and assessment webpage: <http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/wetlands/wetland-monitoring-and-assessment.html>.

Or contact the MPCA at 651-296-6300 or 800-657-3864.