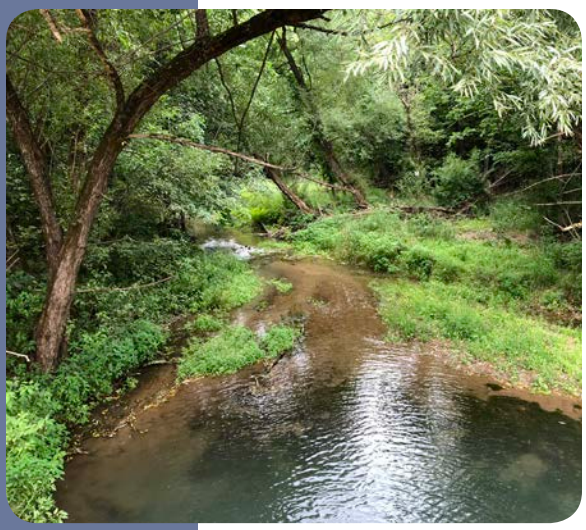
2018 Monitoring Report

North Cannon River Watershed



North Cannon River Watershed Management Organization

Dakota County

Watersheds

The Cannon River Watershed within Dakota County is divided into three major subwatersheds - Chub Creek, Pine Creek, and Trout Brook. This part of the county is predominantly rural in nature, with agriculture as its primary land use. Rolling hills spread across the northern and southwest portions of the watershed; steep hills, bluffs, and rocky outcroppings are found in the east. Karst features exist in this watershed, highlighted by shallow depth of soils and glacial material covering limestone. Water quality is a major concern as these features can have a profound impact on the rate of infiltration and the flow path of water.

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. Several streams are listed as impaired for fecal coliform (Chub Creek, Mud Creek), as well as biologically impaired for aquatic macroinvertebrates (bugs) and fish (Chub Creek, Dutch Creek).

Pine Creek Watershed

The Pine Creek sub-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. With few meanders and a medium slope, the creek flows fairly quickly along its length. Pine Creek is listed as impaired for nitrates.

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. High nitrate levels in the Trout Brook watershed have been a concern for a number of years. The mainstem of Trout Brook is listed on the Impaired Waters list for nitrates (2010) and the western branch was added in 2018. Trout Brook is also listed as impaired for turbidity and aquatic macroinvertebrates.

Monitoring History

Surface Water

The North Cannon River Watershed Management Organization (NCRWMO) has been monitoring the water quality and quantity of major creeks in the watershed since 1999, but began to focus their limited resources on Chub Creek, monitoring near its confluence with the Cannon River, starting in 2006.

Beginning in 2018 and in partnership with Dakota County Parks (DC Parks), water quality monitoring efforts within the Pine and Trout subwatersheds began anew. One monitoring site for the Pine subwatershed and three sites within Trout Brook were selected. In addition to the permanent monitoring station on Chub Creek, three monitoring sites were also added within that subwatershed. All seven sites have been monitored at one time in the past, so historically relevant monitoring data is available when evaluating current conditions in each subwatershed.

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 of these springs have become sentinel nitrate monitoring sites in that they have been monitored on a regular basis over the last three decades (dating back as early as 1985). Nitrate monitoring in this watershed is of particular interest because Trout Brook has some of the highest stream baseflow nitrate concentrations found in southeastern Minnesota.

For over a decade, the NCRWMO has supported a triennial monitoring effort of the sentinel springs to better assess nitrate levels and possible sources in the watershed. Beginning in 2018, DC Parks has continued this effort with quarterly monitoring of the sentinel springs and three stream sites. Nitrate data will be used by DC Parks , Minnesota Department of Natural Resources (MNDNR), and University of Minnesota researchers, as well as other state agencies and local entities, to better understand the dynamics of the surface to groundwater interactions within the watershed.

Water Quality Monitoring

Water quality monitoring of several chemical and physical parameters enables local decision makers and state agencies to evaluate streams in the Chub Creek, Pine Creek, and Trout Brook subwatersheds in order to implement appropriate management strategies to better protect and improve overall health.

