

2025 Water Quality Monitoring Report

Vermillion River watershed
reflecting life

State of the Watershed

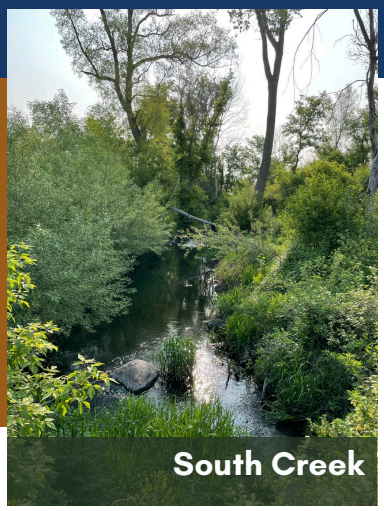
In 2025, water quality and temperature in the Vermillion River and its tributaries met many of the state and federal standards, indicating a healthy condition for the watershed. However, there is room for improvement, particularly regarding level and sources of nitrogen, low dissolved oxygen, elevated *E. coli* bacteria, temperature exceedances, and suspended solids concentrations. Continued monitoring of these issues, as well as the planning and implementation of restoration and protection efforts within the eight unique subwatersheds, will help address the various beneficial use impairments (consumption [mercury], life [aluminum, dissolved oxygen, fish, macroinvertebrates, total suspended solids], and recreation [*E. coli*]) found throughout the watershed.

Sampling Summary

- 25 monitoring events with 200 samples collected
- Conducted under Baseflow, Runoff, and Snowmelt conditions

Highlights

- Decreased total suspended solids levels in South Creek Subwatershed
- Habitat conditions along the Vermillion River and major tributaries are stable



South Creek

Climate Conditions

2025 was a year of climate extremes, characterized by above-average temperatures and persistent drought and heavy rainfall. Following warm, but dry conditions in February, multiple snow events brought heavy precipitation in the early spring. Mild temperatures melted the snow almost as fast as it fell and precipitation levels remained below normal until June. Both June and July were the rainiest months of the year (above the 30-year average) due to multiple days of storm events. After the return of more "normal" hydroclimatic conditions in August, a dry spell took hold through the rest of the year.



South Branch Vermillion River

Vermillion River Watershed

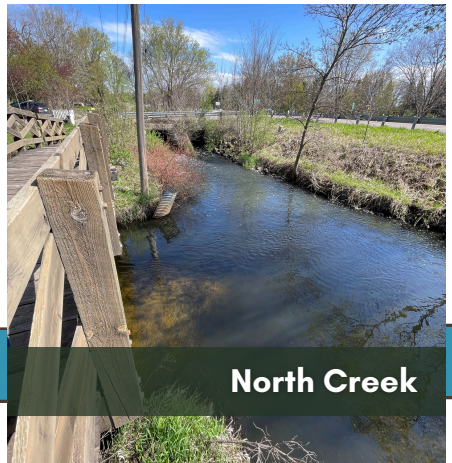
The Vermillion River Watershed (VRW) is the largest watershed in the Twin Cities seven-county metropolitan area. The watershed drains 335 square miles of rural, suburban, and urban landscapes from its headwaters in New Market Township, Scott County and across Dakota County, to its confluences with the Mississippi River at Hastings and Red Wing, Minnesota.

Cities and townships including Apple Valley, Burnsville, Castle Rock Township, Coates, Douglas Township, Elko New Market, Empire, Eureka Township, Farmington, Hampton, Hampton Township, Hastings, Lakeville, Marshan Township, New Market Township, Nininger Township, Ravenna Township, Rosemount, Vermillion, and Vermillion Township make up the watershed.

The Vermillion River main stem travels 35 miles west to east, joined by four major tributaries (North Creek, Middle Creek, South Creek, and South Branch) and many unnamed minor tributaries. The overall topography of the watershed is relatively flat, with low-relief throughout most of the watershed. The watershed's highest elevation is 1,230 feet and lowest elevation is 667 feet. The western part of the watershed has varied topographical features due to glacial moraine deposits. The central and eastern portion flattens out into a relatively level glacial outwash plain. Near the Mississippi River, bedrock bluffs provide more significant relief, but bluff lands make up a small proportion of the overall watershed area.

With its proximity to the Twin Cities Metropolitan Area and a self-sustaining brown trout population, the Vermillion River is a popular place for local anglers and nature enthusiasts. The Vermillion River Watershed protected trout streams includes 32 miles of main stem and 14.4 miles of tributaries and is one of the last trophy trout fisheries in a metropolitan area, according to Trout Unlimited.

The VRW has been, and is continuing to be, threatened by rapid urban development and rural land uses. As the human population in the watershed grows with each passing year, so do concerns for maintaining the ecological integrity of the river and its tributaries.



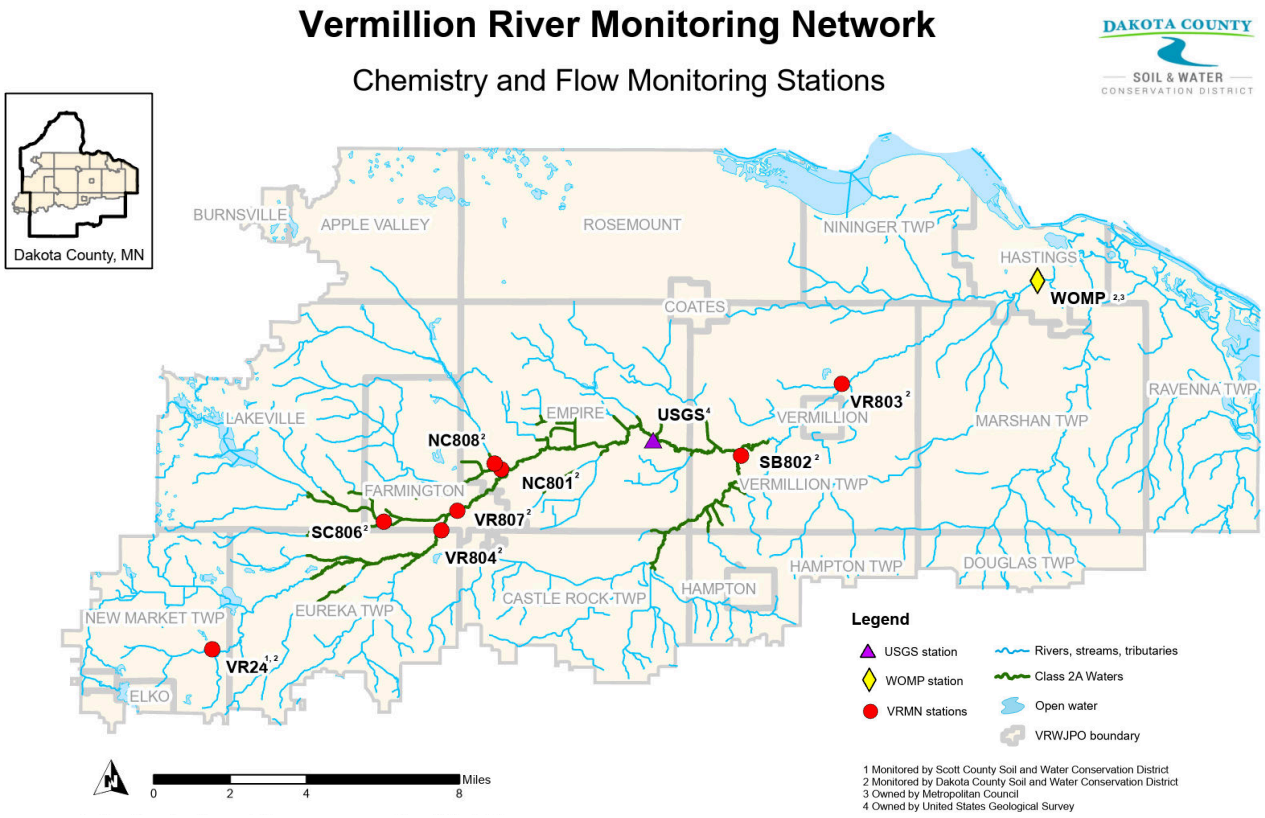
North Creek

Monitoring History and Sampling Parameters

The Vermillion River Monitoring Network (VRMN) was created in the early 2000s to obtain water quality and quantity data for the VRW on behalf of the Vermillion River Watershed Joint Powers Organization (VRWJPO). The VRMN is designed to be spatially extensive and representative of the wide range of flow regimes and land uses encountered in the VRW and its eight unique subwatersheds.

