2023 Water Monitoring Report



WATERSHED MANAGEMENT ORGANIZATION



Monitoring Sites

Chub Creek - 4 sites Pine Creek - 1 sites Trout Brook - 3 sites

Monitoring Frequency

1x per month; April through October

Monitoring Parameters

<u>Physical</u> - Chlorophyll-a, Conductivity, Dissolved Oxygen, pH, Sediment, Temperature <u>Nutrients</u> - Nitrates, Phosphorus <u>Bacteria</u> - E. coli Stage, Streamflow, Continuous temperature

Monitoring sites are located near the pour points of each of the smaller subwatersheds Water quality monitoring at locations throughout the watersheds and of several chemical and physical parameters enables local decision makers and state agencies to evaluate stream health in order to implement appropriate management strategies to better protect and improve overall health.

Report prepared on behalf of the North Cannon River Watershed Management Organization and Dakota County Parks Department by the Dakota County Soil and Water Conservation District



Chub Creek Watershed

Chub Creek originates in Chub Lake, a natural 274-acre lake with a large adjacent wetland. Major tributaries include Dutch Creek, Mud Creek, and the North Branch of Chub Creek. The subwatershed is generally flat and the streams meander slowly through the landscape.

> North Branch Chub Creek

Chub

Mud

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Monitoring Locations



- Dutch Creek (DUTCH300)
- Dutch Creek at 300th Street W

Mud Creek (MUD3)

Mud Creek at Highway 3

North Branch Chub Creek (NB47)

North Branch Chub Creek at Highway 47

Chub Creek (Chub PMS)

Chub Creek on Dixie Ave

Macroinvertebrates (2014)

• Fecal Coliform (1994, 2006)

2023 Field Measurements

• Fecal Coliform (2006)

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Impairments Chub Creek

• Fishes (2014)

Mud Creek



Dutch Creek

- Macroinvertebrates (2016)
- Fishes (2016)



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Mud Creek

locations 2023 monitoring locations

Lake Byllesby

Parameter	Desired Range	Dutch Creek Range	Mud Creek Range	NB Chub Creek Range	Chub Creek Range
Temperature (degC)	Less than 30	6.18 - 23.26	6.95 - 19.402	5.91 - 20.3	7.36 - 26.24
Dissolved Oxygen (mg/L)	Greater than 5.0	1.51 - 7.28	0.86 - 9.36	7.75 - 10.45	7.11 - 10.67
Transparency (cm)	Greater than 25	60 - >100	99 - >100	89 - >100	61 - >100
Conductivity (uS/cm)	Less than 698	560 - 754	506 - 829	550 - 591	575 - 674
рН (S.U.)	6.5 to 9.0	6.94 - 7.7	7.07 - 7.61	7.35 - 7.78	7.6 - 8.1

Phosphorus

Total Phosphorus (TP) includes all forms of phosphorus; particulate and dissolved. The **state standard of 0.15 mg/L** (grey dotted line on graph to right) was **exceeded several times at the sites on Dutch and Mud Creeks**. **No exceedances were recorded at the North Branch monitoring site and the mainstem Chub site only had one exceedance** during the field season. Phosphorus levels increased throughout the season at Dutch Creek, whereas the other sites had a higher degree of variability and stayed below or close to the state standard during all monitoring events.



Nitrates

E. coli

Much of the Chub Creek watershed is characterized by coarse soils which make the shallow groundwater more susceptible to nitrate pollution. Some nitrate in streams is natural, but natural levels are generally around 0.5-2 mg/L. Nitrate leaching can result in contamination of shallow groundwater where private drinking water wells may be located.

The Environmental Protection Agency has set a nitrate standard of ≤10 mg/L in drinking water to protect human health. Nitrate concentrations in Chub Creek, Dutch Creek, and Mud Creek did not exceed the drinking water standard at any point during the monitoring season. Water samples collected on the North Branch of Chub Creek exceeded the standard in two samples and were above 8 mg/L for four of the other five efforts.

Total Suspended Solids

All but one water sample collected met the TSS state standard of 65 mg/L. Dutch Creek exceeded the standard for TSS (and other parameters) during the August monitoring event. Secchi tube readings were consistently >100cm though each site had one event that was less than that.

Chlorophyll-a

Chlorophyll-a serves as an indirect indicator of nutrient levels in a river due to the relationship between water quality and algae biomass. **Chlorophyll-a levels throughout the watershed are low, except at Dutch Creek** in August when the sample was five times the standard (≤35 ug/L).