Temperature is an important factor to consider when assessing water quality. Not only can it influence other important monitoring parameters (such as dissolved oxygen and pH), but water temperature also dictates the types of organisms that are able to survive in a given waterbody. Temperatures outside an organism's preferred range can affect metabolic rate, as well as behavior, predator-prey responses, and duration of active/rest periods. Water temperature is influenced by both natural (groundwater) and anthropogenic factors (stormwater runoff, eroding soils, and removal of streambank vegetation).

Dissolved Oxygen (DO) is a measure of the oxygen available to aquatic organisms (plant and animal). Reduced DO levels within a stream reach can cause aquatic animals (fish, macroinvertebrates) to leave the area, and under extreme conditions, lack of oxygen can result in death of aquatic organisms. In freshwater systems, such as lakes, rivers, and streams, DO concentrations fluctuate diurnally and will vary by season, location, and water depth. Many factors can influence DO levels in a water body including: water temperature, rate of photosynthesis, light penetration (turbidity and water depth), water turbulence or wave action, and the amount of oxygen used by respiration and decay of organic matter.

Transparency of water is affected by both dissolved and suspended materials. The amount of solids (sediment, organic material) suspended in the water has the greatest impact, though dissolved organic material (tea colored water) can also result in low transparency. Elevated sediment levels in a waterbody can reduce the biological productivity of a system by reducing light penetration, increasing water temperature, covering bottom habitat, and diminishing visibility for mobile organisms. Monitoring changes in water transparency is a quick and efficient way to identify when pollutants are present in a given waterbody.

Conductivity is a measure of water's ability to transmit an electrical current due to the presence of dissolved checmicals. Chemicals like sodium chloride (salt) dissolve in water and the ions can have physiological effects on plants and animals. Conductivity is fairly constant in most bodies of water, but significant change, due to natural flooding, evaporation or anthropogenic pollution (such as urban and agricultural runoff), can be very detrimental to water quality.

pH is a measure of acidity (less than 7) or alkalinity (greater than 7). A change in pH can alter the behavior of other chemicals in the water making them toxic (ammonia and some heavy metals). Very low pH can damage gills and membranes, and affect the reproductive success of fish and aquatic macroinvertebrates (bugs), while high pH can ultimately cause death. Anthropogenic causes of pH fluctuations are usually related to pollution, such as stormwater or agricultural runoff, wastewater discharge, or industrial runoff.

Phosphorus is required by all living things and occurs in the natural environment (rocks, soil). Phosphorus is generally considered to be the "limiting nutrient" in aquatic ecosystems, meaning that the availability of phosphorus controls the pace at which algae and aquatic plants grow. When too much phosphorus enters a given water body, eutrophication and harmful algal growth can occur. Sources of excess phosphorus are usually associated with human activities: soil erosion, human and animal wastes, septic systems, detergents, and runoff from farmland or lawns.

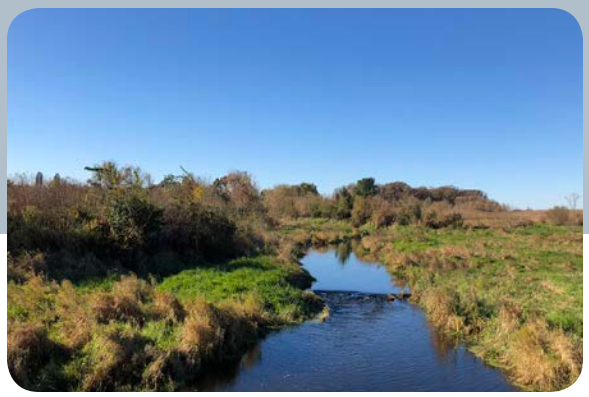
Nitrates are a form of nitrogen, which is found in several different forms (ammonia (NH_3), nitrates (NO_3), and nitrites (NO_2)) in terrestrial and aquatic ecosystems. Nitrates are essential plant nutrients, but in excess amounts they can cause significant water quality problems including accelerated eutrophication, which in turn, affects dissolved oxygen, temperature, and other water quality indicators. Nitrates are naturally present in surface and ground waters in low concentrations, but are harmful to humans and livestock and cause aquatic ecosystem degradation in high concentrations. Sources of nitrates include wastewater treatment plants, runoff from fertilized lawns and cropland, failing on-site septic systems, runoff from animal manure storage areas, and industrial discharges that contain corrosion inhibitors.