Six of these subwatersheds – Upper Mainstem Vermillion River • South Creek • Middle Mainstem Vermillion River • North Creek • South Branch Vermillion River • Lower Mainstem Vermillion River – are reported here. The two additional subwatersheds – Middle Creek and Lower Vermillion-Mississippi Direct – are not explicitly discussed due to the lack of a representative monitoring station in either subwatershed. While conditions in the Middle Creek Subwatershed are understood as part of the North Creek Subwatershed analysis, due to the Mississippi River's influence on the Lower Vermillion-Mississippi Direct Subwatershed during flood conditions, no independent water quality data have been collected in that subwatershed at this time.

The network consists of eight permanent monitoring stations representing the different subwatersheds and several biological (habitat and macroinvertebrate) monitoring stations. These strategically selected sites provide information about the status of the river and its tributaries, allowing for tracking of long-term trends and more effective management of the water quality and quantity of the VRW.



Sampling parameters include a combination of chemical, physical, and biological parameters and assessments to help identify major sources of pollutants and prioritize areas for management.

Chloride • Chlorophyll a • Dissolved Oxygen • *E. coli* bacteria • Habitat Macroinvertebrates • Nitrate • pH • Specific Conductance • Temperature • Total Phosphorus Total Suspended Solids • Transparency

Water Quality Monitoring

Water quality monitoring of several chemical and physical parameters enables local decision makers and state agencies to evaluate the VRW in order to implement appropriate management strategies to better protect and improve overall stream health.

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.

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. The state standard for coldwater streams is 7 mg/L as a daily minimum and 5 mg/L as a daily minimum for warm water streams.

Conductivity is a measure of water's ability to transmit an electrical current due to the presence of dissolved chemicals. 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 (ammonia and some heavy metals) in the water making them toxic . 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. Human sources of pH fluctuations are usually related to pollution, including stormwater or agricultural runoff, wastewater discharge, or industrial runoff.

Temperature is an important factor to consider when assessing water quality. Water temperature is influenced by both natural (groundwater) and anthropogenic factors (stormwater runoff, eroding soils, and removal of streambank vegetation). Not only can it influence other important monitoring parameters (such as DO and pH), temperature also dictates the types of macroinvertebrates and fish that are able to survive in a given waterbody. Several trout species thrive in cooler waters and studies have shown that temperatures outside their preferred range can affect metabolic rate, as well as behavior, predator-prey responses, and duration of active/rest periods.



South Creek



Vermillion River

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. Excess phosphorus sources are usually associated with human activities: soil erosion, human and animal wastes, septic systems, detergents, runoff from farmland, streets (leaf litter) or lawns. The state standard for all monitoring sites within the VRW is less than or equal to 0.15 mg/L.

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, can cause significant water quality problems including accelerated eutrophication, which affects dissolved oxygen, temperature, and other water quality indicators. Nitrates are naturally present in low concentrations in surface and ground waters, but are harmful to humans and livestock, and cause aquatic ecosystem degradation in high concentrations. In the lower portion of the VRW, water flows directly into the underlying groundwater aquifer. Because of this, practices on the landscape can affect the amount of surface water runoff, sediment, and nutrients that are transported to the river. 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. Coldwater streams are protected as potential drinking water sources and have a less than or equal to 10 mg/L standard.

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. The state standard for coldwater streams is less than or equal to 10 mg/L and less than or equal to 30 mg/L for warm water streams.

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. The *E. coli* standard of less than or equal to 126 organisms/100mL as a geometric mean replaced fecal coliform as Minnesota's water quality standard for bacteria in 2008.

Upper Mainstem Vermillion River Subwatershed

2025 Activity Summary

- Water samples were collected biweekly from March through October
- Water level monitoring equipment was installed at VR24 by Dakota SWCD and at VR804 and VR807 by the Minnesota DNR
  - Continuous water level and temperature readings are collected at 15 minute intervals





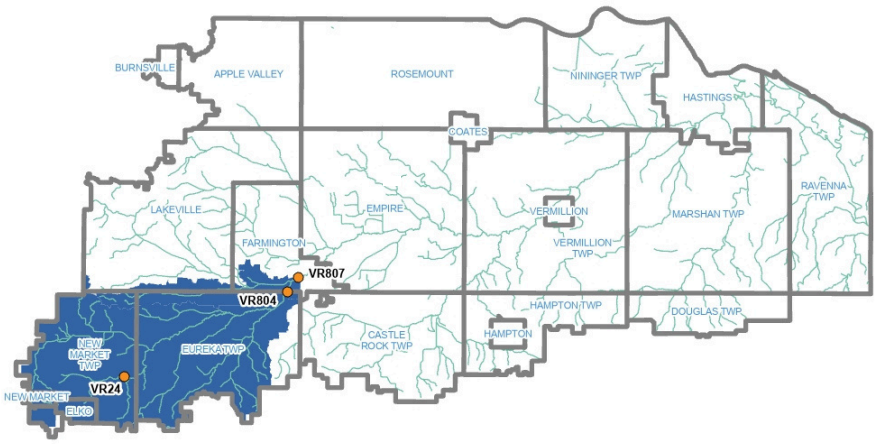


Monitoring Sites

- VR24
  - Vermillion River at Pillsbury Ave
- VR804
  - Vermillion River at 220th St
- VR807
  - Vermillion River at Spruce St

Topography and Land Use

- Gently rolling
- Predominantly agricultural with residential and commercial lots



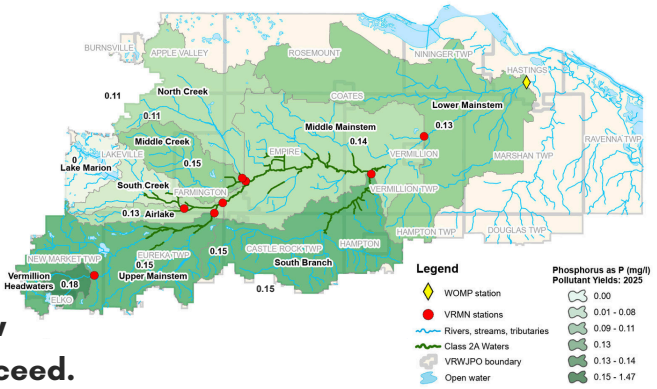
Field Data - Temperature, Dissolved Oxygen, Transparency, Conductivity, pH

Water quality data were collected during all flow conditions from March to October, 2025. **On most occasions, field parameters fell within the desired ranges**. During runoff and snowmelt sampling events, dissolved oxygen (too low at VR804 and VR807), transparency (reduced at all sites), and conductivity (exceeded at at all sites) issues were identified.

Parameter	Desired Range	VR24 Range	VR804 Range	VR807 Range
Temperature (°C)	Less than 30	-0.05 - 21.47	0.11 - 21.26	0.35 - 21.33
Dissolved Oxygen (mg/L)	Warm water - > 5.0 Coldwater - > 7.0	Warm: 7.3 - 13.03	Cold: 5.53 - 12.56	Cold: 5.39 - 12.21
Transparency (cm)	Greater than 25	11 - 100	21 - 100	16 - 100
Conductivity (µS/cm)	Less than 698	460.4 - 840	369.9 - 793	406.2 - 750

Phosphorus

Total Phosphorus (TP) includes all forms of phosphorus; particulate and dissolved. **The state standard of 0.15 mg/L was exceeded during runoff (> 1" rain in 24 hour period) and snowmelt events.** These conditions often lead to phosphorus laden sediment being carried into the river via runoff from streets and agricultural fields. **The majority of samples collected during baseflow conditions were below the standard, though occasional individual sample did exceed.**



In 2025, the Vermillion Headwaters subwatershed (located entirely in Scott County; VR24 is the outlet site), showed TP pollutant yields more in line with other sites (see map above) than in 2024 when yields were 5-6x higher than sites lower in the watershed. Climactic conditions returned to more "normal" rainfall amounts in 2025, so lower yields could be due to a lack of legacy TP flushing through the system.