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E. coli levels throughout the watershed were lowest in the spring and fall. It is believed that the cold water experienced during these months is likely to contribute to stunting the population growth of the bacteria. Throughout the season, **only seven of 21 samples collected were within the state standard of** \leq **126 organisms/100mL**. The highest measured value occurred in July - 1,733 organisms/100mL, almost 14 times higher than the state standard - at the monitoring site on Chub Creek, the most downstream site in the watershed.



Chub Creek

Pine Creek Watershed

Pine Creek watershed drains approximately 21 square miles of flat, agricultural land. Most of the creek's length was ditched and straightened to create County Ditch #1 in 1960. The creek is designated by the MNDNR as a trout stream downstream of Highway 52.

Monitoring Location

- on 🖉
- Pine Creek (PC3)
- Pine Creek at 280th Street

Impairments



• Nitrates (2010)

Pine Creek





2023 Field Measurements 🥼

Water quality data range collected at the Pine Creek monitoring site

Parameter	Desired Range	Pine Creek Range	
Temperature (degC)	Less than 30	7.62 - 15.98	
Dissolved Oxygen (mg/L)	Greater than 5.0	6.27 - 10.67	
Transparency (cm)	Greater than 25	76 - >100	
Conductivity (uS/cm)	Less than 698	587 - 746	
pH (S.U.)	6.5 to 9.0	7.19 - 7.56	



🍖 2023 monitoring location



Pine Creek



MNDNR hydrologists deploy continuous temperature and water level monitoring equipment at this site year round.

Phosphorus

Total Phosphorus (TP) includes all forms of phosphorus; particulate and dissolved. **No exceedances of the state standard of 0.150 mg/L were recorded during the monitoring season.** Phosphorus level was highest (0.078 mg/L) in June.

Nitrates

Although nitrates occur naturally in soil and water, excess levels of nitrates are considered to be a contaminant of ground and surface waters. Most sources of excess nitrates come from human activity including agricultural activities, human wastes, and industrial pollution. Nitrate leaching (movement of nitrate and water through soils) can result in contamination of shallow groundwater where private drinking water wells may be located. The federal standard for nitrate is ≤ 10 mg/L in drinking water to protect human health.

Nitrate concentrations in Pine Creek exceeded the federal standard in all months, but May and June. Nitrate levels have been consistently high since monitoring began in 2006, consistently exceeding the standard throughout the monitoring season. Some variation does occur, but low levels are rare and most likely related to rain events.

Total Suspended Solids

Total suspended solids (TSS) levels were well within the proposed state standard of 65 mg/L at PC3, although the standard may have been exceeded on days when samples were not collected. Historical data supports the findings from 2023. Levels were low throughout the monitoring season (far below the state standard), with occasional increases likely due to the increased amount of sediment in the creek coming off the land after rainfall events.

Chlorophyll-a

Chlorophyll-a serves as an indirect indicator of nutrient levels in a river due to the relationship between water quality and algae biomass (high chlorophyll = high nutrients). Chlorophyll-a levels at the site on Pine Creek was well below the state standard of ≤35 ug/L throughout the season.



E. coli

E. coli levels in 2023 were in line with historical levels in Pine Creek - levels were below or near the state standard in the spring and summer when bacteria growth is stunted by cold water temperatures. Higher water levels during the late summer and early fall most likely resulted in elevated *E. coli* readings in those months, but the reason behind the quick rise and sustained water level increase is currently unknown (increased irrigation due to drought?; downstream blockage?).

Three of the four *E. coli* samples collected this season exceeded the state standard of \leq 126 organisms/100mL. The highest measured value occurred in August - 387 organisms/100mL - almost three times higher than the state standard.

Trout Brook Watershed

Trout Brook is a groundwater-fed stream located in southeast Dakota County. The majority of its perennial flow is contained within the Miesville Ravine Park Reserve, and enters the Cannon River immediately after leaving the park. The lower section is a MNDNR-designated trout streams.

