



Long-term depressional wetland monitoring site: Frank Breen Memorial Wildlife Management Area

The Frank Breen Memorial Wildlife Management Area (WMA) is located in southern Le Sueur County about five miles south of Cleveland, Minnesota. This WMA spans a 30 acre wetland that lies within the Cannon River watershed. The majority of this wetland is a floating mat sedge community surrounded by a 'moat' of open water. During sampling visits, Minnesota Pollution Control Agency (MPCA) biologists have documented the presence of Brook Sticklebacks (*Culaea inconstans*), Northern Leopard Frogs (*Rana pipiens*), and Chorus Frogs (*Pseudacris triseriata*).



Located within a region historically known as the 'Big Woods', Breen WMA is now almost completely surrounded by row crop agriculture with virtually no upland buffer. A road along the eastern edge of this wetland divides what used to be a single contiguous wetland complex. Now a culvert represents the only connection between these two wetlands. Agricultural runoff enters this wetland via both overland flow and subsurface drainage tiles. The Minnesota Department of Natural Resources lists pheasant hunting and wildlife viewing as the two primary recreational opportunities that can be enjoyed at this WMA.

Site Information:

County: Le Sueur
Ecoregion: Mixed Wood Plains

DNR ID#: 40-0099-00
Area: 30 acres
Watershed: Cannon River

Monitoring activities

Breen WMA has been monitored by the MPCA Biological Monitoring Unit since 1999. Plant, aquatic macroinvertebrate (e.g., aquatic bugs, snails, & leeches), and water chemistry monitoring has occurred during the summer months of 1999, 2001, 2002, 2003, 2006, 2010, and 2012. Macroinvertebrate and water chemistry sampling take place in June, while plant sampling occurs in July. Water samples were typically collected during the June macroinvertebrate visit.

Plant and macroinvertebrate monitoring 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).

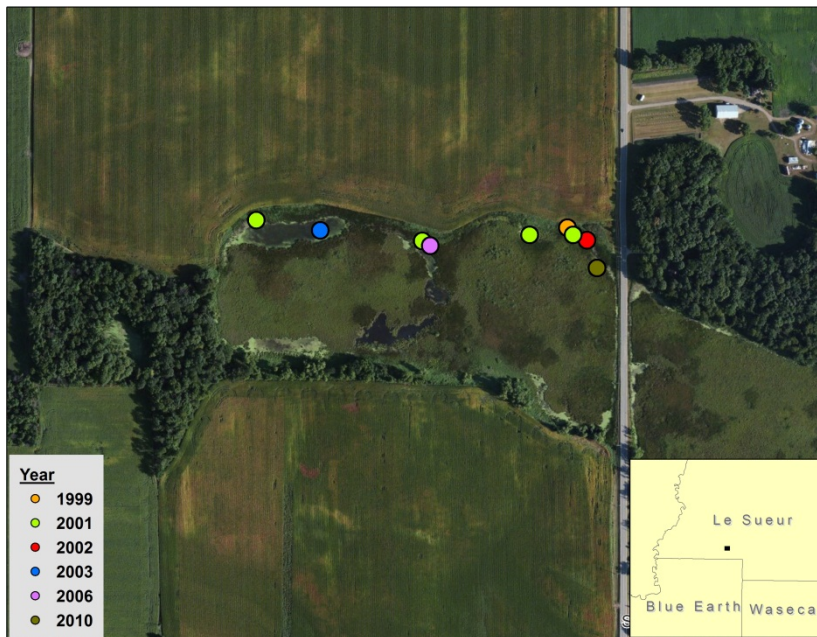
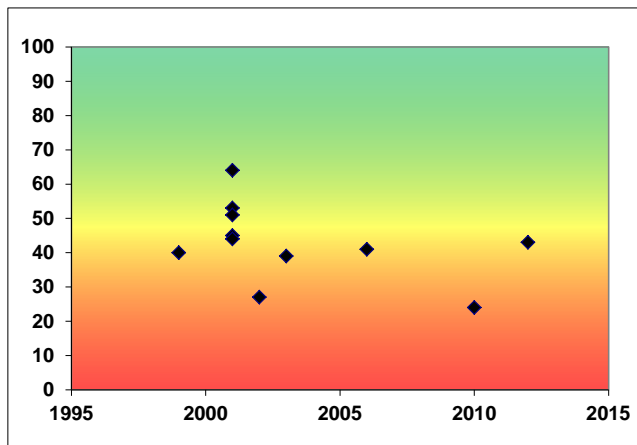


Figure 1. Aquatic macroinvertebrate sampling locations.

