

Lake Francis

Tributary Monitoring 2017

Introduction

2017 was the first year the Lake Francis Improvement Association partnered with the Isanti Soil and Water Conservation District (SWCD) to monitor the health of the North West Inlet that empties into Lake Francis:

- #1 North West Inlet



Date: 1/5/2018

Tributary ID's were developed by the Isanti SWCD

Tributary Monitoring

What: In 2017 five sampling events were conducted at the northwest (NW inlet) inlet targeting three samples during rain events and two during base flow. The NW Inlet runs from west to east and is the only inflow to the lake. Its watershed is nearly 6,500 acres and is dominated by agricultural land use; however, the inlet itself is bordered by wetlands.

The samples were lab-tested for total phosphorus (TP) and total suspended solids (TSS). Water transparency, Dissolved oxygen, temperature, conductivity, pH and water flow were measured in the field.

Why: The information collected helps us focus future lake water quality improvement projects at the best places on the landscape. Additionally, this information can be used to track lake health trends and to determine how well water quality improvement projects are working.

Total Phosphorus: an essential plant nutrient in which an excess can cause severe algal blooms.

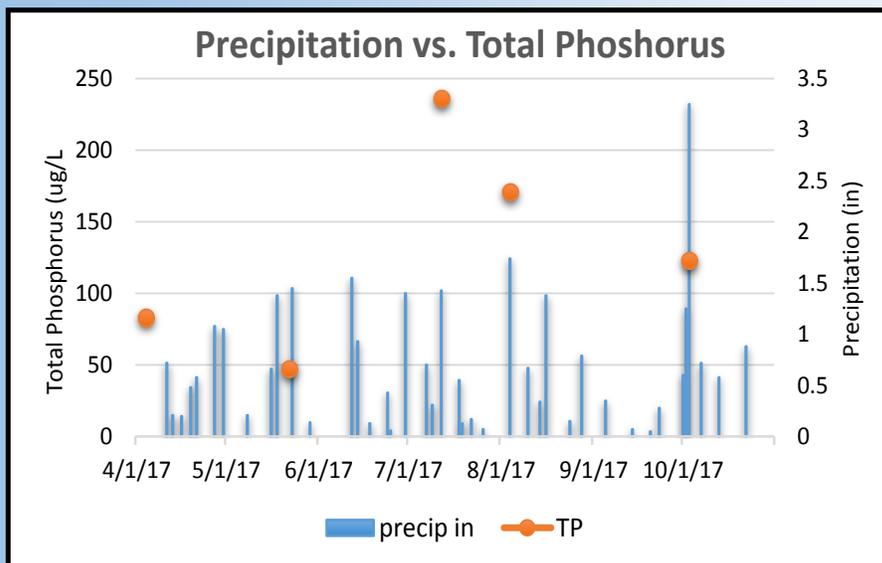
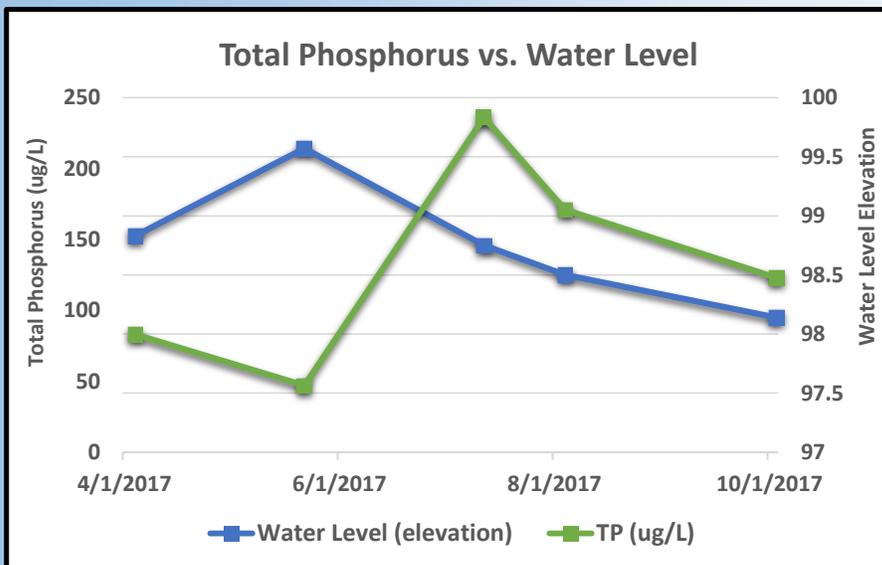
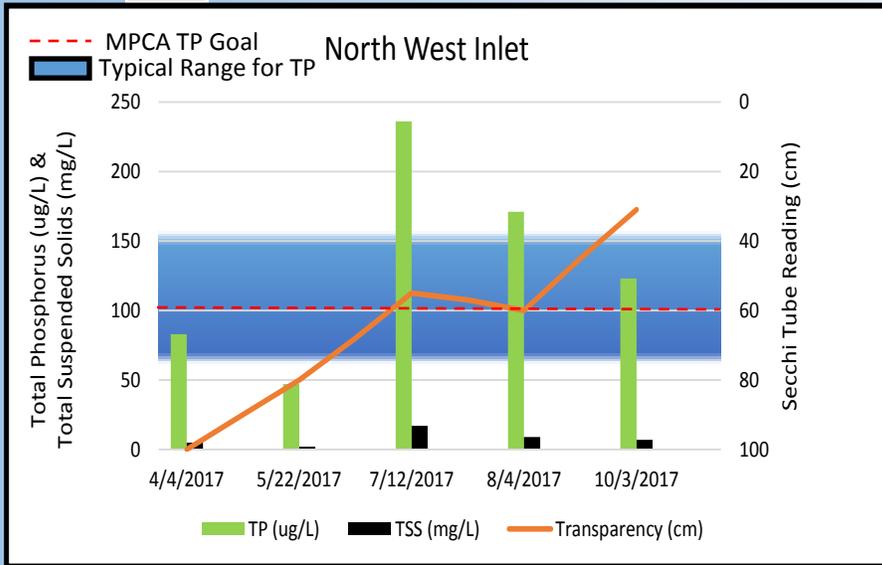
Total Suspended Solids: tiny particles of soil and other matter that remain suspended in water making it cloudy. Particles include sediment and organic matter.

