Sauk River Watershed District

2025 River & Streams Report

Written By: Abi Borgerding, Environmental Monitoring Manager

Email: abigail@srwdmn.org

Website: srwdmn.org

Telephone: 320-352-2231

Address: 642 Lincoln Rd

Sauk Centre, MN 56378

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Acronyms and Abbreviations

Table 1: Common acronyms/abbreviations

Acronym/Abbreviation	Explanation
µg/L	Micrograms per Liter
AIS	Aquatic Invasive Species
BMP	Best Management Practice
BOD	Biological Oxygen Demand
CWA	Clean Water Act
CWMP	Comprehensive Watershed Management Plan
DNR	Minnesota Department of Natural Resources; AKA, MN DNR
DO	Dissolved Oxygen
E. coli	*Escherichia coliform*
EPA	Environmental Protection Agency
FC	Fecal Coliform
FIBI	Fish Index of Biotic Integrity
Fish Bio	Fish Biological Assessment
ft	Foot/Feet
GUS	Getchell, Unnamed, Stony (GUS Plus WMD)
Hg-F	Mercury in fish tissue
Invert Bio	Invertebrate Biological Assessment
IWL	Impaired Waters List
m	Meter
mg	Milligram
MIBI	Macroinvertebrate Index of Biotic Integrity
mL	Milliliter
MPCA	Minnesota Pollution Control Agency
MPN	Most Probable Number
NCHF	North Central Hardwood Forest
NLCD	National Land Cover Database
N+N	Nitrate + Nitrite (inorganic nitrogen)
OP	Ortho-phosphate
PCB-F	Polychlorinated biphenyls in fish tissue
SO_4	Sulfate
SCD	Stearns County Ditch OR Stearns Conservation District
SRDA	Sauk River Drainage Authority
SRWD	Sauk River Watershed District
SWCD	Soil and Water Conservation District
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSS	Total Suspended Solids
WMD	Watershed Management District
WQS	Water Quality Standard

WATERSHED BACKGROUND

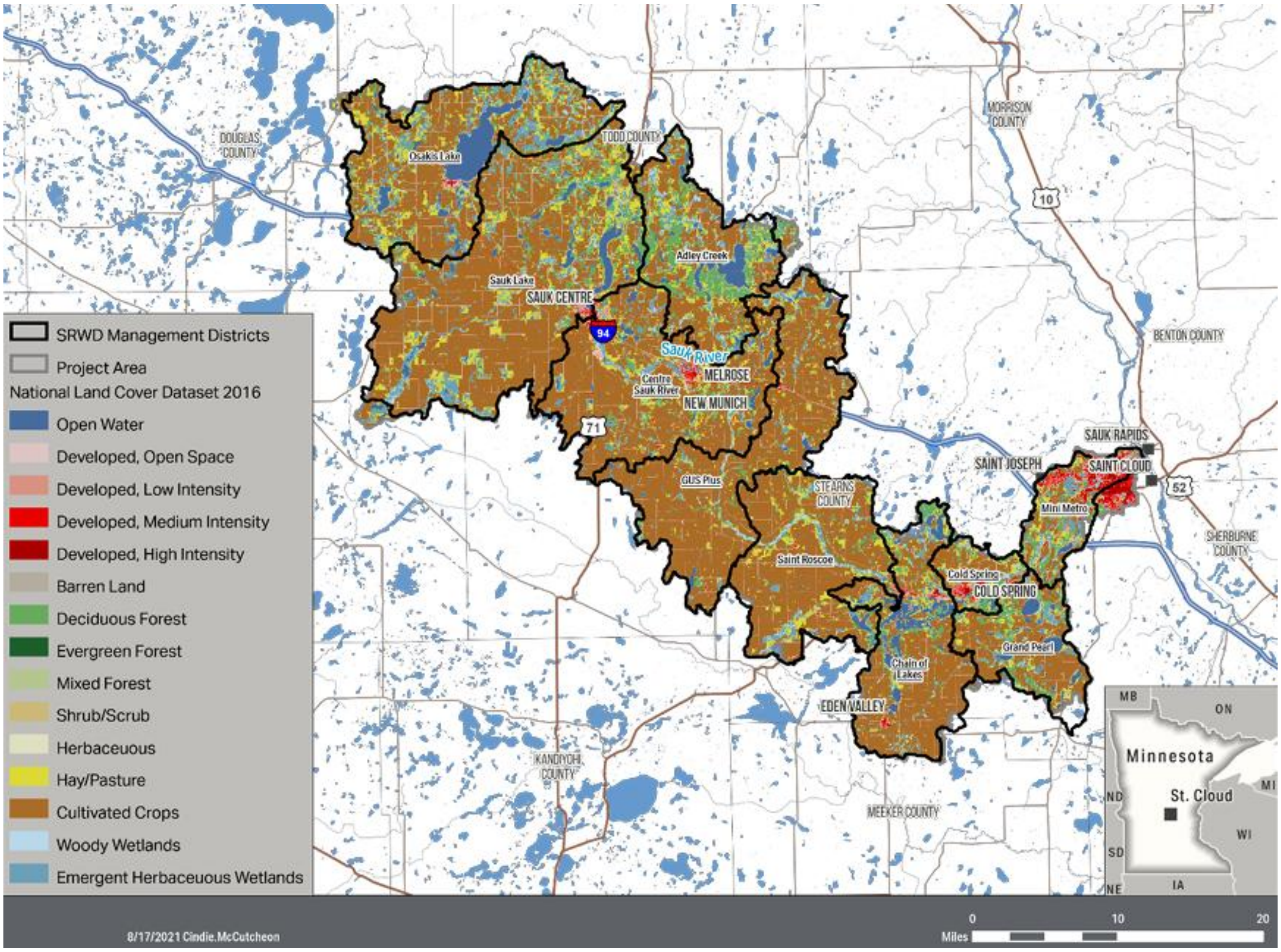
The Sauk River Watershed is one of unique characteristics, stories, and history. Its origin is at the outlet of Lake Osakis, then it flows to the southeast about 126 miles and ultimately outlets into the Mississippi River, just upstream of the St. Cloud Drinking Water Treatment Facility. The watershed drains approximately 1041 square miles and extends into Stearns (64% of watershed area), Todd (21%), Douglas (9%), Pope (5%), and Meeker (1%) Counties. Situated in the middle of the state, it has abundant surface water resources with over 280 lakes greater than 10 acres in size, 366 miles of perennial streams, and 190 extensive miles of public drainage systems. The river has major dams in the cities of Sauk Centre, Melrose, and Cold Spring, creating flowage lakes that affect the river's movement. The flow rate is greatly reduced in these flowage lakes, and water passes through much slower than in the free-flowing portions of the Sauk River.

Image 1: Headwaters of Sauk River at Lake Osakis outlet

The watershed is located in the North Central Hardwood Forests (NCHF) Ecoregion. With a long history of agriculture, the most prominent land use is row crops (61%), followed by hay/pasture (10%), wetlands (9%), forest (8%), urban (6%), and open water (5%). The watershed is divided into 10 watershed management districts (WMDs): Osakis Lake, Sauk Lake, Adley Creek, Centre Sauk River, GUS Plus, Saint Roscoe, Chain of Lakes, Grand Pearl, Cold Spring, and Mini Metro. These WMD boundaries are used to determine areas of beneficial use for water quality improvement projects and to create a regional fee structure to fund projects. The SRWD maintains multiple monitoring sites located at the pour point, or outlet, of each management district, or as close to it as possible. Water quality monitoring samples and flow measurements are collected at these locations to evaluate the water quality within each of the subwatersheds.

Monitoring all tributaries within the SRWD is not possible due to limited personnel, time, and funding. To bolster data collection, partnerships have been made with the Minnesota Pollution Control Agency (MPCA), Minnesota Department of Natural Resources (MN DNR), multiple local lake associations, and citizen volunteers to allow the SRWD to collect considerably more water quality samples each year than would be possible with SRWD's limited staff. Water quality data has been collected at many of the current sampling sites for several years, which allows the SRWD and our partners to analyze the data for long-term trends and track water quality changes over time.

Figure 1: Land cover and watershed management districts (WMDs)



Water Quality & Pollutants

Sources of water quality pollutants are highly variable and depend on the surrounding landscape, land use practices, soil types, topography, climate, and more. A pollutant usually refers to a chemical or nutrient that can contaminate a waterbody and negatively affect the recreational use and aquatic environment. Water quality standards (WQS) are numeric pollutant concentrations that, when met, describe the desired condition of a waterbody. WQS are critical regulatory tools in protecting aquatic resources from the impacts of pollution. The Sauk River is considered a **Class 2** waterway, meaning the primary designated use is for aquatic habitat and recreation. The federal Clean Water Act (CWA) and Minnesota Rules provide some flexibility to the WQS in waterbodies with unique circumstances that alter the typical relationship between a pollutant and the water's beneficial uses. There are several waterbodies in the SRWD with alternative/site-specific WQS.