Total Suspended Solids (TSS) is a measure of all the suspended particles (organic and inorganic material, bacteria, and algae) in the water and is a significant factor when monitoring water clarity. Suspended particles can come from a variety of sources including soil erosion from fields and stream banks, storm water runoff, industrial or wastewater discharges, stirred bottom sediments, decaying vegetation, and algal blooms. Excessive suspended sediment can impair water quality for both aquatic and human life, disrupt feeding behaviors, impede navigation and increase the potential for flooding.

TSS values are used to quantify suspended particles in the water

Escherichia coli (*E. coli*) bacteria are measured as an indicator of the presence of disease-causing pathogens in the water. Originating in the intestines of living creatures (humans and other warm-blooded animals), the presence of *E. coli* in water is a strong indication of recent sewage or animal waste contamination. Potential sources of *E. coli* include land use practices (manure used as fertilizers), animal waste (wild or domestic), and failing septic tanks. *E. coli* contamination is found most commonly in heavily populated or farmed areas. *E. coli* replaced fecal coliform as Minnesota's water quality standard for bacteria in 2008.

Chub Creek Watershed



Monitoring Activity Summary

- Water samples were collected monthly from April through October at the permanent monitoring site on *Chub Creek* on Dixie Ave in Randolph
    - 7 total samples, collected on routine basis
- Monitoring at the sites on *Dutch Creek*, *Mud Creek*, and the *North Branch of Chub Creek* began in July
    - 4 samples at each site, collected on routine basis
- Water level monitoring equipment was installed at the permanent monitoring site on *Chub Creek* on Dixie Ave in April and was removed in November
    - Water level and temperature were recorded at 15 minute intervals on continuous basis
- Three manual streamflow measurements were collected in October and November

2018 Monitoring Locations

Dutch Creek (DUTCH300)

- Dutch Creek at 300th Street W

Mud Creek (MUD3)

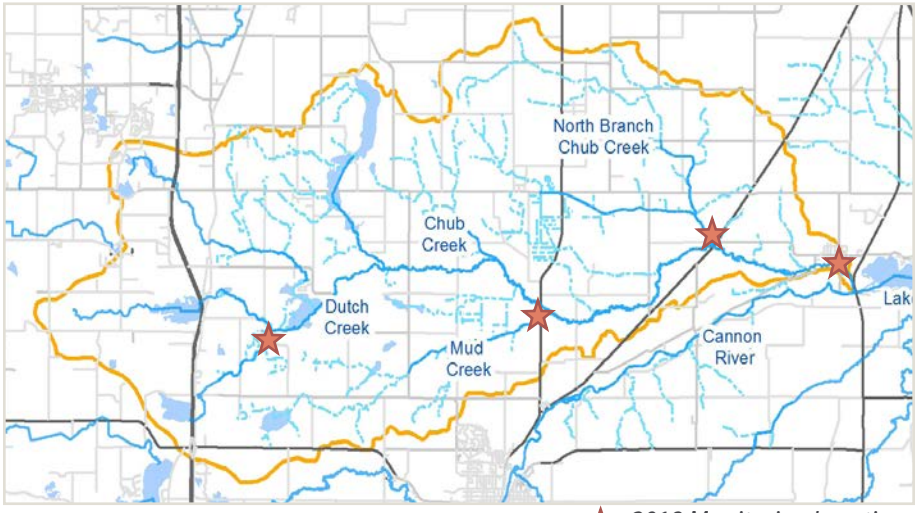
- Mud Creek at Highway 3

North Branch Chub Creek (NB47)

- North Branch Chub Creek at Highway 47

Chub Creek (Chub PMS)