Nitrates

The US Environmental Protection Agency set a nitrate (NO_3) standard of ⩽10 mg/L for drinking water to protect human health. Nitrate in streams is natural, but natural levels are generally around 0.5-2 mg/L. **In 2025, nitrate concentrations did not exceed the drinking water standard at any site.** Nitrate was highest during baseflow conditions and decreased due to rainwater diluting in-stream concentrations.

Total Suspended Solids

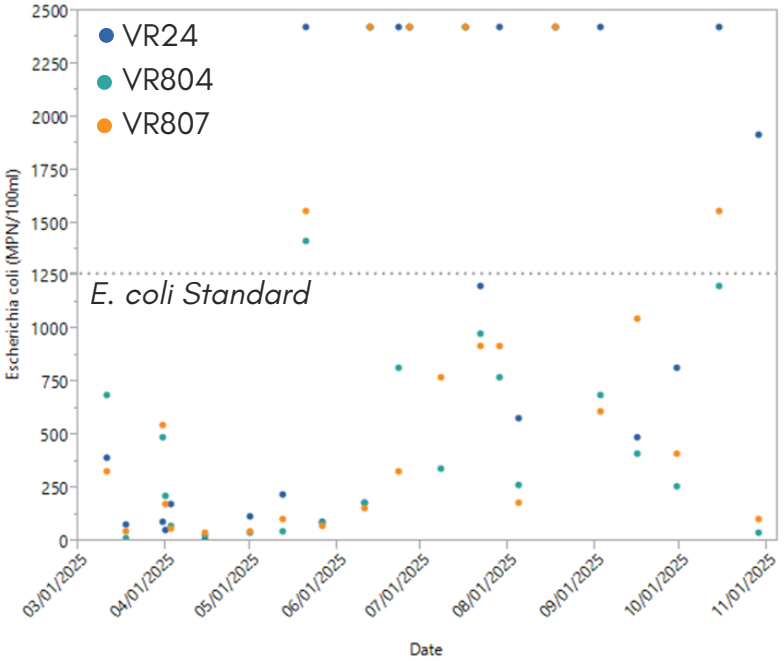
For all water samples collected in 2025, median TSS levels were below the state standard of 30 mg/L (VR24 - warm water standard) and 10 mg/L (VR804 & VR807 - coldwater standard) respectively. TSS levels fluctuated throughout the season, but were highest during runoff or snowmelt events due to increased sediment flowing into the creek.

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 were well below the state standard (⩽ 35 ug/L) at all sites.**

E. coli

VR24 continues to have *E. coli* levels that are considerably higher than other stations in the network, violating the single sample standard (< 1,260 MPN/100mL - see right) in over a third of samples collected in 2025. **The annual *E. coli* geometric mean (126 MPN/100mL standard) of 510.95 MPN/100 mL continues to be much higher than at other VRMN sites**. *E. coli* levels at VR804 (321.56 MPN/100mL), and VR807 (370.76 MPN/100mL) were consistent with levels seen in the lower portions of the watershed.

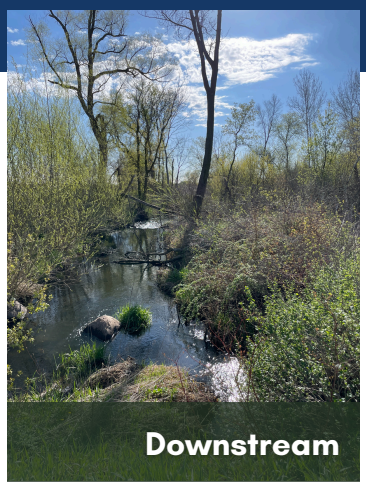


**VR24 and VR807 analysis limit at 2,420 MPN/100mL*

From 2016-2023, Scott SWCD staff assessed watercourses upstream of VR24 to determine the source of the elevated *E. coli* levels. Analyses showed sources of human DNA at all sites, with septic sources suspected as contributing to the issue. The VRWJPO continues to work with Scott County to determine a management strategy.

South Creek Subwatershed


Upstream


Downstream

2025 Activity Summary

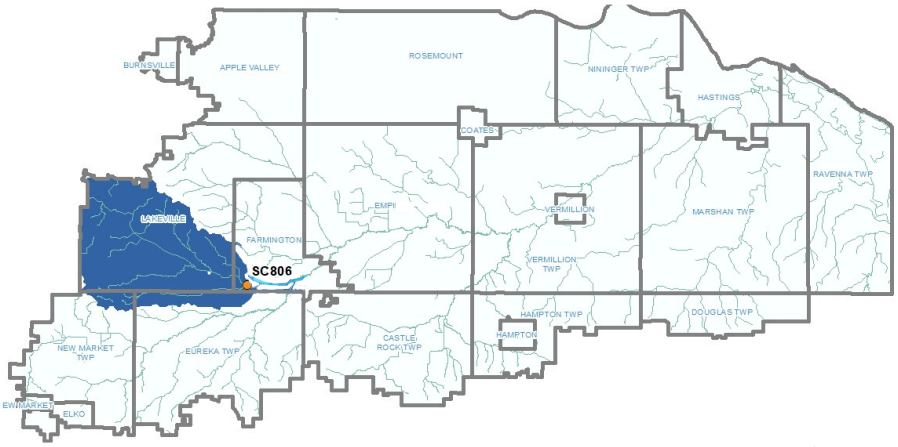
- Water samples were collected biweekly from March through October
- Water level monitoring equipment was installed by the Minnesota DNR
  - Continuous water level and temperature readings are collected at 15 minute intervals

Monitoring Site

- SC806
  - South Creek at Flagstaff Ave

Topography and Land Use

- Gently rolling
- Residential with industrial and agricultural



Field Data - Temperature, Dissolved Oxygen, Transparency, Conductivity, pH

Water quality data were collected at SC806 during all flow conditions from March to October, 2025. **On most occasions, field parameters fell within the desired ranges**. During runoff events, dissolved oxygen (too low), transparency (reduced), and conductivity (exceeds) issues were identified.

Parameter	Desired Range	SC806 Range
Temperature (°C)	Less than 30	0.38 - 22.34
Dissolved Oxygen (mg/L)	Greater than 7.0	4.87 - 11.56
Transparency (cm)	Greater than 25	20 - 100
Conductivity (µS/cm)	Less than 698	318.5 - 910
pH (S.U.)	6.5 to 9.0	7.62 - 8.05

Phosphorus

TP samples collected during baseflow conditions were below the state standard of 0.15 mg/L throughout the monitoring season. **Spring runoff conditions resulted in samples that exceeded the standard** as large runoff events send sediment and other pollutants into the creek via storm runoff from streets, parking lots, and industrial areas in this watershed.