To understand the conditions of water resources and water quality trends, it is vital to have long records of data collection. The SRWD has a robust history of water quality monitoring and has been collecting water samples since its inception in 1986. Water quality has always been a top priority for the District. In fact, the watershed district was formed around concerns over the conditions of the Sauk River Chain of Lakes. At the time, the Sauk River Lake Chain of Lakes Association, Inc. had just been formed, becoming established in 1982. Since the water quality of the Chain of Lakes is primarily influenced by the conditions of the Sauk River upstream, the concerned citizens realized that if improvements were to be made in their lakes, issues in the upstream watershed would have to be addressed. They also realized that any restoration efforts or conservation practices would require a more substantial financial backing than the members of the Lake Association would be able to supply. As a result, an attorney was contacted to determine the feasibility of forming a watershed district. On January 17, 1986, a petition signed by 400 landowners was filed with the Minnesota Water Resources Board for the establishment of the Sauk River Watershed District (SRWD). After additional petitions and public hearings, the Water Resources Board established the SRWD on July 22, 1986.

Image 2: Flow measurement with FlowTracker 2 device

The goals of the SRWD Monitoring Department are to:

1. Track long-term water quality trends.
2. Evaluate project and program effectiveness.
3. Utilize the monitoring results in making sound, science-based decisions on future projects/programs.

Precipitation amounts, flow rates, and pollution concentrations vary widely year to year, so consistent monitoring over time is key to accounting for seasonal fluctuations. Average monthly precipitation is generally highest in the late spring and summer months (June to August). To account for the variability in precipitation, climate, and agricultural activities, surface water monitoring sites are sampled once every two weeks from ice-out in the spring until the end of September and is done annually over multiple years. Flow measurements are also collected and evaluated throughout the open-water season to estimate a rating curve for the stream system. The rating curve allows us to calculate the pollutant load of a waterway. When water quality samples are taken, they are analyzed for pollutant concentrations in milligrams per liter (mg/L) or micrograms per liter (µg/L). Flow measurements are taken using specialized equipment that can measure the water's velocity while gathering information on the channel's cross-sectional dimensions. Flow rates are reported in cubic feet per second (cfs). One cubic foot can hold 28.3 liters of water, and so a pollutant load calculation computes as follows:

(Flow Rate in cubic feet per second) x (28.3 liters per 1 cubic foot) x (concentration of pollutant per liter) = pollutant load in milligrams per second

This pollutant load calculation can then be scaled up using water quality sample results and the channel's predicted flow (using a rating curve) to calculate pounds per month and pounds per year. These pollutant loads are used to estimate the amount of that pollutant present in a waterbody annually and how much of a load reduction is needed to improve the conditions enough to meet its WQS. These calculations and models are used to create a Total Maximum Daily Load (TMDL) report. A TMDL is a regulatory tool for federal and state agencies to address water pollution through data analysis and watershed-based implementation strategies. TMDL reports are often compiled by the MPCA for Minnesota waters. The implementation strategies focus on adaptive management processes for achieving water quality standards and restoring beneficial uses. Strategies include agricultural best management practices (BMPs), buffers and streambank stabilization, urban BMPs, septic system improvements, restoration of altered hydrology, drainage system management, and lakeshore buffers. The most recent Sauk River Watershed TMDL was released in 2023, and the sampling/data collection period was in 2018 and 2019. The MPCA conducts watershed-wide intensive monitoring on a 10-year rotational basis, so they will return to this watershed to begin the assessment process in 2028. The MPCA's 10-year watershed intensive monitoring includes fish and macroinvertebrate studies alongside the water chemistry monitoring to evaluate water quality. This intensive monitoring was last done in 2008 and 2018.

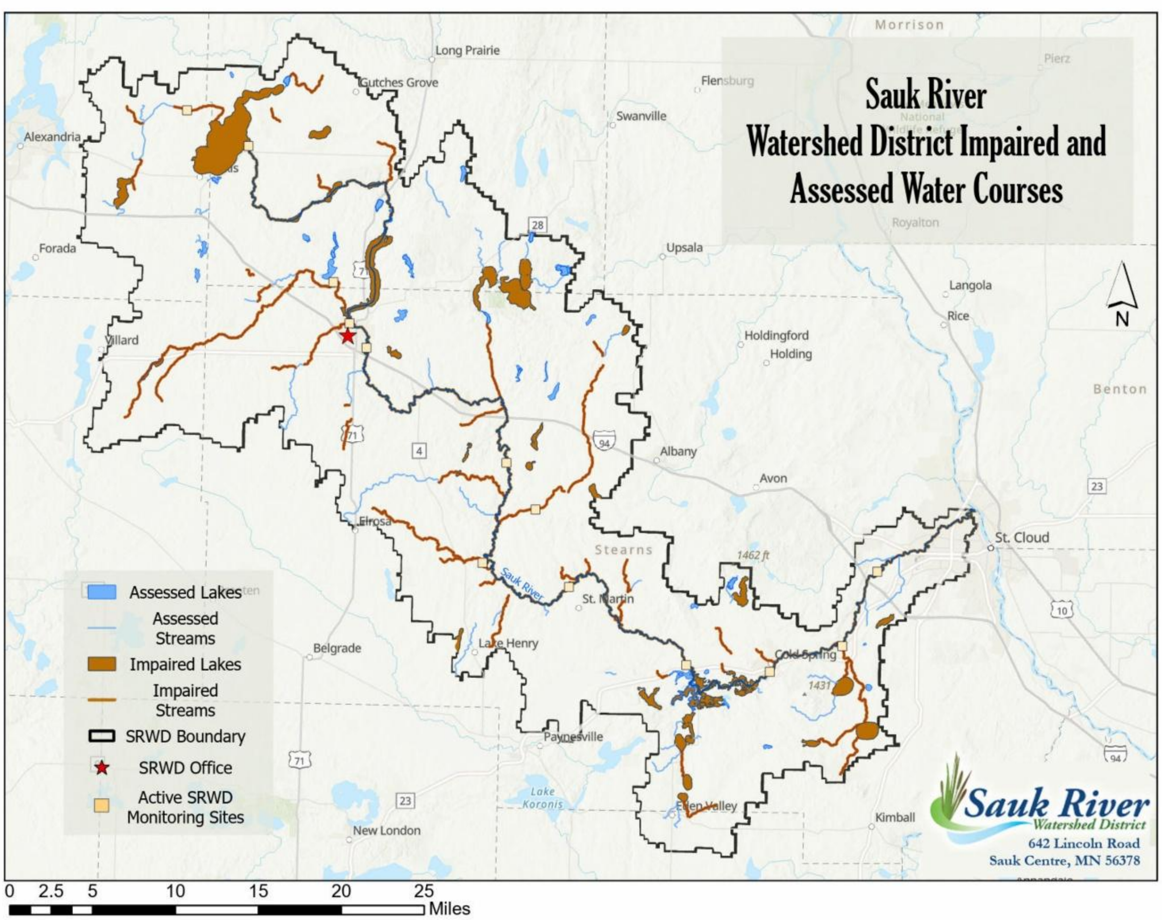
WATERSHED IMPAIRMENTS

Nearly 50 percent of the assessed rivers and streams in the SRWD are impaired. The most common impairments are:

- Excessive nutrients (phosphorus and nitrogen)
- Low dissolved oxygen concentrations (daily flux of more than 3.5 mg/L)
- Excessive *E. coli* levels (monthly geomean >126 MPN/100 mL)
- Poor-quality habitat for fish and aquatic insects (FIBI and MIBI studies)
- Excessive suspended solids (>30 mg/L)

The types of pollutants found on a landscape are mainly tied to the designated land-use. Land use type in the Sauk River Watershed is heavily agricultural with a large percentage in row crops and pastureland. Only a portion of identified impairments have an associated TMDL calculated at this time.

Figure 2: Impaired waterways and active SRWD river and stream monitoring sites



European settlement in this watershed began in the 1860s. Since then, much of the native prairies have been plowed, hardwood forests have been harvested, wetlands have been drained, and streams have been altered. The land use modification has primarily been conversion to farmland and development. In regards to excessive nutrient impairments, the main sources in the watershed include runoff from agricultural fields, pastureland, developed areas, permitted wastewater discharges, septic systems, and internal phosphorus released by bacteria from lake sediments. Nutrients can also come from lawn care products, grass clippings, road surface particles, organic debris, eroded soil particles, pet and wildlife waste, and some atmospheric deposition. It is worth noting that the nutrient-impaired waterbodies in the SRWD all have drainage areas that are comprised of at least 50 percent or more of row crops. Tables 2 and 3 break down WQS impairments for the entire watershed by management district. Table 2 does not include lake impairments.