- Chub Creek on Dixie Ave



- *2018 Monitoring Locations*

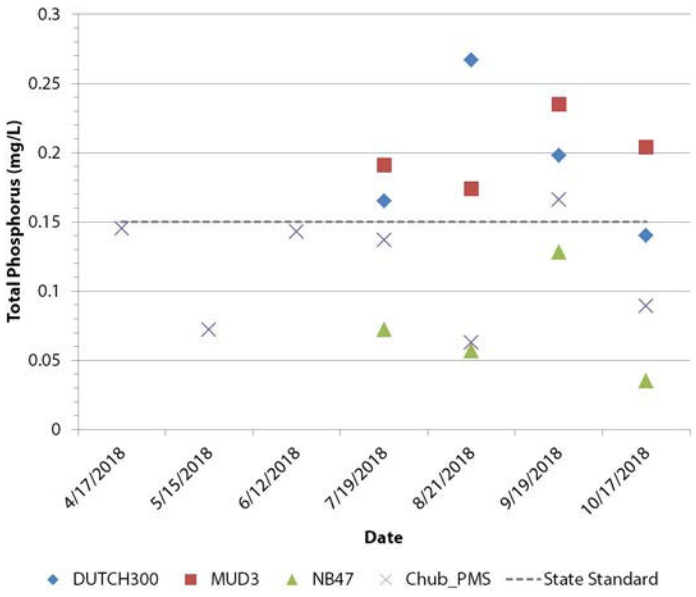
Temperature, Dissolved Oxygen, Transparency, Conductivity, pH

2018 water quality data collected at monitoring sites in *Chub Creek* watershed from April (*July) to October

Parameter	Desired Range	Dutch Creek Range*	Mud Creek Range*	NB Chub Creek Range*	Chub Creek Range
Temperature (°C)	Less than 30	4.92 - 21.42 °C	7.07- 19.24 °C	8.50 - 15.54 °C	0.72 - 19.67 °C
Dissolved Oxygen (mg/L)	Greater than 5.0	1.3 - 9.12 mg/L	6.28 - 9.78 mg/L	7.75 - 10.20 mg/L	8.27 - 11.24 mg/L
Transparency (cm)	Greater than 25	>100 cm	>100 cm	72 - >100 cm	34 - >100 cm
Conductivity (µS/cm)	Less than 698	572 - 668 µS/cm	627 - 665 µS/cm	535 - 610 µS/cm	540 - 633 µS/cm
pH (S.U.)	6.5 to 9.0	7.43 - 7.67 S.U.	7.60 - 7.95 S.U.	7.72 - 8.13 S.U.	8.09 - 8.44 S.U.

Phosphorus

Total Phosphorus (TP) includes all forms of phosphorus; particulate and dissolved. The **state standard of 0.150 mg/L** (grey dotted line on graph to right) was **exceeded several times** at the permanent monitoring site on **Chub Creek**, and at the sites on **Dutch and Mud Creeks**. **No exceedances** were recorded at the **North Branch of Chub Creek** monitoring site.



Phosphorus levels were highest from July through September at both Dutch Creek and Mud. The only exceedance on the main stem occurred in September, which occurred during a 1.6" rain event. Large runoff events often lead to sediment and other pollutants being carried into the creek via storm runoff from parking lots, streets, and agricultural fields.

Nitrates

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**.

North Branch Chub Creek

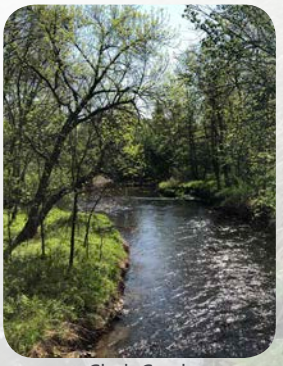
Nitrate concentrations in **Chub Creek**, **Dutch Creek**, and **Mud Creek did not exceed the drinking water standard at any point** during the monitoring season (Chub Creek concentrations were also in line with historical levels). Water samples collected on the **North Branch of Chub Creek exceeded the standard in three of the four months samples** in 2018. The sample collected in September (below standard) was collected during a runoff event which may have caused dilution of nitrate levels due to the influx of stormwater runoff in the system.

Total Suspended Solids

For all water samples collected in 2018 at all monitoring sites, the **TSS levels were within the state standard of 65 mg/L**, although the standard may have been exceeded on days when samples were not collected. TSS levels fluctuated throughout the season, but were **highest during runoff or snowmelt events** in the watershed as that would have resulted in increased sediment flowing into the creek. **Secchi tube readings** collected during these monitoring efforts **did not show as strong of a correlation between decreases in water transparency and elevated TSS levels** as in previous year.

E. coli

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.



Chub Creek

Throughout the season, **only four of 19 samples collected** were **within the state standard** of ≤126 organisms/100mL. The **highest measured value** occurred in July - **1,986 organisms/100mL**, *over 15 times higher* than the state standard - at the monitoring site on Chub Creek, the most downstream site in the watershed. On average, levels were highest at the sites on both the North Branch and the main branch of Chub Creek.