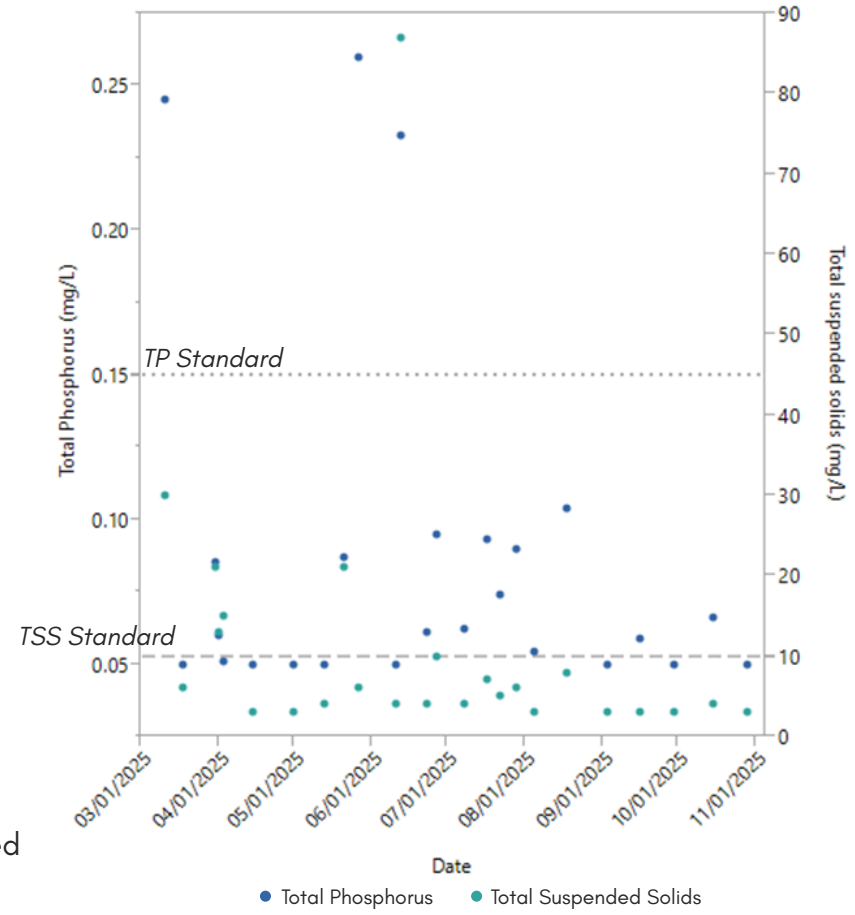
Total Suspended Solids

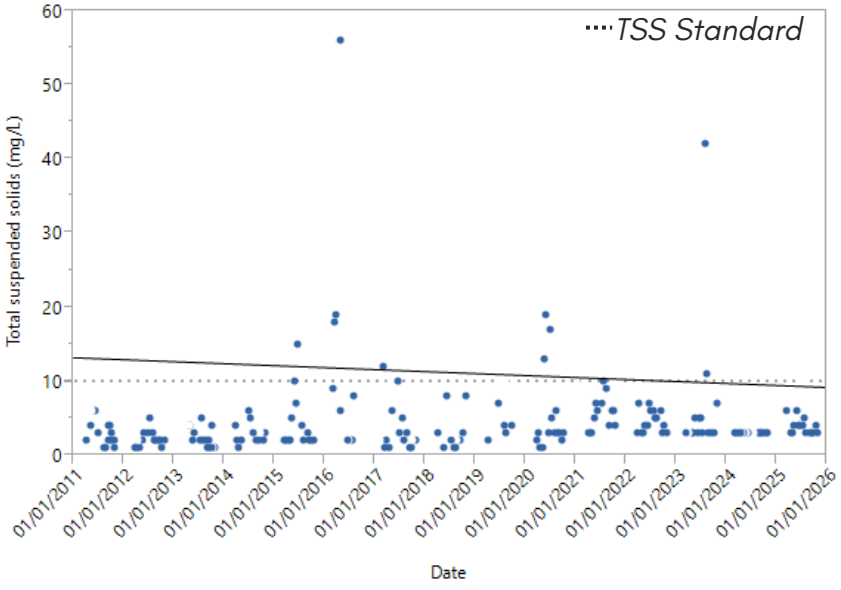
All samples collected during baseflow conditions met the TSS state coldwater standard of 10 mg/L. The highest TSS levels occurred during monitoring events that TP levels were also higher. TSS showed less variability during the midsummer and fall when the stream returned to baseflow conditions.

In recent years, the VRWJPO has implemented several projects in the South Creek Subwatershed focusing on TSS reduction: installation of hydrodynamic separator stormwater treatment devices, stream restorations, and bio infiltration. Historical monitoring results since 2016 show a reduction in TSS concentration overtime, as well as increased consistency in sample levels during baseflow conditions, suggesting efforts are meaningfully addressing pollutant reductions on the landscape.

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 were below the state standard (⩽ 35 ug/L), with variability under all conditions.**





E. coli

***E. coli* levels are significantly lower in the South Creek Subwatershed than in the Upper Mainstem Vermillion River Subwatershed.** Only six samples exceeded the state single sample standard (< 1,260 MPN/100mL) with the majority of samples collected in the early spring.

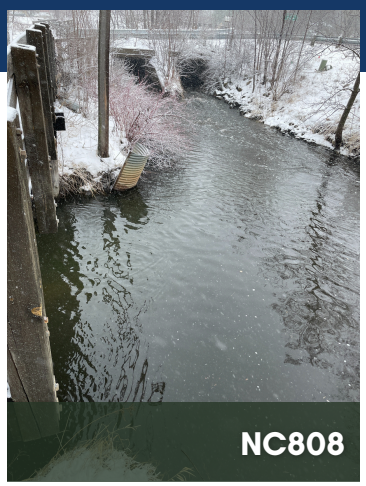
The *E. coli* geometric mean of 315.33 MPN/100 mL was nearly half of VR24, in line with VR804 and VR807 which are located nearby.

Nitrates

Nitrate concentrations were significantly below the EPA's ⩽ 10 mg/L) drinking water standard regardless of monitoring condition.

North Creek Subwatershed





2025 Activity Summary

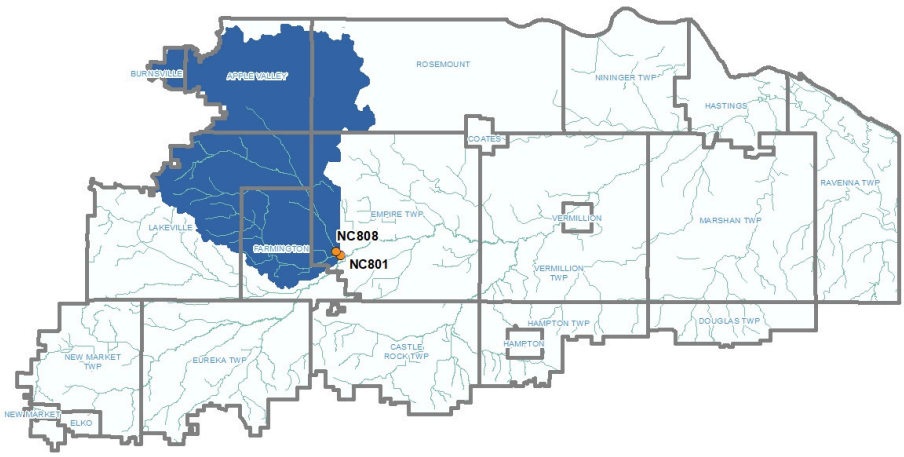
- Water samples were collected biweekly from March through October
- Water level monitoring equipment was installed by Dakota SWCD staff
  - Continuous water level and temperature readings are collected at 15 minute intervals

Monitoring Sites

- NC801
  - North Creek at Hwy 3 (DS)
- NC808
  - North Creek at Hwy 3 (US)

Topography and Land Use

- Relatively flat to gently rolling
- Residential with some agriculture, commercial, and industrial



Field Data - Temperature, Dissolved Oxygen, Transparency, Conductivity, pH

Water quality data were collected at NC801 and NC808 during all flow conditions from March to October, 2025. **On most occasions, field parameters fell within the desired ranges**. Dissolved oxygen (too low at both sites), transparency (reduced for both sites), and conductivity (exceeded at both) were issues identified during runoff and snowmelt events.