Table 2: Impairment types by WMD

WMD	Impaired Reach Segments	MIBI	FIBI	DO	Nutrients	TSS	*E. coli*/Fecal Coliform	Total Impairments
Osakis Lake	5	3	4	1	1	1	1	10
Sauk Lake	8	5	8	2	-	-	1	16
Adley Creek	1	-	1	-	-	-	1	2
Centre Sauk	7	5	7	-	-	-	1	13
GUS Plus	10	6	5	3	-	2	7	23
St. Roscoe	5	3	3	-	-	-	1	7
Chain of Lakes	6	2	2	3	-	-	2	9
Cold Spring	4	1	1	-	1	-	2	5
Grand Pearl	3	1	1	-	-	-	3	5
Mini Metro	1	-	-	-	1	-	-	1
Total	**50**	**26**	**32**	**9**	**3**	**3**	**19**	**90**

Image 3: Cow standing in Stony Creek

Table 3: Impairments for 2025 river and stream monitoring sites (Sauk River mainstem sites in **bold**)

Location Name	EQuIS Site ID	Management District	Impairment(s)
JD2 @CR3	S006-568	Osakis Lake	TSS, Fish Bio, Invert Bio, DO, Nutrients, *E. coli*
Osakis Outlet (Headwaters to Guernsey Lk)	S002-649	Sauk Lake	Mercury in fish tissue
Hoboken Creek	S014-892	Sauk Lake	Fish Bio
Ashely 11	S004-625	Sauk Lake	Fish Bio, Invert Bio, *E. coli*, DO
Sauk River's Edge (Sauk Lk to Melrose Dam)	S000-373	Centre Sauk	Fish Bio, Invert Bio, Mercury in fish tissue
SR 30 (Sauk River; Adley Cr to Getchell Cr)	S000-366	Centre Sauk	Fish Bio, Invert Bio, Mercury in fish tissue, *E. coli*
Getchell Creek	S003-289	GUS Plus	Fish Bio, Invert Bio, DO, *E. coli*
Stony Creek	S000-497	GUS Plus	TSS, Fish Bio, Invert Bio, *E. coli*
Unnamed Creek (07010202-542)	S000-950	GUS Plus	*E. coli*, turbidity
SR 12 (Sauk River; Getchell Cr to State Hwy 23)	S000-702	St. Roscoe	Mercury in fish tissue, *E. coli*
Richmond (Sauk River; Getchell Cr to State Hwy 23)	S000-517	St. Roscoe	Mercury in fish tissue, *E. coli*
Cold Spring (Sauk River; Knaus Lk to Cold Spring Dam)	S003-286	Cold Spring	Mercury in fish tissue, Nutrients
Mill Creek	S000-444	Grand Pearl	Fish Bio, Invert Bio, E. coli, Fecal coliform
SR 121 (Sauk River; Mill Cr to Mississippi R)	S000-360	Mini Metro	Mercury in fish tissue, Nutrients, PCB-F

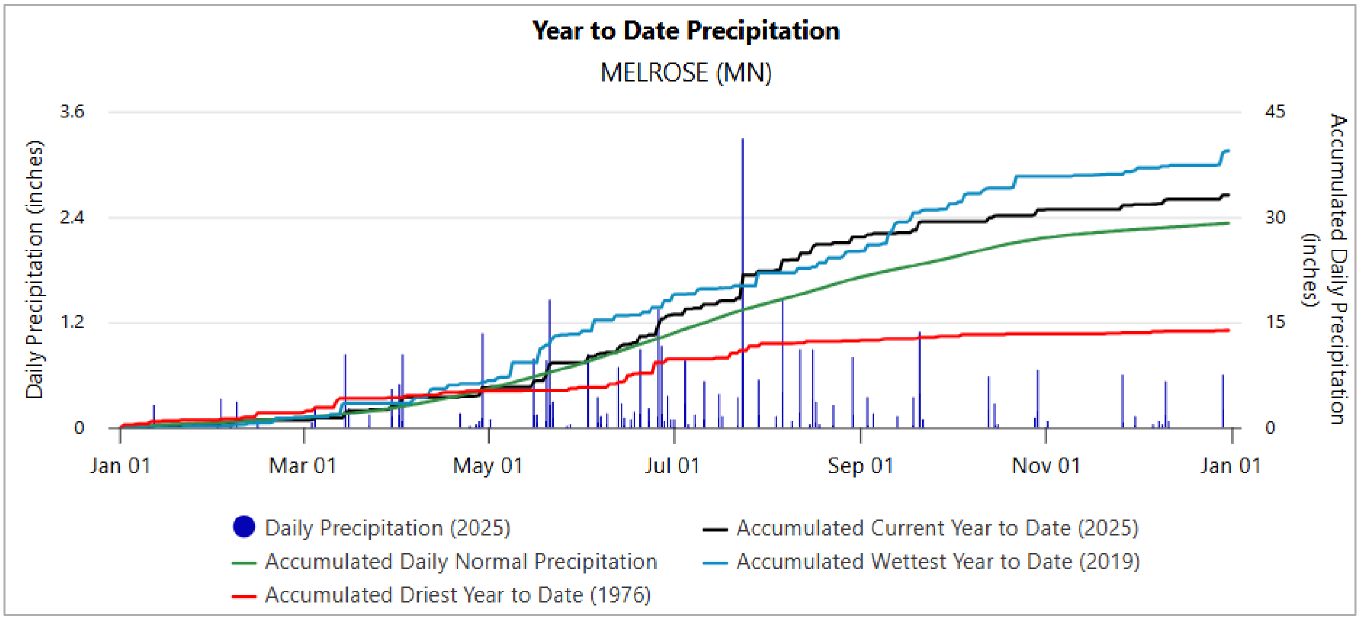
2025 WEATHER & PRECIPITATION

Compared to the start of 2024, which experienced an extremely early spring and lake ice-outs, 2025 fared better with ice coverage on lakes and somewhat average winter temperatures. There was still not much snowpack built up over the 2024-2025 winter. While January and February of 2025 were dry months, March came lake a lion with a blizzard spanning from March 4–5. A rain system also came through the area on March 14–15, delivering just over an inch of rain in 48 hours. There was a late-season surprise of snow with a weather system later named the "April Fool's Winter Storm." This storm, spanning parts of three days, delivered wet, heavy snow to much of Minnesota with moderate to heavy rains in the southern part of the state. About 40% of the state received accumulations of 6 inches or more, and several weather stations in west-central MN recorded a foot or more of snow. By early July, 63% of Minnesota was free of any drought designation due to June being quite a wet month.

The wet trend continued, and the growing season in 2025 saw an abundance of rain. Figure 3 on the following page shows the total accumulated precipitation in 2025 (black line). A normal amount of precipitation for this region (green line) from March to September is **22.75 inches**. Precipitation data was taken from the Melrose weather station due to its central location in the watershed. It is worth noting that the fall of 2025 was warm and dry. In fact, it was the second warmest in Minnesota on record, averaging nearly 6°F above normal.

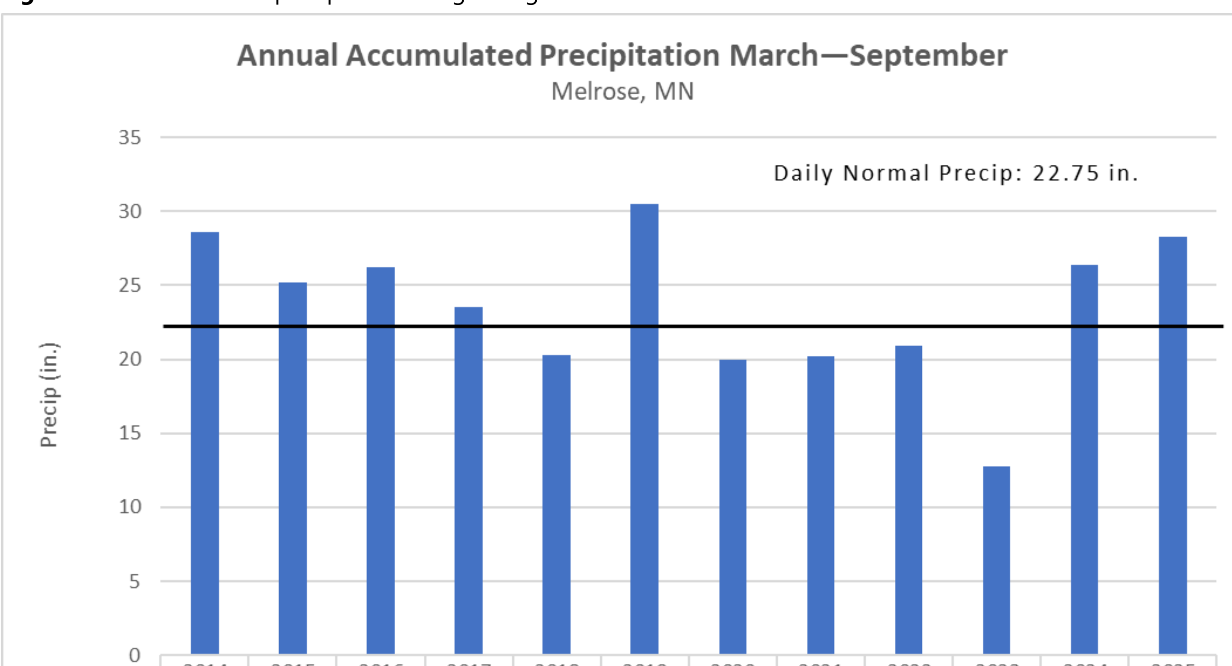
According to the 2023 TMDL Report, there is a widely variable, but generally increasing, pattern of annual precipitation in the watershed since 1895. This increase is particularly evident for the recent years encompassing the TMDL reporting period (2010-2019).