Pine Creek Watershed

Monitoring Activity Summary

- Water samples were collected monthly July through October at the monitoring location on *Pine Creek* at 280th Street
  - 4 samples total, collected on routine basis
- Water level monitoring equipment was installed by MNDNR in 2017
  - Water level and temperature were recorded on 15 minute intervals on continuous basis
- Manual streamflow measurements collected by MNDNR on routine basis throughout the year

Historical Context

- Beginning in 1999, multiple sites on *Pine Creek* were monitored for several water quality parameters including: flow, bacteria, sediment, nitrates, and phosphorus
- *Pine Creek* was last monitored for water quality in 2010

2018 Monitoring Locations

Pine Creek (PC3)

- Pine Creek at 280th Street

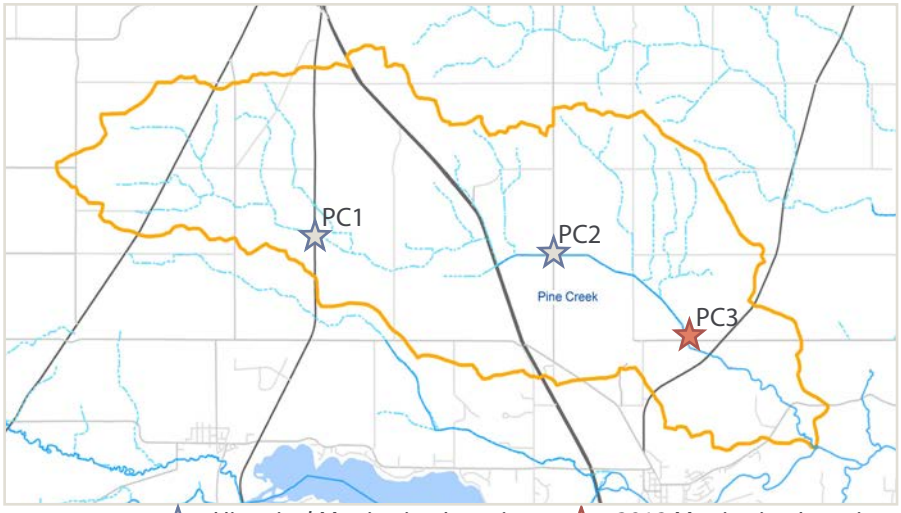
Historical Montitoring Locations

Pine Creek (PC1)

- Pine Creek at Emery Avenue (MN Highway 56)

Pine Creek (PC2)

- Pine Creek at Hogan Avenue (County Highway 85)



- Historical Monitoring Locations *- 2018 Monitoring Locations*

Temperature, Dissolved Oxygen, Transparency, Conductivity, pH

Water quality data collected at single monitoring site in *Pine Creek* watershed from July to October, 2018. For comparison, historical data ranges are included below for all three monitoring sites on Pine Creek.

Parameter	Desired Range	PC3 2018 Range	PC3 Historical Range	PC2 Historical Range	PC1 Historical Range
Temperature (°C)	Less than 30	9.27 - 15.12 °C	3.7 - 19.93 °C	7.78 - 21.86 °C	5.3 - 16.1 °C
Dissolved Oxygen (mg/L)	Greater than 5.0	5.48 - 8.86 mg/L	3.39 - 10.76 mg/L	1.27 - 13.66 mg/L	5.33 - 12.98 mg/L
Transparency (cm)	Greater than 25	>100 cm	>100 cm	>100 cm	N/A
Conductivity (µS/cm)	Less than 698	551 - 631 µS/cm	321 - 631 µS/cm	449 - 650 µS/cm	174.4 - 668 µS/cm
pH (S.U.)	6.5 to 9.0	7.59 - 7.91 S.U.	7.35 - 8.38 S.U.	7.14 - 8.22 S.U.	7.4 - 8.2 S.U.

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 (0.094 mg/L) in September, following1.6" rainfall event 24 hours prior to monitoring. Heavy rain events can lead to sediment and other pollutants being carried into the creek via storm runoff from residential lawns, streets, and agricultural fields.

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 September**. The September sample was collected following a rain event, which led to an increase in the amount of water flowing through the system, thereby diluting the nitrate concentration in the creek.