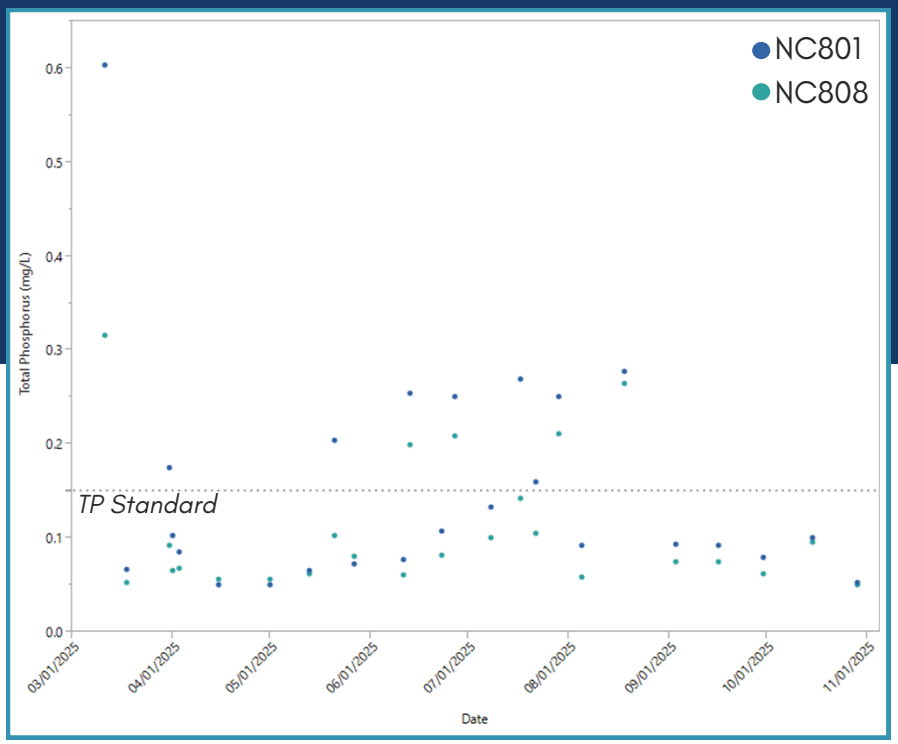
Parameter	Desired Range	NC801 Range	NC808 Range
Temperature (°C)	Less than 30	0.14 - 21.56	1.22 - 21.67
Dissolved Oxygen (mg/L)	Greater than 7.0	4.48 - 11.83	5.1 - 12.09
Transparency (cm)	Greater than 25	14 - 100	18 - 100
Conductivity (µS/cm)	Less than 698	408.3 - 795	332.5 - 821
pH (S.U.)	6.5 to 9.0	7.6 - 8.28	7.51 - 8.87

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 were below the standard (⩽ 35 ug/L), with variability throughout the monitoring season.**

Phosphorus

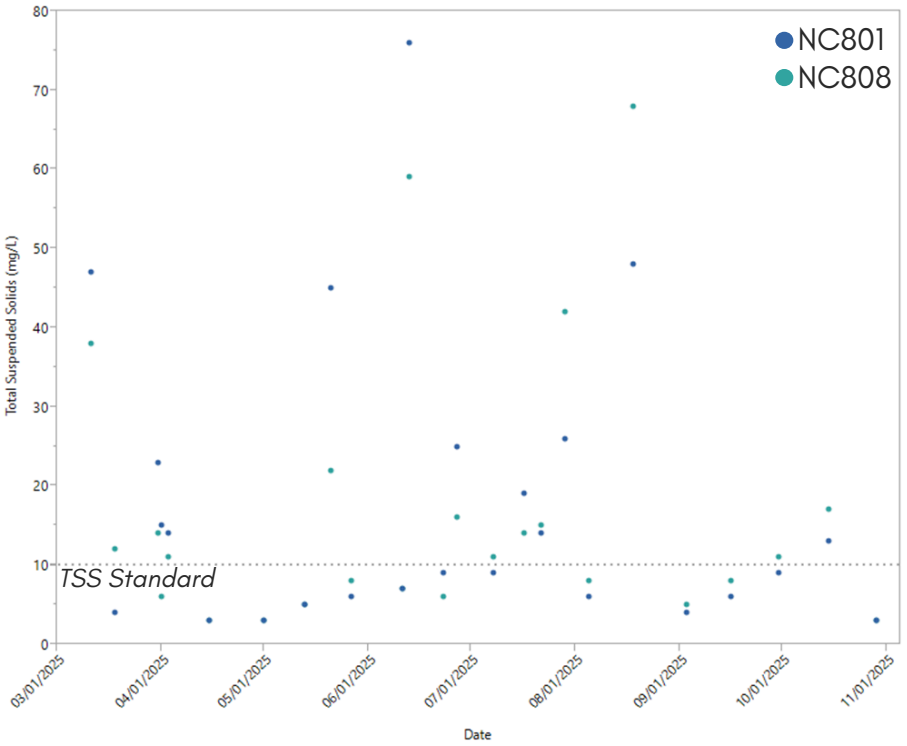
The TP state standard of 0.15 mg/L was exceeded during runoff conditions (> 1" rain in 24 hour period) in the midsummer. Samples collected during baseflow conditions in the spring and fall were below the standard at both sites. Throughout the season, TP levels at NC801 (DS site) were consistently higher than at NC808.



Total Suspended Solids

TSS levels were within the state's coldwater standard of 10 mg/L during the late spring and throughout the fall months. **TSS levels fluctuated with snowmelt and individual rain events in the early spring before being consistently above the standard from late May through early August.** The highest value in 2025 was seen at NC808 on June 13th with a reading of 76 mg/L.

Unlike with TP, TSS levels at NC808 were consistently above levels at NC801.



E. coli

***E. coli* levels in the North Creek Subwatershed were in line with levels seen elsewhere in the VRW.** Eight samples at both sites exceeded the state single sample standard (< 1,260 MPN/100mL) with the majority of samples collected in the early spring.

The annual geometric mean at NC801 of 404.77 MPN/100mL was the second highest while 269.04 MPN/100 mL at NC808 was average for the VRW.

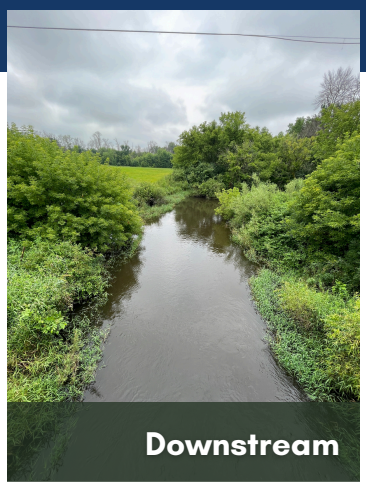
Nitrates

Nitrate concentrations did not exceed the EPA's ⩽ 10 mg/L drinking water standard during the monitoring season at either site. Concentrations were in fact considerably lower than the standard, much like in other parts of the VRW. Nitrate was highest during baseflow conditions and decreased due to rainwater diluting in-stream concentrations.

North Creek

South BranchVermillion River Subwatershed





2025 Activity Summary

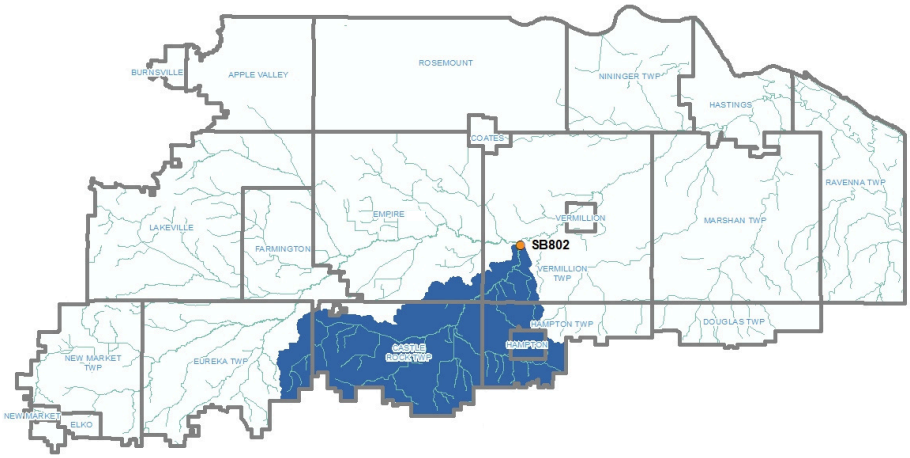
- Water samples were collected biweekly from March through October
- Water level monitoring equipment was installed by the Minnesota DNR
  - Continuous water level and temperature readings are collected at 15 minute intervals

Monitoring Sites

- SB802
  - South Branch Vermillion River at 200th St E

Topography and Land Use

- Flat with hills in southern portion
- Predominately agricultural land use



Field Data - Temperature, Dissolved Oxygen, Transparency, Conductivity, pH

Water quality data were collected at SB802 during all flow conditions from March to October, 2025. **On most occasions, field parameters fell within the desired ranges**. Dissolved oxygen (too low) and transparency (reduced) issues were identified in the watershed during runoff and snowmelt conditions.