Figure 4: Annual accumulated precipitation at Melrose weather station (Source: National Oceanic & Atmospheric Administration)



As seen in the above graph, accumulated precipitation in 2025 quickly surpassed the daily normal precipitation. The total accumulated precipitation from March to September was 28.3 inches, which is **5.51 inches higher** than normal years. Figure 4 below shows precipitation totals since 2014 from March through September.

Figure 3: Melrose station precipitation for growing season since 2014



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total (in.)	28.6	25.2	26.2	23.5	20.3	30.5	20.0	20.2	20.9	12.8	26.4	28.3

SAUK RIVER MAINSTEM

SRWD sampling sites are broken up into mainstem and tributary sites. The District monitors and samples seven mainstem sites once every two weeks. Additional monitoring activities include taking flow, also known as discharge, measurements at least once a month. This is the case for all sites except for SR12 near St. Martin, which is a joint site with the MPCA and DNR, who manage all flow measurement collection and data analysis. The seven mainstem sites are listed below:

- **Osakis Outlet** (Osakis—*headwaters*)
- **Sauk River's Edge** (Sauk Centre, CR 186)
- **SR 30** (New Munich, CR 30)
- **SR 12** (St. Martin, CR 12)
- **Richmond** (CR 111)
- **Cold Spring** (CR 2)
- **SR 121** (St. Joseph, CR 121)

The bolded site names will be used throughout this report to refer to the specific sampling locations. The map below displays the locations of the mainstem monitoring sites, along with the 10 WMDs in the SRWD. These management districts are used to determine priority areas and resources for water quality improvement projects. Tributary monitoring will be discussed in a later section.

Figure 5: Sauk River mainstem monitoring sites

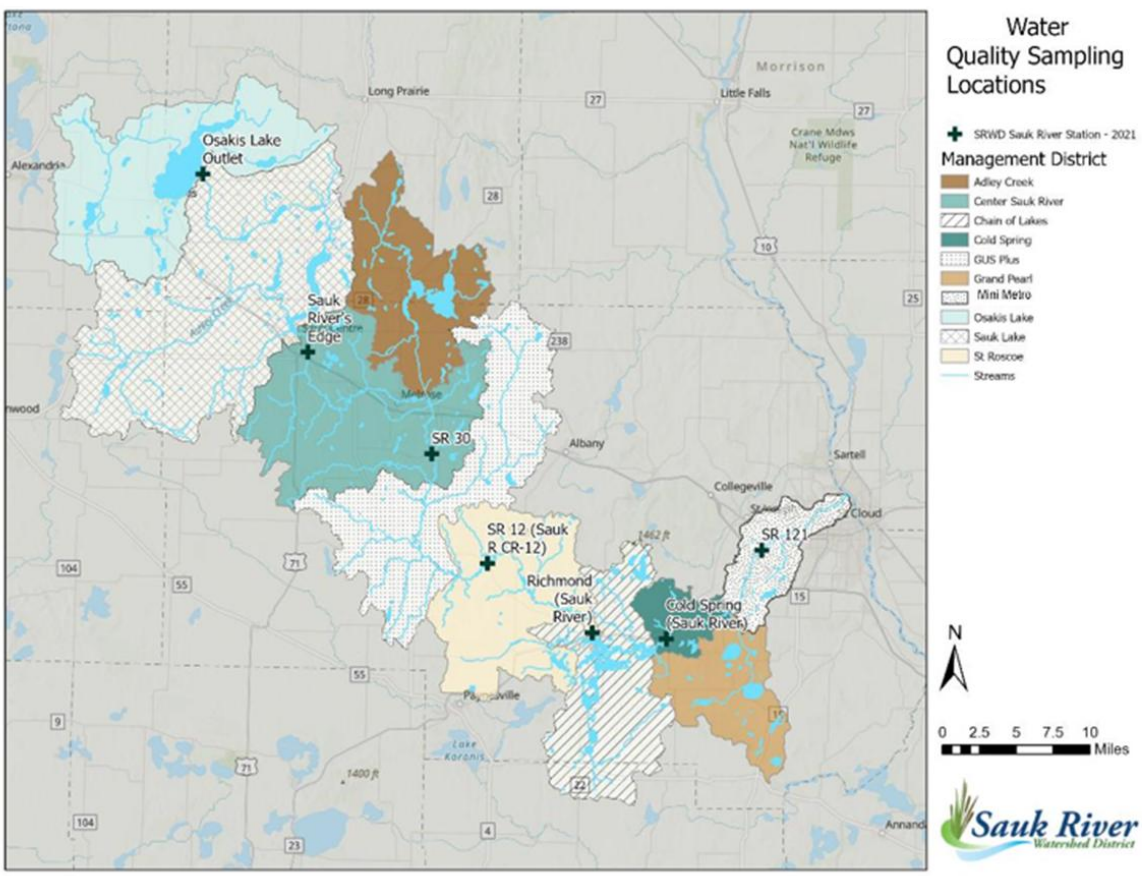


Table 4 below contains the annual average concentrations for each 2025 mainstem monitoring site, along with the flow count and number of samples collected. Values that are underlined and bolded indicate averages that exceed the state WQS. As can be expected considering previous years' results, total phosphorus (TP) average results exceeded or nearly exceeded the WQS at many of the mainstem monitoring sites. The % OP:TP ratio compares the ortho-phosphate (OP) and TP concentrations. OP is the dissolved, inorganic form of phosphorus that can be taken up by plants. A high ratio of OP means there is a larger portion of all forms of phosphorus that can be used by organisms for growth. An OP:TP ratio that is above 30% is reaching a concerning level, and there would be potential downstream impacts. Table 5 outlines water quality parameters and the associated WQS set by the MPCA. An explanation of each sampling parameter and what it indicates can be found in the glossary starting on page 43.

Table 4: 2025 annual averages for mainstem sites

2025 Monitoring Sites	Total Phosphorus (µg/L)	Ortho-phophate (µg/L)	% OP:TP	Total Kjeldahl Nitrogen (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Specific Conductivity (µS/cm)	Chloride (mg/L)	Hardness (CaCO3)	Transparency Tube (cm)	DO (mg/L)	Temp (°C)	Temp (°F)	Flow Count	Sample Visits
Osakis Outlet	68	25	*37*	1.07	0.03	10.2	408.0	20.4	201	91.9	9.98	16.2	61.2	8	16
SR Edge	78	39	*50*	1.04	1.73	4.3	525.8	22.2	266	93.3	9.31	17.4	63.3	8	15
SR 30	**<u>109</u>**	67	*61*	0.95	1.44	3.7	573.1	32.2	261	95.9	7.82	17.1	62.8	8	16
SR 12	**<u>134</u>**	89	*66*	1.03	2.02	6.8	603.1	32.4	272	88.0	8.16	16.2	61.2	N/A	16
Richmond	**<u>145</u>**	106	*73*	0.95	2.19	4.0	613.5	28.8	287	93.7	6.36	16.3	61.3	9	15
Cold Spring	**<u>131</u>**	81	*62*	1.09	1.26	5.2	569.5	29.8	248	80.3	9.70	17.1	62.8	8	16
SR 121	**<u>136</u>**	97	*71*	0.98	1.25	3.7	579.7	33.2	288	97.0	8.71	17.5	63.5	8	16

Table 5: State surface water quality standards (WQS)

Eutrophication standards for class 2B & 2Bd rivers and streams.		
Substance	**Units**	**Chronic Standard**
Total Suspended Solids	mg/L	less than or equal to 30
Phosphorus, total	µg/L	less than or equal to 100
Chlorophyll-a (seston)	µg/L	less than or equal to 18
Diel dissolved oxygen flux	mg/L	less than or equal to 3.5
Biochemical oxygen demand (BOD5)	mg/L	less than or equal to 2.0
T-tube	cm	greater than or equal to 20
pH	unit-less	Range of 6 to 9
Temperature	C	30 °C as a daily maximum
Dissolved Oxygen	mg/L	7.0 mg/L as a daily minimum

The graphs on the following pages break down the annual average concentrations of specific parameters for each mainstem site, listed left to right in order of upstream to downstream. 2025 averages are compared to 2024 averages and the 10-year average. The sites are ordered this way because average nutrient concentrations typically increase as you travel further downstream, but significantly decrease once reaching the Cold Spring site. This is mostly due to the presence of the dam in Cold Spring. The drop in concentrations is especially apparent for the parameters OP and nitrate + nitrite (N+N). There are three major dams along the Sauk River: Sauk Centre (upstream of the SR Edge site), Melrose (upstream of the SR30 site), and Cold Spring. Our monitoring site is upstream of the Cold Spring dam, which forms the Sauk River Chain of Lakes system by significantly confining the flow. When stream systems reach a reservoir that is backed up by a dam, flow slows significantly, and debris and nutrients will sink down to the bottom sediments. This helps to explain the drop in some concentrations once water reaches the Cold Spring site.