Transparency: an indirect measure of suspended and dissolved materials (soil particles and tea color caused by organic materials) in the water.

2017 Tributary Monitoring Results

Total Suspended Solids, Total Phosphorus and Transparency Tube

Data Analysis NW Inlet:



- TP measurements for this area typically range between 60 and 150 $\mu\text{g/L}$ (indicated in the graph as shaded blue zone). Concentrations exceeded 150 $\mu\text{g/L}$ during the peak summer months of July and August.
- The average concentration of TP at this location in 2017 was 132 $\mu\text{g/L}$; 32 $\mu\text{g/L}$ above the goal of 100 $\mu\text{g/L}$ set by MPCA in the Total Maximum Daily Load (TMDL) (indicated in graph with red dash line).
- TSS measurements for this area typically range between 4.8 and 16 mg/L. The average concentration of TSS detected at this location was 8.00 mg/L. Well within the normal range.
- Transparency readings averaged 65.20 cm (Transparency tubes only measure to 100 cm) this means the water is typically cloudy. Samples taken in May and June were very clear. Clarity greatly decreased during peak summer months and after heavy rain events (water color was noted as tea-colored).
- When comparing TP and water level, the TP concentrations stay consistent with water level starting in July. When water level drops so does TP concentration. However, spring readings show opposite; when the water level is high the TP concentrations are low. The high spike in TP concentrations in July may be a result of wetland release and runoff from the watershed.
- Flow data combined with sampling data suggests the inlet has an effect on lake water health. This information is valuable to accurately understanding the impacts and solutions to lake health.

2018 Results and Recommendations

Summary:

Concentrations of both TP and TSS were low early in the season. Although no definite conclusions can be drawn from this, we do not think the early season increase in phosphorus is worth focusing on. Increases in phosphorus later in the summer were more severe. TP and TSS spiked in July (TP 236 µg/L, TSS 17 mg/L). The increases could be due to a combination of factors such as: 1) wetland phosphorus release: sporadic but continuous rain events (>5 inches) over the weeks prior likely kept the adjacent wetlands saturated. This may have caused phosphorus and organic particles to be released by wetland sediments; AND/OR 2) rain water runoff from adjacent fields: the sporadic and continuous rain events could have carried phosphorus off of already saturated land. TSS was minimal throughout the season (with the exception of the July event) suggesting the wetlands are capturing any sediment that may be coming from the land.

A Diagnostic-Feasibility Study was completed by the Minnesota Pollution Control Agency (MPCA) in 2002 for Lake Francis. Interestingly enough, the NW Inlet (incorrectly called CD-10) was monitored for TP and TSS during the study and the data was very similar to 2017. Data from that study shows the average concentration for TP was 128 µg/L and TSS was 5 mg/L. Based on 2017 data it appears that not much may have changed over the last 17 years.

Because weather conditions and other environmental factors can vary so drastically from year to year it is recommended to collect another year of data at the NW inlet. Additionally, we recommend sampling lake water quality to help understand variables effecting the lakes water quality. The 2002 Feasibility Study indicated that the largest contributor to lake health is internal loading (recycling of nutrients from within the lake). This means much of the phosphorus is bound within the lake bed and because of the shallow lake depths, the soils are easily disturbed, allowing phosphorus to be released into the water column.

Below are key points and recommendations for monitoring in 2018.

- Data suggests the NW inlet watershed is contributing TP and TSS to Lake Francis health (even if minimally compared to internal).
- **NEW:** Increase sampling: 8 grab samples at(4) highest and (4) normal to low water levels (peak flow and base flow); TP, TSS, water level measurements, flow, dissolved oxygen, temperature, pH.
- **NEW:** Lake water quality monitoring: 10 grab samples total, twice a month from May to September; TP; Chl-a; dissolved oxygen; temperature; pH; transparency.

Lake Management Considerations: The following are lake management considerations based on 2017 monitoring and the 2002 Feasibility Study:

- Identify contributing land and identify project locations in NW Inlet watershed. (2019 or 2020)
- Begin discussions about a lake drawdown to reduce nutrients and improve aquatic plant health. (2018)
- Discuss SSTS upgrades with County. (2018)

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