Parameter	Desired Range	SB802 Range
Temperature (°C)	Less than 30	0.37 - 20.81
Dissolved Oxygen (mg/L)	Greater than 7.0	5.99 - 12.3
Transparency (cm)	Greater than 25	13 - 100
Conductivity (µS/cm)	Less than 698	296.5 - 601
pH (S.U.)	6.5 to 9.0	7.72 - 8.1

Phosphorus

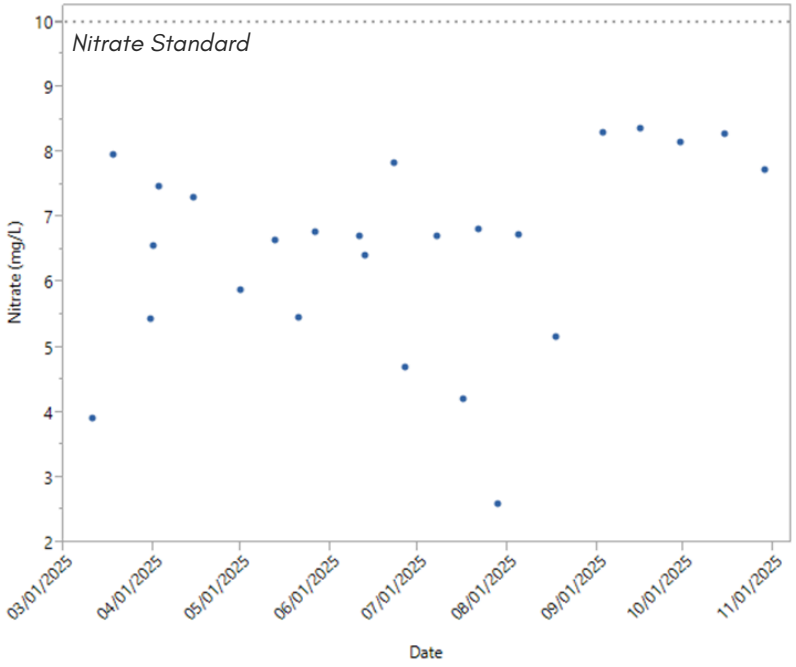
The TP state standard of 0.15 mg/L was **exceeded during runoff conditions (> 1" rain in 24 hour period) in late May/early June and late July/early August. Samples collected during baseflow conditions were below the standard.** Large runoff events often lead to sediment and other pollutants being carried into the creek via storm runoff from streets and agricultural fields.

Total Suspended Solids

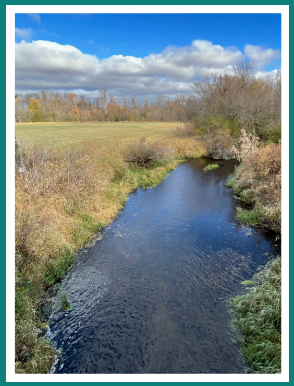
For the majority of water samples collected in 2025, **the TSS levels were within the state's coldwater standard of 10 mg/L**, although the standard may have been exceeded on days when samples were not collected. TSS levels fluctuated throughout the season, but were highest during runoff or snowmelt events in the watershed as that would have resulted in increased sediment flowing into the creek.

Nitrates

Nitrate concentrations **did not exceed the EPA's ⩽ 10 mg/L drinking water standard** during the monitoring season, **though levels are higher in this subwatershed than in others in the VRW.** Nitrate was highest during baseflow conditions and decreased due to rainwater diluting in-stream concentrations.



The **baseflow nitrate levels measured at SB802 continue to increase.** The subwatershed is predominately agricultural land use, has course-textured soils, and a high-water table. The increasing NO3 in the watershed may be the result of one of the following factors - 1) an increase in the amount of drain tile installed; 2) the turnover of marginal land not in production (or lands in conservation programs) to lands in production with concurrent nitrogen applications; 3) poor nutrient management resulting in the improper rate, source, time or placement of nitrogen fertilizers; or 4) an increase in the total acreage of agricultural land in the watershed, which in turn results in greater application of fertilizer to said land. All these factors can result in elevated NO3 levels in the soil, from which available NO3 can leach into shallow groundwater or be directly discharged to a nearby stream or ditch through drain tile.



E. coli

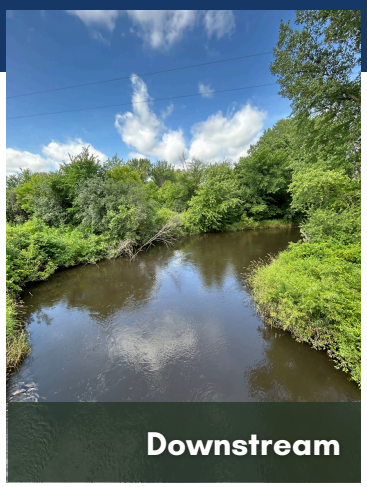
***E. coli* levels are lower in the South Branch Vermillion River Watershed than elsewhere.** Only six samples exceeded the state single sample standard (< 1,260 MPN/100mL) with the majority collected during the rainy period from June to late August. **The annual *E. coli* geometric mean of 245.24 MPN/100 mL was lowest in the whole watershed.**

Chlorophyll-a

Chlorophyll-a levels were well below the state standard (⩽ 35 ug/L), with variability throughout the monitoring season.

Middle Mainstem Vermillion River Subwatershed


Upstream


Downstream

2025 Activity Summary

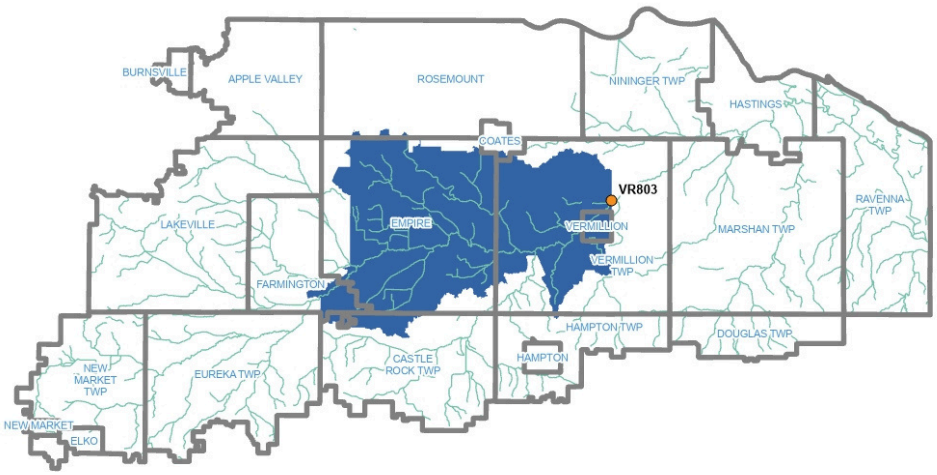
- Water samples were collected biweekly from March through October
- Water level monitoring equipment was installed by the Minnesota DNR
  - Continuous water level and temperature readings are collected at 15 minute intervals

Monitoring Sites

- VR803
  - Vermillion River at Goodwin Ave

Topography and Land Use

- Gently rolling
- Predominantly agricultural with residential and commercial lots