An exciting update about the Cold Spring dam: it has been proposed by the city of Cold Spring and the Stearns Conservation District (SCD) to remove the dam and replace it with a rock-arch rapids structure. A rock-arch rapids is a riffle design of large boulders arranged in a line of curved "steps" that gradually lower the water level as it flows downstream. The design is meant to maintain the water level of the upstream lakes while allowing for fish passage and reducing erosion impacts that dams cause. This proposal is still in the preliminary stages, and a feasibility study would have to be conducted first before any concrete plans or designs are made.

Phosphorus

Figure 6: Mainstem TP annual averages

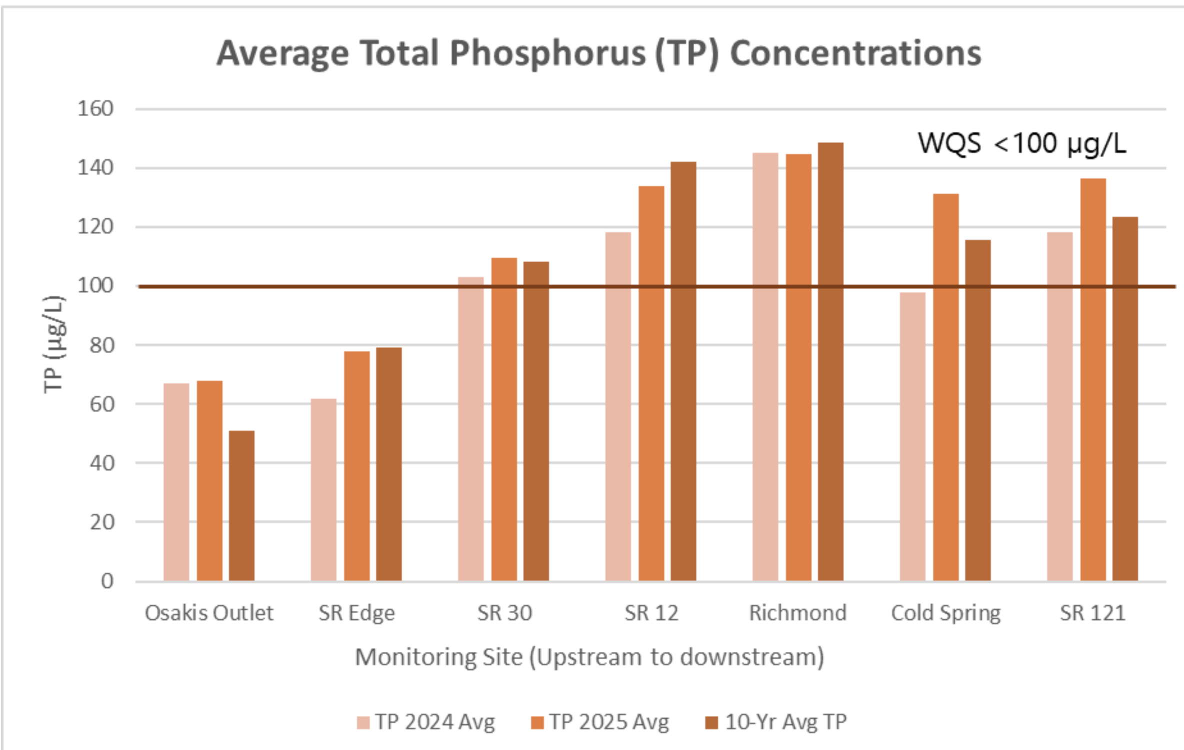
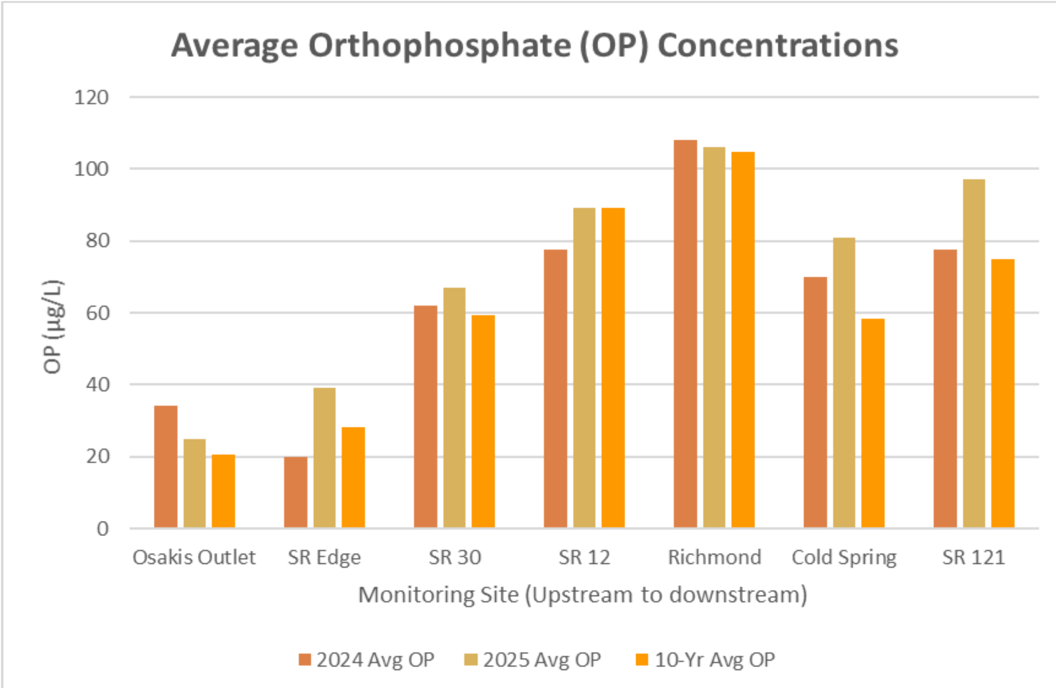


Figure 6 displays the TP annual averages for each mainstem site for 2025, 2024, and the 10-year average. The horizontal line represents the WQS of <100 µg/L for TP. In 2025, only the Osakis Outlet and SR Edge sites remained below the WQS. The 2025 average was above the 10-year average at Osakis Outlet, SR30, Cold Spring, and SR121. Each 2025 average was also above the 2024 average except for at Richmond, but not by much. The general trend for concentrations increases from upstream to downstream, with a slight drop at Cold Spring.

Figure 7: Mainstem OP annual averages



A similar pattern is observed for OP concentrations. Compared to the 10-year average, 2025 averages were consistently higher, except for at SR12. The 2025 averages were also higher than the 2024 averages except for at Osakis Outlet and Richmond. There is a notable drop in concentration from Richmond to Cold Spring. There is currently no state WQS for OP levels.

Figure 8 below is a somewhat outdated map, but it gives an idea of which subwatersheds constitute the largest portion of phosphorus loading. Note that darker colors are higher concentrations.