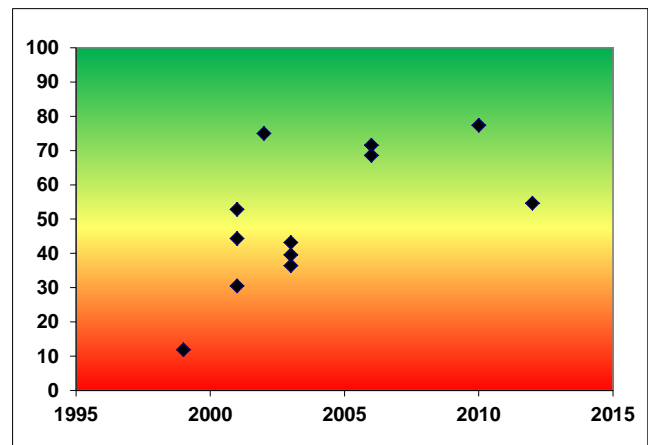
The purpose of biological monitoring is to evaluate the condition or ecological integrity of water bodies. The MPCA uses a plant and macroinvertebrate index of biological integrity (IBI) to evaluate depressional wetland condition. These two indicators determine whether a wetland is in good, fair, or 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.

Monitoring results

Macroinvertebrate IBI Scores



Plant IBI Scores



Both indicators exhibit a wide range of scores over the monitoring period (1999 - 2012). One explanation may be that sample location is contributing to these variations in IBI scores. As mentioned, this site has a floating mat community and the interior portions of the wetland have a more diverse plant community than its predominantly cattail (*Typha X glauca*) fringe. Over the past several years, plant sampling has occurred in both areas and resulted in very different IBI scores. Similarly, macroinvertebrate sampling locations within the wetland have had to vary over the years depending on water levels. In some years the water has been too low to collect samples from the emergent vegetation, sampling submergent aquatic vegetation instead. This can also result in drastically different IBI scores. A situation such as this illustrates why it is important to have long term monitoring sites; to capture year-to-year fluctuations in indicator values that may be attributed to regional-scale factors (e.g., drought). Neither indicator exhibited a statistically significant trend over the monitoring period of 1999 – 2012.

Water Chemistry

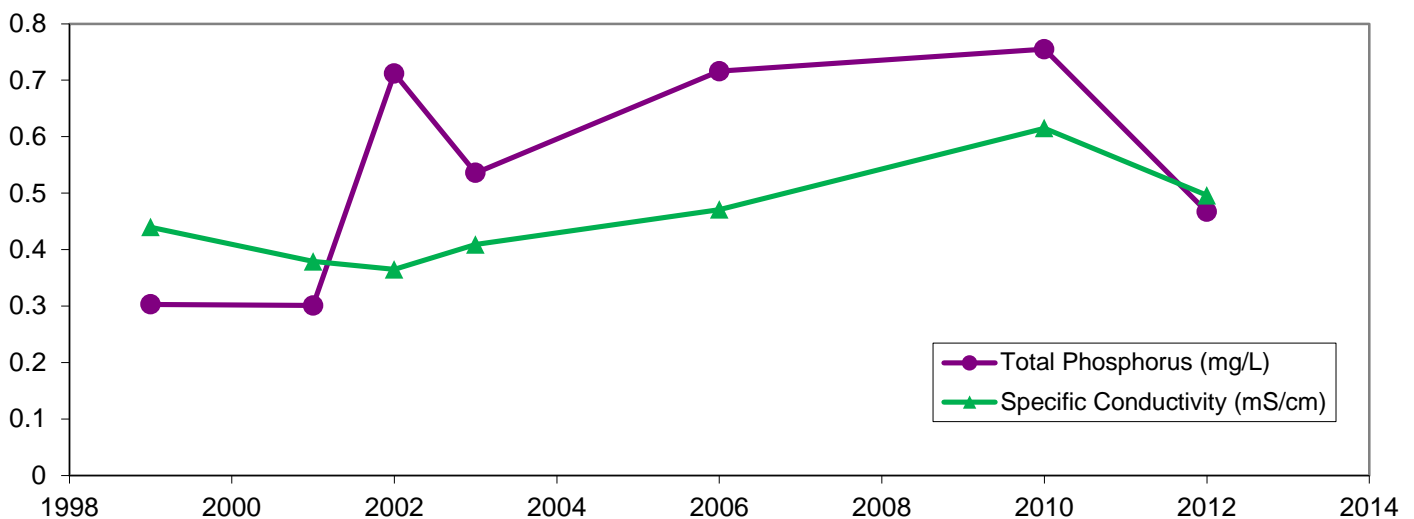
Analysis of water samples from Breen WMA suggests that nutrient enrichment may be detrimental to aquatic and semiaquatic communities inhabiting this wetland. Kjeldahl nitrogen (*organic N + ammonia*) and total phosphorus concentrations have consistently been at levels considered to be high for depressional wetlands in the Mixed Wood Plains ecoregion. This over-fertilization of the water can lead to excessive growth of phytoplankton, filamentous algae, and vascular plants (particularly invasive species) which can reduce plant community diversity or indirectly affect other organisms through reduced dissolved oxygen concentrations, reduced water clarity, and cascading effects on the food web. Plant community data from this wetland indicate that invasive cattails (*Typha X glauca & T. angustifolia*) and duckweed (*Lemna minor*) may be the primary response to increased nutrients. Turbidity and Secchi tube (switched to this transparency measurement in 2012) data suggest that phytoplankton may also be proliferating in the open water areas of this wetland in response to increased nutrient levels, leading to reduced water clarity.