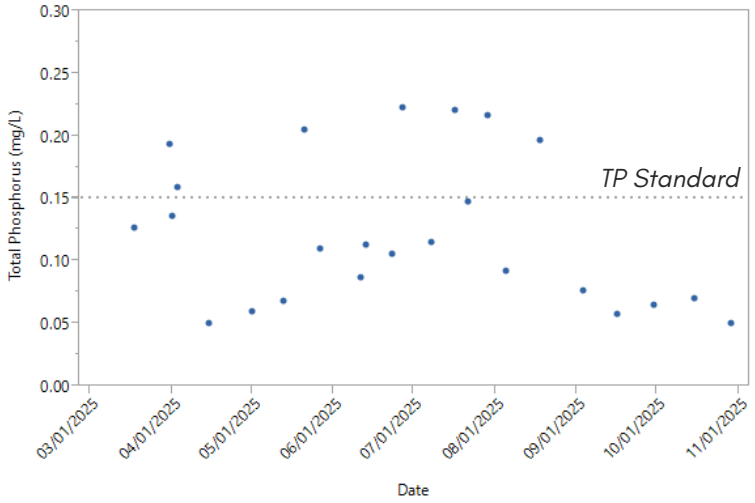
Field Data - Temperature, Dissolved Oxygen, Transparency, Conductivity, pH

Water quality data were collected during all flow conditions from March to October, 2025. **On most occasions, field parameters fell within the desired ranges**. Baseflow conditions met expectations, while during runoff events, dissolved oxygen (too low), transparency (reduced), and pH (exceeds) issues were identified.

Parameter	Desired Range	VR803 Range
Temperature (°C)	Less than 30	1.54 - 22.10
Dissolved Oxygen (mg/L)	Coldwater - Greater than 7.0	6.32 - 12.39
Transparency (cm)	Greater than 25	14 - 100
Conductivity (µS/cm)	Less than 698	383 - 680
pH (S.U.)	6.5 to 9.0	7.83 - 8.29

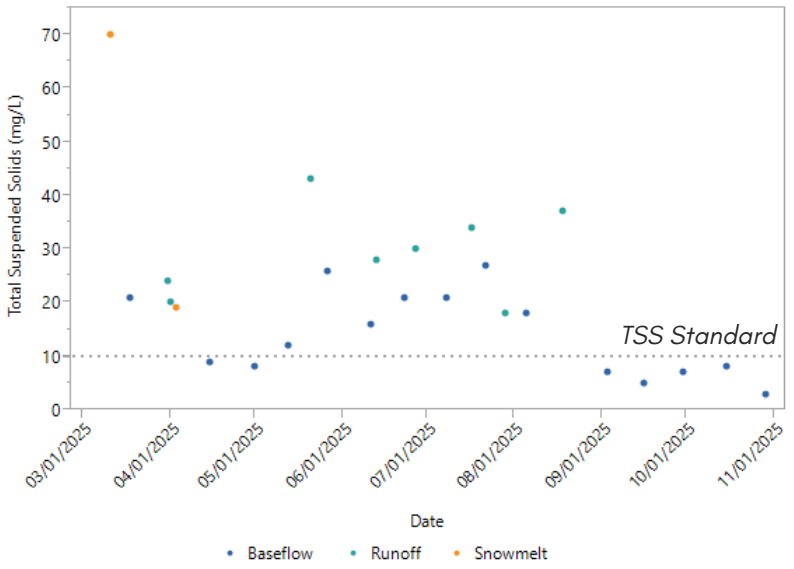
Phosphorus

The TP state standard of 0.15 mg/L was exceeded during runoff conditions (> 1" rain in 24 hour period) **in late May/early June and late July/early August. Samples collected during baseflow conditions were below the standard.** Large runoff events often lead to sediment and other pollutants being carried into the creek via storm runoff from streets, parking lots, and agricultural fields.



Total Suspended Solids

TSS levels exceeded the state's coldwater standard of 10 mg/L several times throughout the monitoring season. TSS levels were highest during runoff and snowmelt events in the watershed. During these conditions, TSS levels would be higher due to increased sediment flowing into the creek. Mid-summer sampling events also had elevated TSS levels as water levels were slowly returning to baseflow levels.



Nitrates

Nitrate **concentrations did not exceed the EPA's ⩽ 10 mg/L drinking water standard during the monitoring season at both sites.** Nitrate was highest (4.95 mg/L) during baseflow conditions and decreased to 1.17 mg/L due to rainwater dilution of in-stream nitrate concentrations.



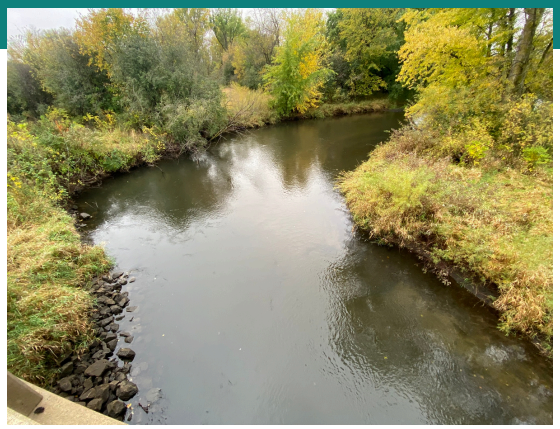
Chlorophyll-a

Chlorophyll-a levels were **below the state standard (⩽ 35 ug/L),** with increased variability towards the end of the year.

E. coli

E. coli levels are again much lower in the Middle Mainstem Vermillion River Subwatershed than what was found in the Upper Mainstem Vermillion River (specifically VR24). **Only six samples exceeded the state single sample standard (< 1,260 MPN/100mL) with five of the samples collected during the rainy period from June to late August.**

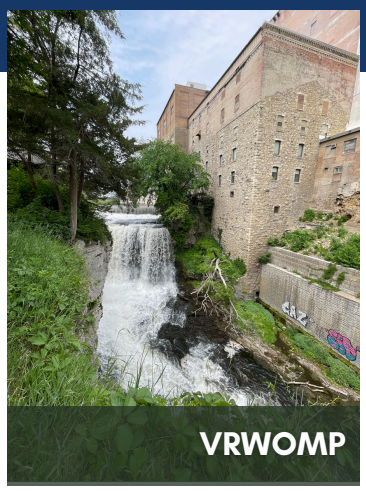
The annual *E. coli* geometric mean of 295.50 MPN/100 mL in line with other VRMN sites in the watershed.



Middle Mainstem Vermillion River

Lower Mainstem Vermillion River Subwatershed





2025 Activity Summary

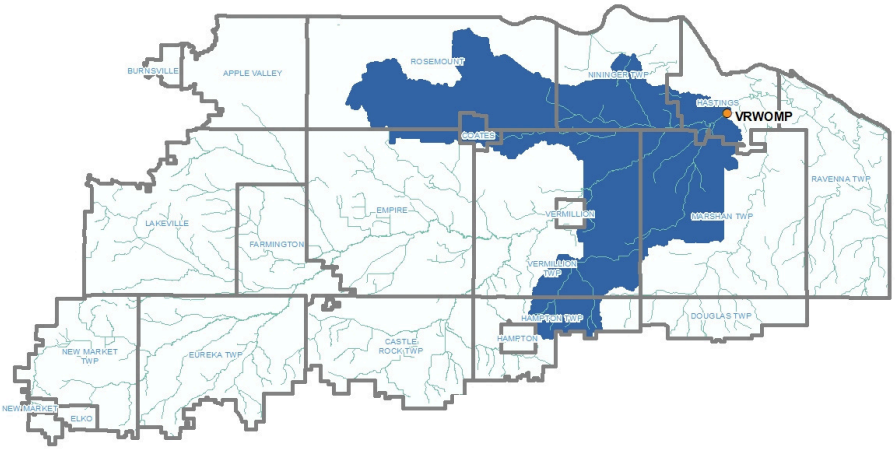
- Water samples were collected monthly from March through October
- Water level monitoring equipment was installed by Metropolitan Council
  - Continuous water level and temperature readings are collected at 15 minute intervals

Monitoring Sites

- VRWOMP
  - Vermillion River at Vermillion Falls Park (Great River Rd)

Topography and Land Use

- Steeper slopes transitioning to flat
- Predominately agricultural land use



Field Data - Temperature, Dissolved Oxygen, Transparency, Conductivity, pH

Water quality data were collected at VRWOMP during all flow conditions from March to October, 2025. **On most occasions, field parameters fell within the desired ranges**. Transparency (reduced) and conductivity (exceeded) measurements were out of range, but to a lesser extent than at other sites in the watershed.