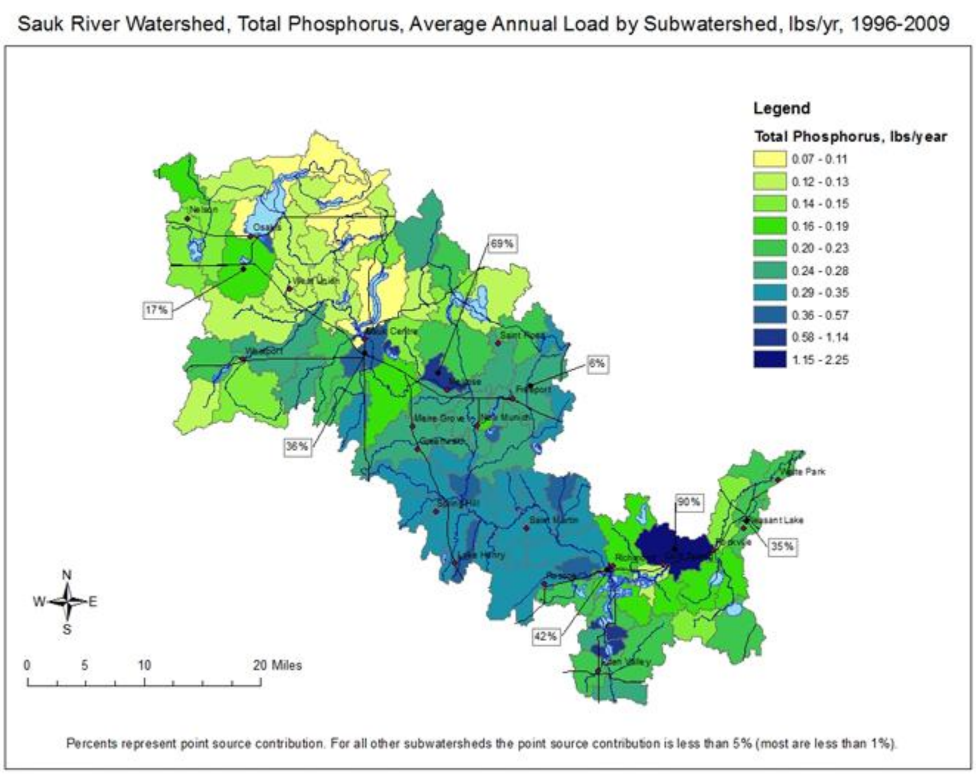
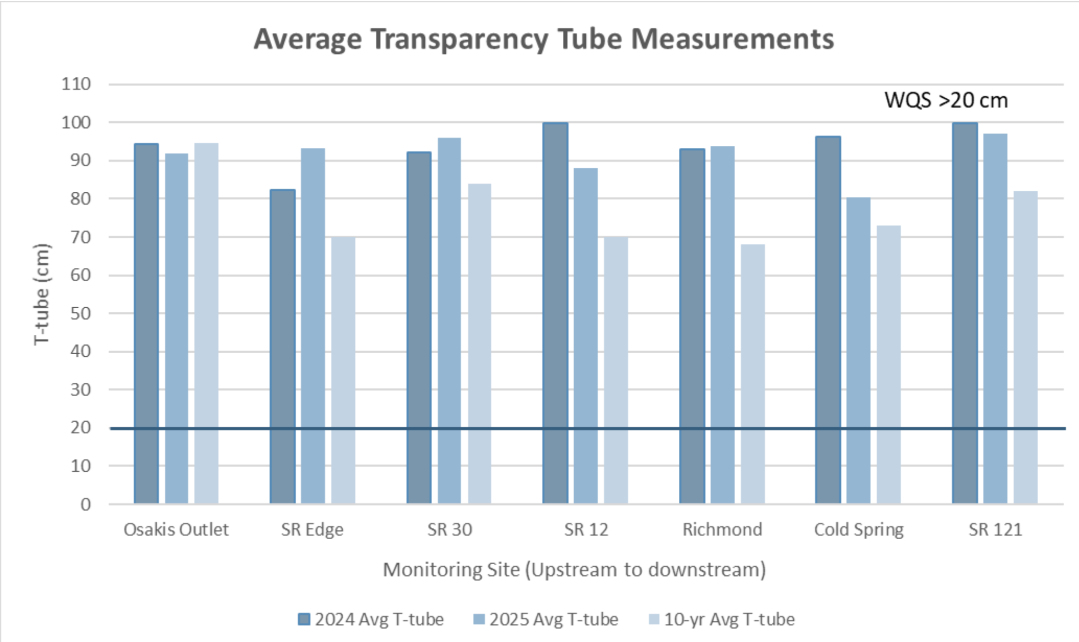


Figure 8: Average TP load by subwatershed

Transparency Tube (Water Clarity)

Figure 9: Mainstem transparency tube annual averages



A transparency measurement represents stream water clarity, or how clear the water is, and acts as a basic indicator of water quality. This is done by using a transparency tube (T-tube), which is a clear, plastic 1-meter tube that is filled with water from the waterbody of interest to create a vertical column of water. The user then looks down from the top of the T-tube to determine the depth/distance at which the small Secchi disk attached to a string can be seen. They slowly pull up on the string until the Secchi disk can be seen, then take note of the depth at which the Secchi disk lies. The WQS for T-tube measurements is >20 cm.

Figure 9 above illustrates the mainstem annual averages. Note that in this case, higher results are desirable since they indicate better water clarity. The 2025 averages are above those from 2024 at SR Edge, SR30, and Richmond. The 2025 averages are above the 10-year average at all sites besides Osakis Outlet. All seven sites are well above the WQS. The mainstem of the Sauk River has historically and continues to have encouraging water clarity measurements.

The parameter on the following page ties into T-tube measurements, which is total suspended solids (TSS). Although the Sauk River itself does not have any TSS impairments, there is a section that has had temporarily elevated TSS concentrations. The section is **Reach 505**, which is between the Adley Creek and Getchell Creek outlets. In the 2023 Sauk River TMDL report, it highlights a lack of habitat diversity due to sand-dominated substrate and bank failure, as seen by the increased TSS and sediment deposition from Sauk Lake Dam to Melrose. It notes that a healthy variety of fish and macroinvertebrates that use coarse substrate is generally missing or exists in lower numbers in Reach 505. Although the percent exceedance of the WQS is less than 10%, indicating that this section meets the TSS standard, suspended sediment impacts aquatic life. Therefore, a TSS TMDL was developed to address the biological impairments in Reach 505.

Total Suspended Solids (TSS)

Figure 10: Mainstem TSS annual averages

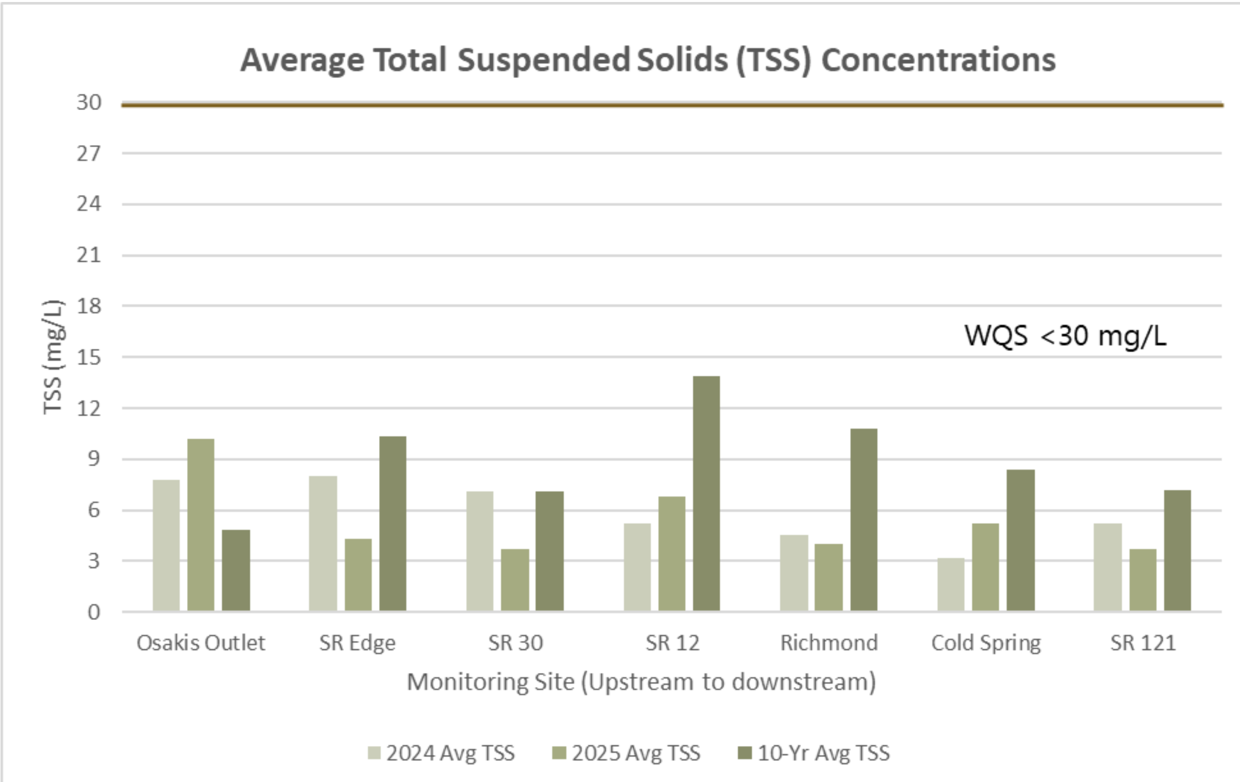
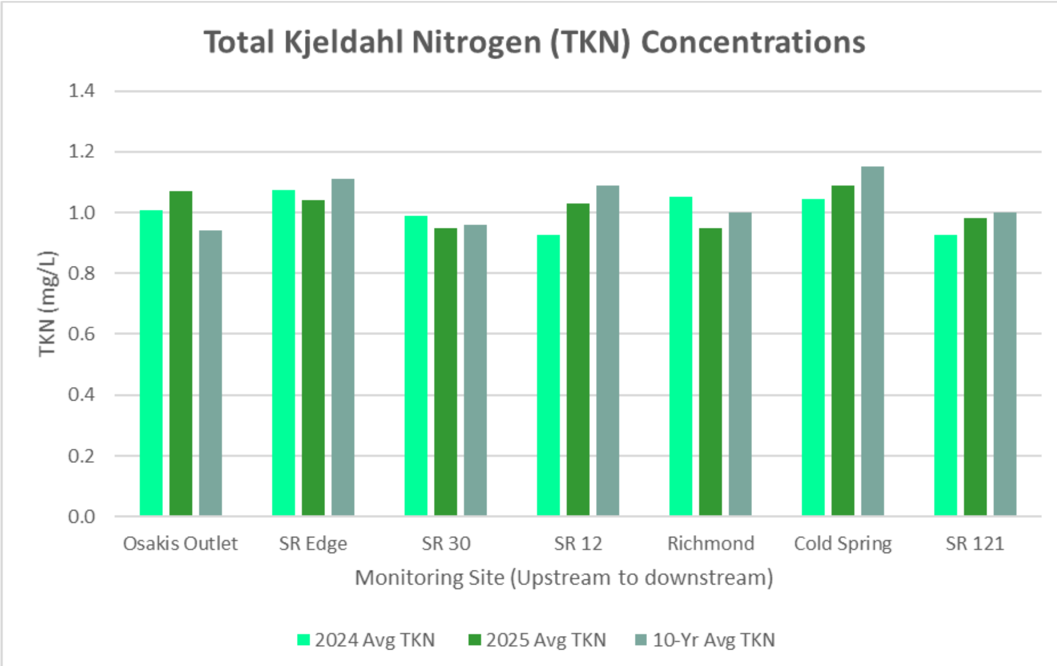