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.

Pine Creek

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. Much like the phosphorus results, the **TSS level was higher during the September sampling event** due to the increased particulate matter (organic and inorganic) in the creek, in comparison to samples collected under baseflow conditions.

Historical data supports the findings from 2018. Levels were low throughout the monitoring season (far below the state standard), with occasional increases after heavy rainfall due to the increased amount of sediment in the creek coming off the land.

E. coli

Only one of the three *E. coli* samples collected this season exceeded the state standard of ≤126 organisms/100mL. No sample was collected in August. The **highest measured value occurred in September - 345 organisms/100mL** - *almost three times higher* than the state standard. Elevated levels during this month correspond in time with the mid-month rain event which would have led to increased runoff from nearby land.

***E. coli* levels in 2018 were in line with historical levels in Pine Creek**. Levels were below or near the state standard (especially in the spring and summer when bacteria growth is stunted by cold water temperatures), with occasional spikes that most likely correspond to runoff events in the summer and early fall.

Trout Brook Watershed

Surface Water Monitoring Activity Summary

- Water samples were collected monthly from July through October at the three surface water monitoring sites
  - 4 samples at each site, collected on routine basis
- Water level monitoring equipment was installed by MNDNR in 2017
  - Water level and temperature were recorded on 15 minute intervals on continuous basis
- Manual streamflow measurements collected by MNDNR on routine basis throughout the year

Groundwater Monitoring Activity Summary

- Water samples were collected at four sentinel springs and three surface water sites quarterly in 2018
- Samples analyzed for nitrates; data collection supports long term record of monitoring at these sites

2018 Monitoring Locations

Trout Brook (TB1)

- Unnamed Tributary to Trout Brook at Miesville Trail

Trout Brook (TB2)

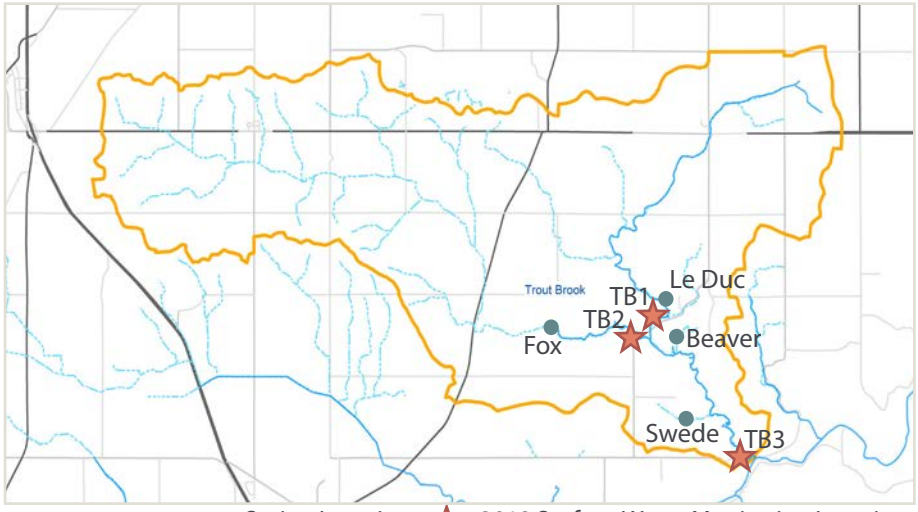
- Trout Brook at Miesville Trail

Trout Brook (TB3)

- Trout Brook at Orlando Trail

Springs

- Beaver, Fox, Le Duc, Swede



● - *Spring Locations* ★ - *2018 Surface Water Monitoring Locations*

Temperature, Dissolved Oxygen, Transparency, Conductivity, pH

Water quality monitoring data collected at the three surface water monitoring sites in the Trout Brook watershed during four monitoring events between July and October, 2018.