Parameter	Desired Range	VRWOMP Range
Temperature (°C)	Less than 30	0 - 24.24
Dissolved Oxygen (mg/L)	Warm water - Greater than 5.0	7.57 - 13.3
Transparency (cm)	Greater than 25	16 - 100
Conductivity (µS/cm)	Less than 698	390.3 - 745
pH (S.U.)	6.5 to 9.0	8.03 - 8.5

Phosphorus

The TP state standard of 0.15 mg/L was exceeded during runoff conditions (> 1" rain in 24 hour period) in late May/early June and late July/early August. Samples collected during baseflow conditions in the early spring and fall were below the standard. Large runoff events often lead to sediment and other phosphorus-laden pollutants being carried into the river via storm runoff from streets, parking lots, and agricultural fields.

E. coli

***E. coli* levels seen at the VRWOMP site are in line with levels seen elsewhere higher up in the watershed.** Six samples exceeded the state single sample standard (< 1,260 MPN/100mL) with all samples collected between the middle of May and mid August. The annual *E. coli* geometric mean of 278.21 MPN/100 mL was third lowest in the watershed.

Chlorophyll-a

Chlorophyll-a levels were well below the state standard (⩽ 35 ug/L). Levels were rather consistent throughout the year, showing less variability than in previous years..

Nitrates

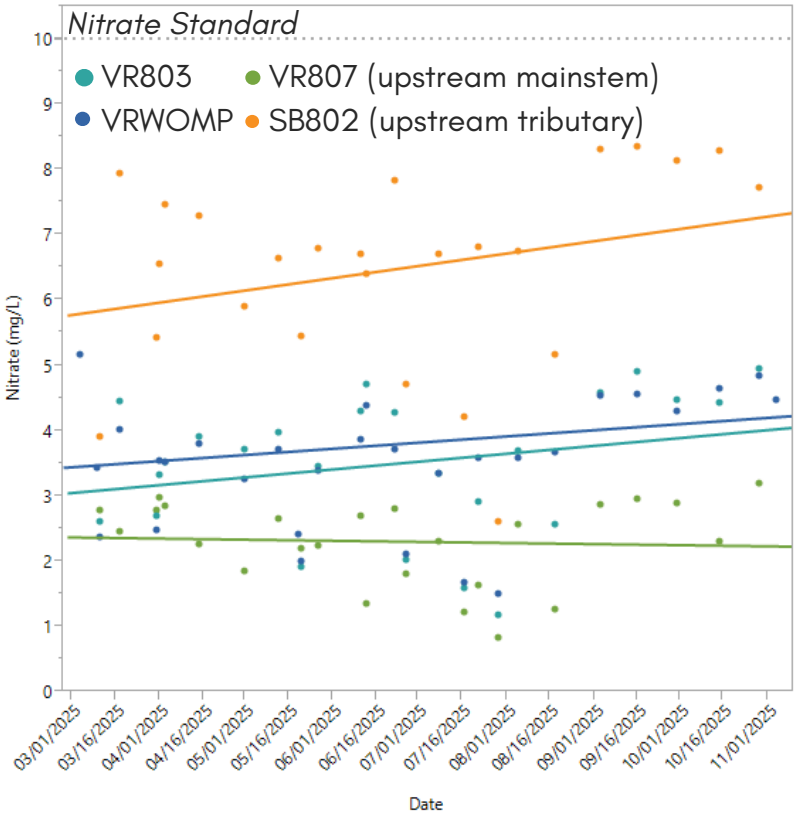
VRWOMP nitrate concentrations did not exceed the drinking water standard, though it is higher than levels in the middle watershed (VR803) and upper (VR807) watersheds due to influence from the South Branch Vermillion River (SB802). Nitrate levels were highest during baseflow conditions in the spring and fall and decreased mid-season due to rainwater causing a dilution of in-stream nitrate concentrations.

The area's soils and underlying geology allow the Vermillion River water to recharge underlying groundwater aquifers. Nitrogen leaching from agricultural production has led to groundwater contamination in private drinking water wells and the city of Hastings' drinking water supply.

Total Suspended Solids

The TSS levels were within the state's warm water standard of 30 mg/L during baseflow conditions. Exceedances were most often seen when monitoring occurred during or immediately after a rain event. Variability was high throughout much of the season before dropping in early August, and then remained low until the end of the season.



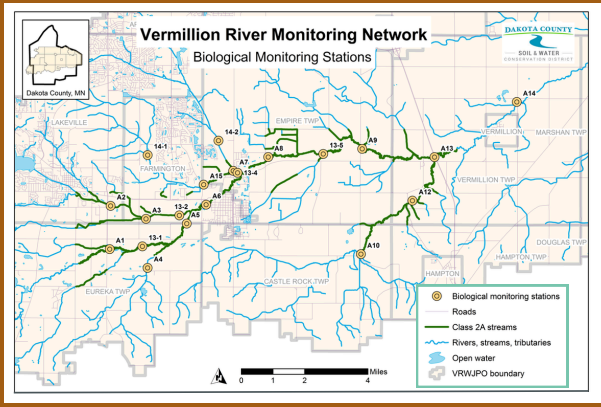


Lower Mainstem Vermillion River

Habitat and Macroinvertebrates

Monitoring biological communities is an accepted method for assessing the health of an aquatic environment. It is believed that biological monitoring is more sensitive when identifying the cumulative effects of numerous, simultaneous stressors as opposed to chemical and physical parameters which only provide a snapshot of the abiotic factors during the monitoring season.

Habitat assessments are completed at biological monitoring stations on the main stem Vermillion River and its tributaries to better understand possible stressors to the biotic community. **Six sites were monitored in August and September 2025. Two macroinvertebrate sampling sites scored above the impairment threshhold** and **four were below the threshhold**. **Five sites were categorized as "fair"** and **one as "good" for habitat**.



Temperature

Temperature is an important factor in growth and reproduction rates of macroinvertebrates and fish, particularly brown trout.

In 2025, temperature maximums were measured above 20°C (resistance range: prolonged exposure leads to a high mortality rate) at all coldwater stream sites during the summer months. **The highest water temperatures were observed in July at most sites.** The highest temperatures observed at SB802 were observed in August.

The three sites with the lowest temperatures (SC806, VR807, and SB802) may be attributed to cool groundwater influence during low flow conditions, either naturally from springs and seeps or artificially from tile drainage. The greatest temperature-induced stress on fish likely occurs in July when temperature is highest. Annual fish surveys have identified the reach at VR804 to likely have the least desirable temperature structure for coldwater fish as few, if any, coldwater fish were caught during previous sampling surveys.

Conclusion

The VRMN is valuable as it allows staff to make informed management decisions based on the VRW's physical, chemical, and biological characteristics. Improvement is possible even in the face of observed pollutant challenges. Water quantity and flow patterns impact aquatic communities, with too much or too little causing stress. Restoring in-stream and riparian habitat, reducing nutrients and suspended materials in the stream, minimizing temperature peaks, and identifying *E. coli* sources, among other possible conservation strategies, will have a cascading positive effect on the overall health of the river and its tributaries. An effective management strategy that focuses on both the water quality and quantity aspects of the VRW.

Recommendations

- Study conductivity and DO issues in North Creek and South Creek subwatersheds
- Implement projects to address increasing NO3 levels in the South Branch Vermillion River subwatershed
- Undertake habitat improvement projects to improve fish cover, sinuosity, and channel substrate
- Network with local landowners to initiate dialogue of available restoration opportunities
- Work with partners to install strategically placed water storage and retention features in prioritized areas to minimize fluctuations in flow and temperature
- Continue monitoring to assess progress toward water quality goals

Prepared for the Vermillion River Watershed Joint Powers Organization by the Dakota County Soil and Water Conservation District, May 2026