Figure 10 indicates that TSS in the mainstem has consistently fallen well below the WQS of <30 mg/L. SR30 falls within Reach 505, but the site had one of the lowest TSS averages in 2025. In general, all of the 2025 averages fell below the 10-year average, except for at Osakis Outlet. The 2025 average was also below the 2024 average at four sites. Interestingly, the TSS average at Cold Spring in 2025 was slightly higher than the average at Richmond. This could be because bank failure is more common downstream of dams due to the confined flow of incised channels, along with increased water depth and shear force. The sediment created by bank downcutting may not be suspended long enough to trigger a TSS impairment, but it still degrades the habitat quality, as evidenced by MIBI and FIBI studies.

Nitrogen (TKN, N+N)

Nitrogen levels in the watershed are evaluated by sampling two forms of nitrogen: total Kjeldahl nitrogen (TKN) and nitrates + nitrites (N+N). TKN is made up of organic nitrogen and ammonia. High levels of TKN often indicate the presence of animal waste and can lead to excessive plant growth. This in turn can have adverse effects on aquatic ecosystems, plants, invertebrates, fish, and humans. N+N are inorganic forms of nitrogen, with nitrates in particular being an essential plant nutrient. Sources of nitrates include wastewater plants, runoff from fertilized lawns and cropland, failing septic systems, runoff from manure storage areas, and industrial discharges that contain corrosion inhibitors. Excessive nitrates can become toxic to warm-blooded animals at concentrations around 10 mg/L. The natural level of nitrogen in surface water is typically less than 1 mg/L.

Figure 11: Mainstem TKN annual averages



Unlike TP, there is no state WQS for TKN in surface waters. There is no clear pattern that emerges between SRWD's sites, as TKN averages remained fairly steady across the board. The highest average in 2025 was Cold Spring's at 1.09 mg/L. 2025 averages were below the 10-year averages, except for Osakis Outlet. For context, the average TKN concentration for the North Central Hardwood Forests (NCHF) ecoregion is 0.6-1.2 mg/L.

Figure 12: Mainstem N+N averages

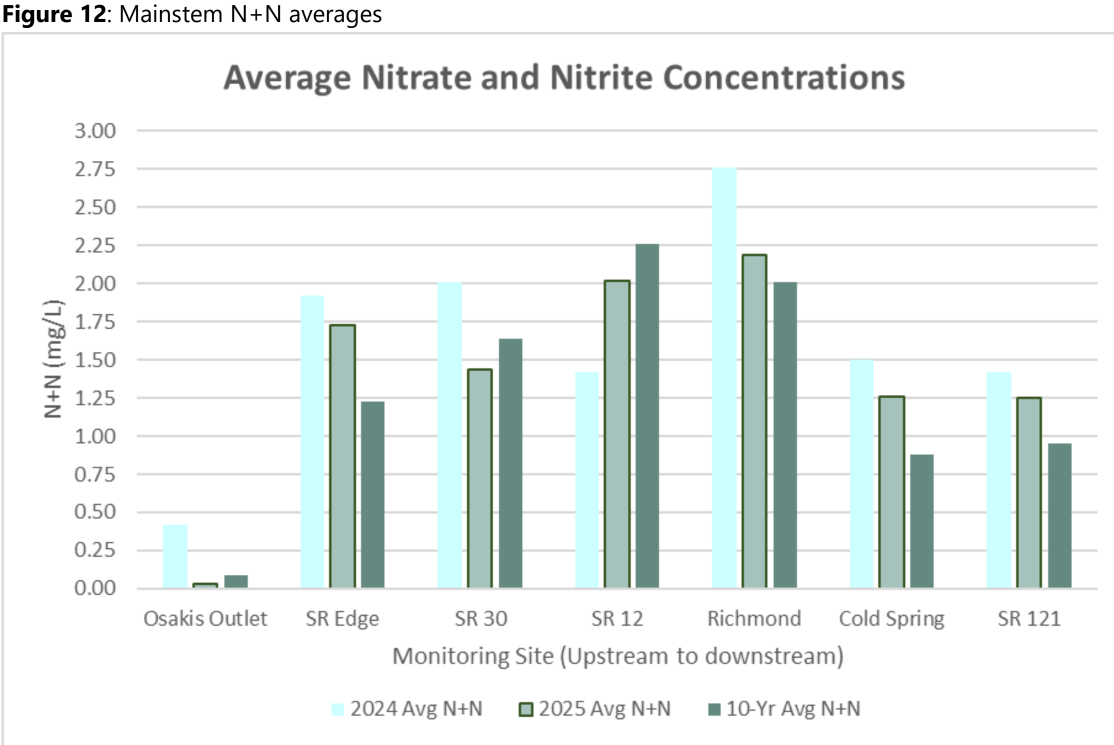
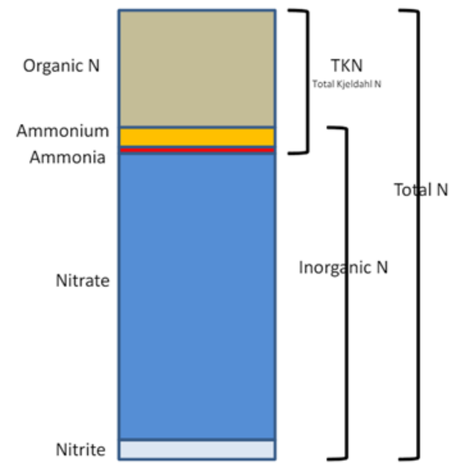


Figure 12 demonstrates there were some significant decreases in N+N concentrations in 2025. There is no state WQS that applies to surface waters for N+N, but there is an Environmental Protection Agency (EPA) drinking water standard of<10 mg/L. Each of the averages fall well below that standard. Compared to 2024 averages, the most significant decreases were seen at Osakis Outlet, SR30, and Richmond. Each of the 2025 averages were below the 2024 average, except at SR12. The 2025 N+N averages also fell below the 10-year average at three sites. Nitrogen is a parameter the SRWD will continue to closely monitor, as there have been some slight increases in N+N levels throughout the watershed.