Monitoring Locations



 Unnamed Tributary to Trout Brook at Miesville Trail

Trout Brook (TB2)

Trout Brook (TB1)

• Trout Brook at Miesville Trail

Trout Brook (TB3)

• Trout Brook at Orlando Trail

Impairments Mainstem



- Turbidity (2006)
- Nitrates (2010 and 2018)
- Macroinvertebrate (2014)

East branch - unnamed tributary

• Nitrates (2024)

2023 Field Measurements





Trout Brook - TB3 (left) & TB1 (right)

locations 2023 monitoring locations

Water quality data ranges collected at monitoring sites in Trout Brook watershed

Parameter	Desired Range	TB1 Range	TB2 Range	TB3 Range
Temperature (degC)	Less than 30	8.37 - 10.62	7.62 - 12.30	7.57 - 12.54
Dissolved Oxygen (mg/L)	Greater than 5.0	8 - 12.46	8.09 - 12.78	9.3 - 11.86
Transparency (cm)	Greater than 25	>100	>100	>100
Conductivity (uS/cm)	Less than 698	660 - 705	701 - 771	649 - 701
рН (S.U.)	6.5 to 9.0	7.1 - 7.46	7.56 - 7.73	7.45 - 8.01

Phosphorus

Total Phosphorus (TP) includes all forms of phosphorus; particulate and dissolved. **No exceedances of the state standard of 0.150 mg/L were recorded at any of the monitoring sites during the monitoring season.** Phosphorus levels were lowest in April and May and showed the highest degree of variability at TB2 (upstream site on the mainstem).

Nitrates

Trout Brook is found in a karst landscape, a geologic system that is characterized by underground drainage systems such as caves and sinkholes, and dotted with springs. Bedrock fracturing and thin layers of soil contribute to rapid groundwater velocities and short residence times, making water quality a major concern, as land use

practices can have a direct, and almost immediate, impact on groundwater. Nitrate leaching can result in contamination of shallow groundwater where private drinking water wells may be located. The federal standard for nitrate is ≤10 mg/L in drinking water to protect human health.

Nitrate levels exceeded the drinking

water standard at all monitoring sites in all months (winter sampling included). TB2 had the highest nitrate levels of the three stream monitoring sites, with concentrations two times the federal standard. Since monitoring of these sites began in 1999, nitrate concentrations at all three sites - TB1 (east branch),



Trout Brook - TB3



Trout Brook - TB1

TB2 (west branch), and TB3 (main stem) - have shown an increasing trend over time.

Total Suspended Solids

For all monitoring sites in 2023, the TSS levels were well within the state standard of 65 mg/L (standard may have been exceeded on days when samples were not collected). Secchi tube readings record during each event show a strong correlation between water transparency and TSS levels as is expected.

Chlorophyll-a

Chlorophyll-a serves as an indirect indicator of nutrient levels in a river due to the relationship between water quality and algae biomass (high chlorophyll = high nutrients). **Chlorophyll-a levels at all sites in the watershed were well below the state standard of ≤35 ug/L** throughout the season.

E. coli

Throughout the season, **TB1 had** *E. coli* levels far below the standard of ≤126 organisms/100mL. Half of the samples at **TB2 and TB3 were above the standard**, a few were right below, and the rest were well below. Samples in June and August were highest at all three sites.

Trout Brook Groundwater

Trout Brook is found in a karst landscape, a geologic system that is characterized by underground drainage systems such as caves and sinkholes, and dotted with springs. Four sentinel springs have been monitored for nitrate on a semi-regular basis since 1985.

Trout Brook



Listed Upstream to Downstream

Fox Spring (mainstem)

LeDuc Spring (unnamed trib)

Beaver Spring

Swede Spring

Starting in 2018, monitoring frequency increased from once per year to quarterly. Increased sampling frequency results in higher resolution dataset that provides a more robust understanding of nitrate levels throughout the watershed.

2023 Field Measurements 🖉

Water quality data ranges collected at Trout Brook spring monitoring sites

Parameter	Fox Spring	LeDuc Spring	Beaver Spring	Swede Spring
Temperature (degC)	9.1 - 9.48	8.63 - 8.85	9.01 - 9.21	8.65 - 9.03
Dissolved Oxygen (mg/L)	8.33 - 8.63	6.85 - 7.3	9.15 - 9.6	6.63 - 7.17
Conductivity (uS/cm)	732 - 791	663 - 732	699 - 754	588 - 636
Nitrate (mg/L)	23.4 - 25.9	16.5 - 19.7	19.4 - 21.9	8.21 - 11.4
Trending	Increasing 0.15 mg/L/yr	Increasing 0.33 mg/L/yr	Increasing 0.33 mg/L/yr	Increasing 0.15 mg/L/yr



Beaver Spring



Fox Spring

All four spring monitoring sites show increasing nitrate concentration trends over time. Fox Spring (top of the watershed; upstream TB2) has the highest levels of all four sites. Swede Spring (bottom of the watershed; upstream of TB3) has the lowest nitrate levels in the watershed. All sites have nitrate levels above the state drinking water standard (10 mg/L).