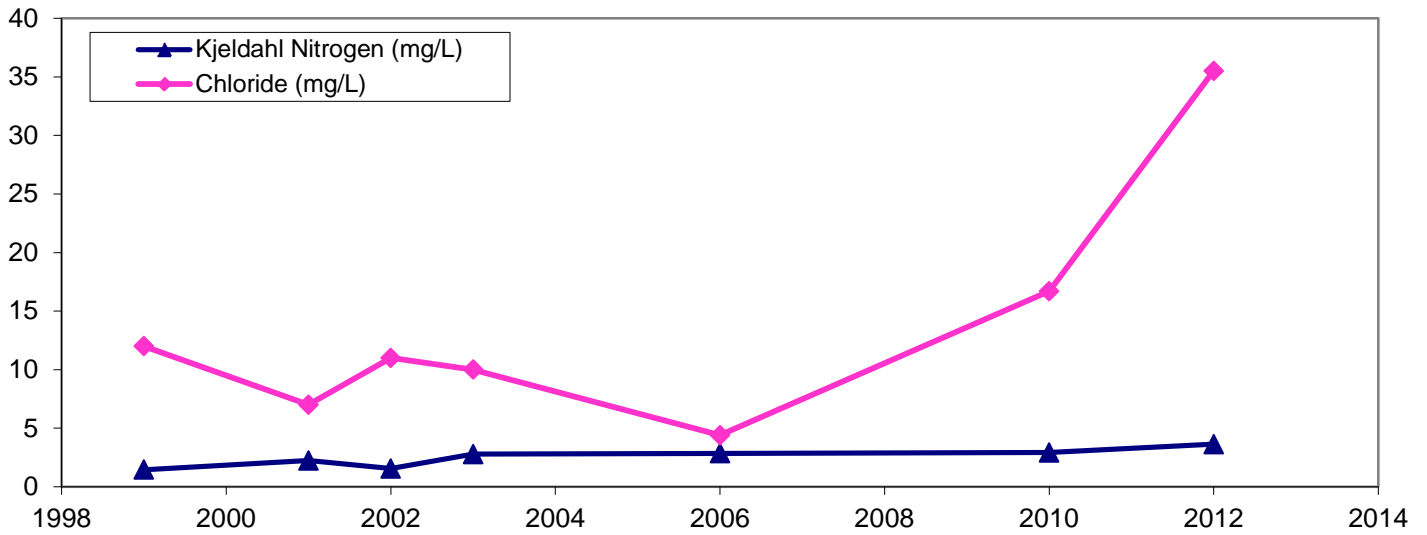
Dissolved oxygen concentrations have on several occasions been measured below five mg/L during the middle of the day, indicating that there may not be enough oxygen for some aquatic organisms. This may explain the relatively low macroinvertebrate IBI scores. Organisms sensitive to low oxygen concentrations such as mayflies, caddisflies, and dragonflies have low diversity and abundance in Breen WMA compared to least-disturbed reference wetlands in this ecoregion.

Chloride is relatively high in this wetland compared to reference conditions and appears to be increasing. The County State Aid Highway that forms the eastern edge of this wetland is the likely contributor of chloride to this wetland in the form of road salt. Currently, concentrations in June are well below the State's aquatic life standard of 230 mg/L. While concentrations in any given year likely reflect the amount of snow received during the winter months, the fact that chloride can accumulate in water bodies and groundwater is a cause of concern for wetlands adjacent to paved surfaces.

Trends

Water chemistry data were analyzed for trends over the period of 1999 to 2012 using the Seasonal Kendall Test for Trends (only June data displayed below). Kjeldahl nitrogen and specific conductance both exhibited a significant increasing trend over this period. None of the other variables exhibited a significant trend at the 95% 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.