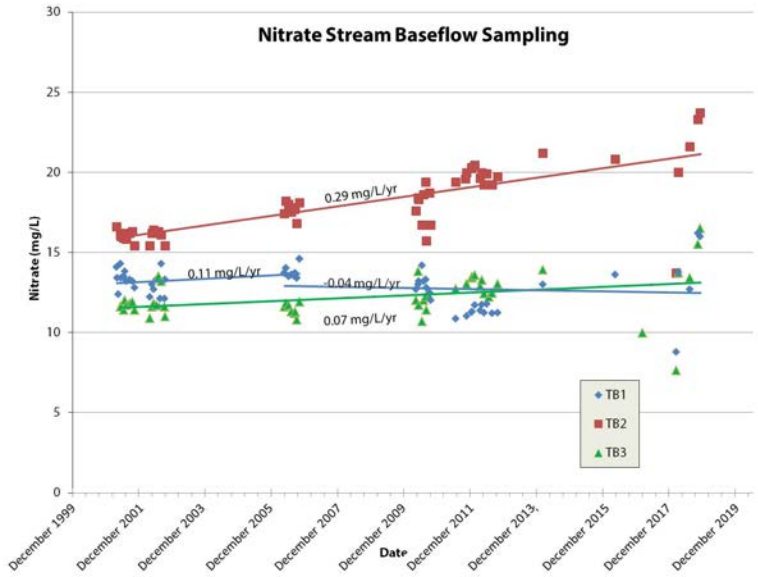
Parameter	Desired Range	TB1 Range	TB2 Range	TB3 Range
Temperature (°C)	Less than 30	9.67 - 10.24 °C	9.67 - 11.98 °C	7.64 - 12.23 °C
Dissolved Oxygen (mg/L)	Greater than 5.0	8.12 - 8.73 mg/L	9.36 - 9.99 mg/L	9.86 - 10.82 mg/L
Transparency (cm)	Greater than 25	>100 cm	>100 cm	>100 cm
Conductivity (µS/cm)	Less than 698	645 - 659 µS/cm	706 - 708 µS/cm	650 - 656 µS/cm
pH (S.U.)	6.5 to 9.0	7.49 - 7.73 S.U.	7.84 - 8 S.U.	7.88 - 8.24 S.U.

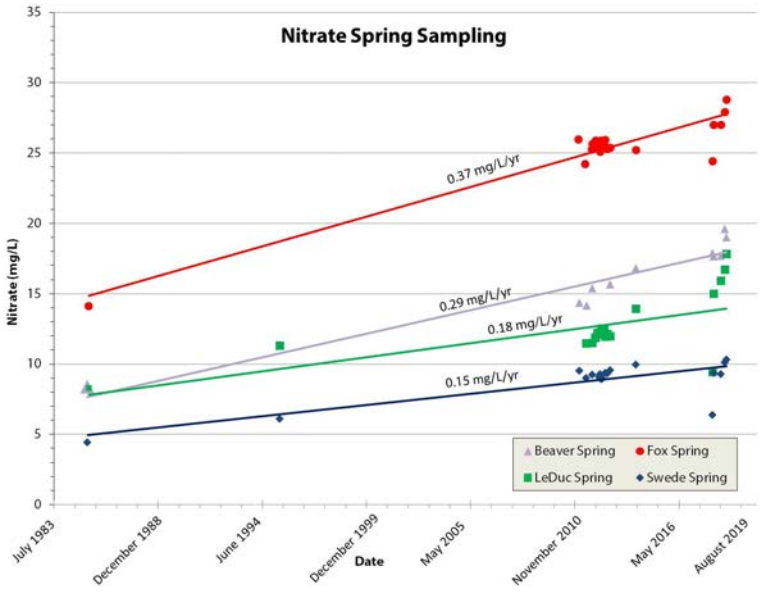
Phosphorus

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 highest (0.04 - 0.082 mg/L) in September, following1.6" rain event the day prior to monitoring. Rain events of this magnitude can lead to sediment and other pollutants being carried into the creek via storm runoff from residential lawns, streets, and agricultural fields.

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**.





A study done by the MPCA found that baseflow nitrate concentrations in Trout Brook are the highest in southeastern Minnesota's karst region and this continues to be true in 2018. 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 TB2 (west branch) and TB3 (main stem) have shown an increasing trend, whereas TB1 (east branch) shows a decreasing trend (since 2006).

All four spring monitoring sites show increasing nitrate concentration trends over time. Fox Spring (upstream TB2) had the highest concentrations of nitrate and is increasing at the fastest rate, about 0.37 mg/L/year. Recent monitoring at LeDuc Spring (upstream of TB1) increased the rate from 0.11 to 0.18 mg/L/yr. Beaver and Swede springs, both upstream of TB3, are increasing at rates of about 0.29 mg/L/year and 0.15 mg/L/year, respectively. Swede Spring has the lowest nitrate values, which may be because it is lower in the stratigraphic section and has a greater proportion of deeper, regional water input to dilute the nitrate-polluted water.

Total Suspended Solids

For all monitoring sites in 2018, 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.

E. coli

Throughout the season, **all but three of 14 samples** collected **exceeded the state standard** for *E. coli* of ≤126 organisms/100mL. *E. coli* levels at TB2 (west branch) and TB3 (mainstem) were consistently at or above the standard for the duration of the monitoring season, whereas analysis of TB1 samples show *E. coli* levels far below the standard.

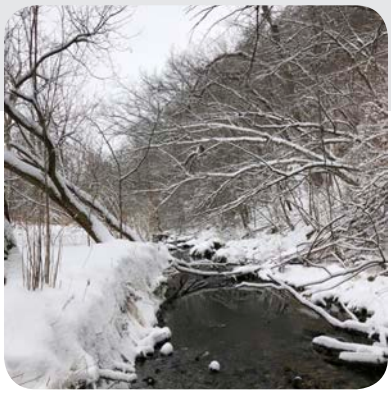
The **highest measured value** occurred in September - **49,500 organisms/100mL**, *almost 400 times higher* than the state standard - at TB2, the monitoring site on the western branch. All monitoring sites had elevated *E. coli* levels in September due to the rain event, just not as high as TB2.

Conclusions

In 2018, all three of the major Dakota County tributaries to the Cannon River were monitored together for the first time in almost ten years. Water quality was moderate to good in all three subwatersheds in 2018. Total Phosphorus levels were consistent across subwatersheds at the majority of sites – low during baseflow conditions and elevated after rain events. Chub Creek, Dutch Creek, and Mud Creek exceeded the state standard, regardless of runoff conditions.

Nitrate levels were elevated in the Trout Brook, Pine Creek, and the North Branch of Chub Creek. Levels throughout the rest of the Chub Creek subwatershed were below the standard for the entirety of the monitoring season. E. coli bacteria levels in Chub Creek indicate a potential for a human health risk as multiple samples collected in each subwatershed exceeded the state standard.

Reducing the sources and overall abundance of pollutants in a stream is important in order to maintain a healthy aquatic ecosystem. The plants and animals that live there, as well as the people who enjoy recreating in, and along its banks, benefit from clean water. Continued monitoring of each of the subwatersheds will help to better assess long term trends and track the progress towards meeting water quality goals.



Future Monitoring

In 2019, DCSWCD staff will collect surface water samples within the Chub Creek, Pine Creek, and Trout Brook subwatersheds in partnership with the NCRWMO and Dakota County Parks. Several water quality and quantity parameters will be measured during each monitoring effort. Streamflow measurements will be conducted during the monitoring season at Chub Creek - Dixie Ave to continue the development of the rating curve for Chub Creek. The information collected will be used to make management decisions, as well as support important conservation initiatives such as streambank restorations and the implementation of best management practices that address various pollutants of concern throughout the subwatersheds.

The nitrate monitoring project in the Trout Brook subwatershed will continue in 2019. Water samples will be collected at four spring and three stream sites following the strategy laid out in the NCRWMO Watershed Plan (2013). Sample findings from 2018 were consistent with the historical record, showing elevated nitrate levels at all sites throughout the watershed. This work is supported by DC Parks and is undertaken in partnership with MPCA, Minnesota Geological Survey, and the University of Minnesota.

In August 2019, macroinvertebrate (aquatic insect) samples will be collected at several sites in the Chub Creek, Trout Brook, and Pine Creek subwatersheds. Macroinvertebrate samples are often used to identify areas of concern within streams and rivers, as their presence/absence/abundance can be used to determine the extent of environmental impairments caused by pollutants. Macroinvertebrate samples were collected in these watersheds by the MPCA during the monitoring effort in support of the Watershed Restoration and Protection Strategy (WRAPS) process undertaken in 2013. This work will continue that effort, in addition to supplementing the aquatic invasive species (AIS) surveys that are being conducted throughout Dakota County. Funding for monitoring is provided by Dakota County through the Local AIS Prevention Aid grant.