Figure 13: Breakdown of different nitrogen forms



Lake Osakis and Crooked Lake Basin

Lake Osakis plays a large role in the SRWD due to its outlet being the headwaters of the Sauk River. It is worth mentioning the work and studies that have been done in the Lake Osakis area. In 2022, the SRWD and the Osakis Lake Association (OLA) began working with the US Army Corps of Engineers (USACE) to develop an Alternatives Analysis study on Lake Osakis and its surrounding watershed. This idea was brought about following concerns over Lake Osakis' water quality, especially in Miller Bay, and the formation of a project team. There has historically been water quality and habitat issues on Lake Osakis, much of it due to the drainage of the Crooked Lake Basin west of the lake. Crooked Lake was once a shallow "lake" or network of wetlands that eventually flowed into the Long Prairie River just north of the Sauk River Watershed's current boundary. In 1910, Crooked Lake was fundamentally drained due to the creation of Judicial Ditch 2 (JD2), a public drainage system network that channelized and diverted the flow of wetlands in the Crooked Lake Basin. JD2 eventually outlets into Lake Osakis at Miller Bay, meaning there is an influx of water and nutrients entering the lake from this drainage area.

In the wake of these issues, the JD2 Project Team was formed to receive input from local residents, the Lake Association (OLA), county drainage authorities, and state agencies. It was quickly realized that the collaboration of these groups did not have a framework for evaluating efforts that would be best to improve the lake. Therefore, it was decided that a comprehensive plan was needed to establish a range of alternative approaches that could support improvements in the overall function of Lake Osakis and its watershed. As a stakeholder, the SRWD is the owner of the JD2 Sediment Ponds just west of the lake and is the lead organization in helping to implement several wetland restorations within the JD2 drainage area/Crooked Lake Basin.

Image 4: Outlet of Lake Osakis, headwaters of the Sauk River

After an agreement was signed in 2023, the JD2 Project Team partnered with the USACE and SRWD to conduct the Alternatives Analysis study that will inform the development of a comprehensive plan to address the problems identified by the project team. The first task was to establish the current condition of Lake Osakis.

This involved survey work, water quality and sediment sampling, and modeling. The outcome is a Lake Response Model that can predict how different management practices and conservation efforts will affect the lake and surrounding drainage area. This model will give the SRWD a better understanding of what projects would be best to implement and where to focus our attention to work towards removing Lake Osakis from the state's impaired waters list (IWL). Findings from the Alternatives Analysis will also be used to develop a comprehensive plan, which will be used to identify and pursue funding needs for potential project implementation.

TRIBUTARIES

The Monitoring Department routinely monitors six tributaries/streams to the Sauk River. This involves water quality and quantity (flow) measurements. Samples are collected once every two weeks during the open water season, and flow measurements were completed at least once per month. The six sites are listed below:

- **Judicial Ditch #2, CR3 Crossing** (also called Crooked Lake Ditch; outlets into Lake Osakis)
- **Ashley Creek** (north of Sauk Centre)
- **Hoboken Creek** (Sauk Centre)
- **Getchell Creek/CD #26** (south of New Munich)
- **Unnamed Creek** (east of Spring Hill)
- **Mill Creek** (Rockville)

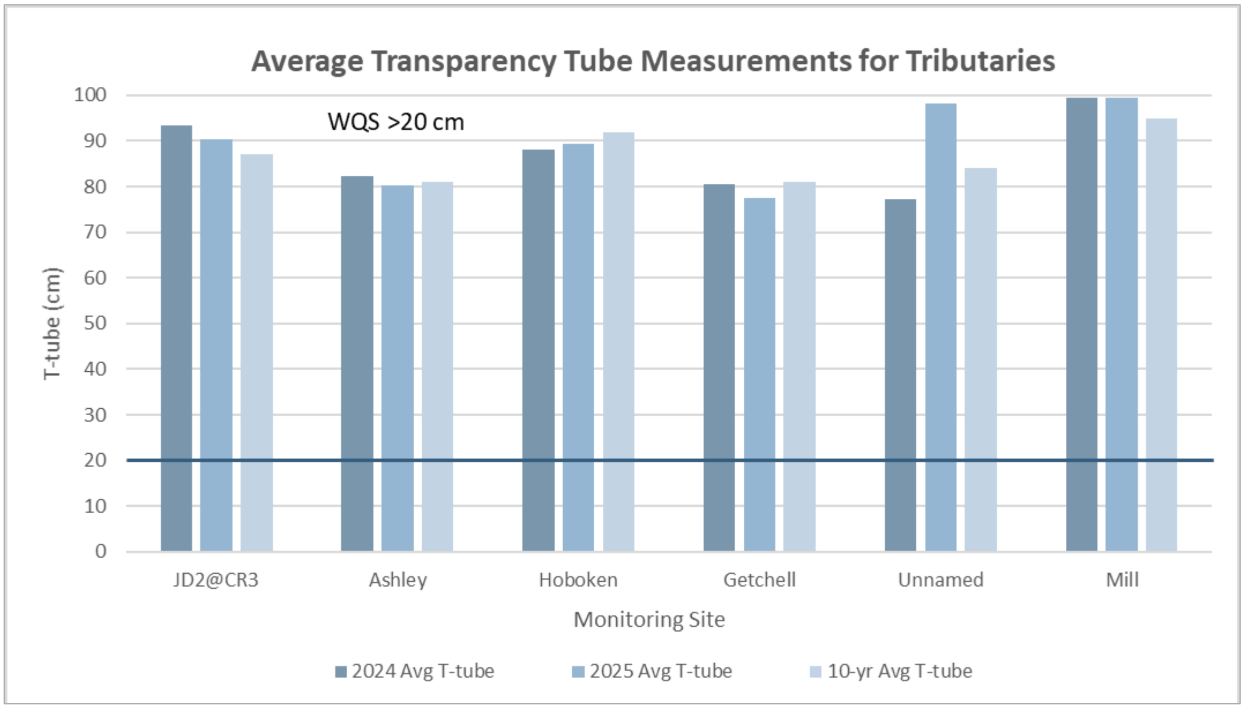
Table 6 summarizes the annual average concentrations for the tributary sites in 2025. Values that are underlined and bolded indicate averages that exceed the state WQS. The N+N average for Hoboken Creek is in red because it is a concerning concentration, but not an exceedance since there is no surface WQS for nitrates.

Table 5: 2025 annual averages for tributary sites

2025 Monitoring Sites	Total Phosphorus (µg/L)	Ortho-phophate (µg/L)	% OP:TP	Total Kjeldahl Nitrogen (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Specific Conductivity (µS/cm)	Chloride (mg/L)	Hardness (CaCO3)	Transparency Tube (cm)	DO (mg/L)	Temp (°F)	Flow Count	Sample Visits
JD2@CR3	**181**	89	*49*	1.59	0.62	18.4	550.8	19.6	266	90.4	4.67	59.7	18	16
Ashley Creek	**153**	95	*62*	1.25	2.96	16.2	639.3	23.8	333	80.3	7.64	57.7	7	16
Hoboken Creek	**145**	106	*73*	1.31	11.81	5.9	823.3	32.4	470	89.4	9.99	55.9	8	16
Getchell Creek	**298**	204	*68*	1.93	1.61	16.8	690.3	33.9	306	77.6	8.01	59.9	9	17
Unnamed Creek	**105**	65	*62*	0.98	7.22	5.7	804.4	27.2	336	98.1	11.46	45.3	1	7
Mill Creek	60	26	*43*	0.65	0.37	5.0	468.0	22.8	252	99.4	9.74	58.8	9	16

Each stream is evaluated individually since they have their own subwatersheds, but Figure 14 (on the next page) provides a comparison of T-tube averages. Each of the averages are well above the WQS of >20 cm. The 2025 average was above the 2024 average at Hoboken and Unnamed. Note that the long-term average for Ashley Creek is only 9 years since the site was re-established in 2024, and it is only an 8-year average at Unnamed.

Figure 14: Tributary T-tube annual averages



Judicial Ditch #2 (JD2 @CR3)

Image 5: JD2 monitoring site on 10.13.2025

Routine water quality monitoring on JD2 @CR3, also referred to as Crooked Lake Ditch, has taken place since 2015. This site was originally established over concerns about the water quality of the Crooked Lake area. The data was used in conjunction with other monitoring sites along JD2 to help gain a better understanding of the drainage area and where to create capital improvement projects to restore pockets of Crooked Lake. The SRWD now continuously monitors the site since the JD2 drainage area (38,636 acres) makes up around 45% of Lake Osakis's entire watershed. Much of the land use in the ditch's watershed is agricultural, with 16.5% in hay/pasture and 57% in row crops. The stream section that our monitoring site falls within has impairments for *E. coli*, dissolved oxygen, and fish bioassessments. There have been other monitoring sites on JD2 that the SRWD has used, these being located at the CR 73 crossing, CR 82 crossing, and the mouth of JD2. These monitoring sites were discontinued due to the unsuitable conditions for taking flow measurements and redundancy of data results. Taking accurate flow measurements at this site has proven difficult due to dense vegetation and high flow events, so SRWD staff measured flow on JD2 @CR3 on a weekly basis in 2025 once vegetation growth began in the channel.

Figure 15: Land use in the Lake Osakis watershed (Source: Osakis Lake Area TMDL)

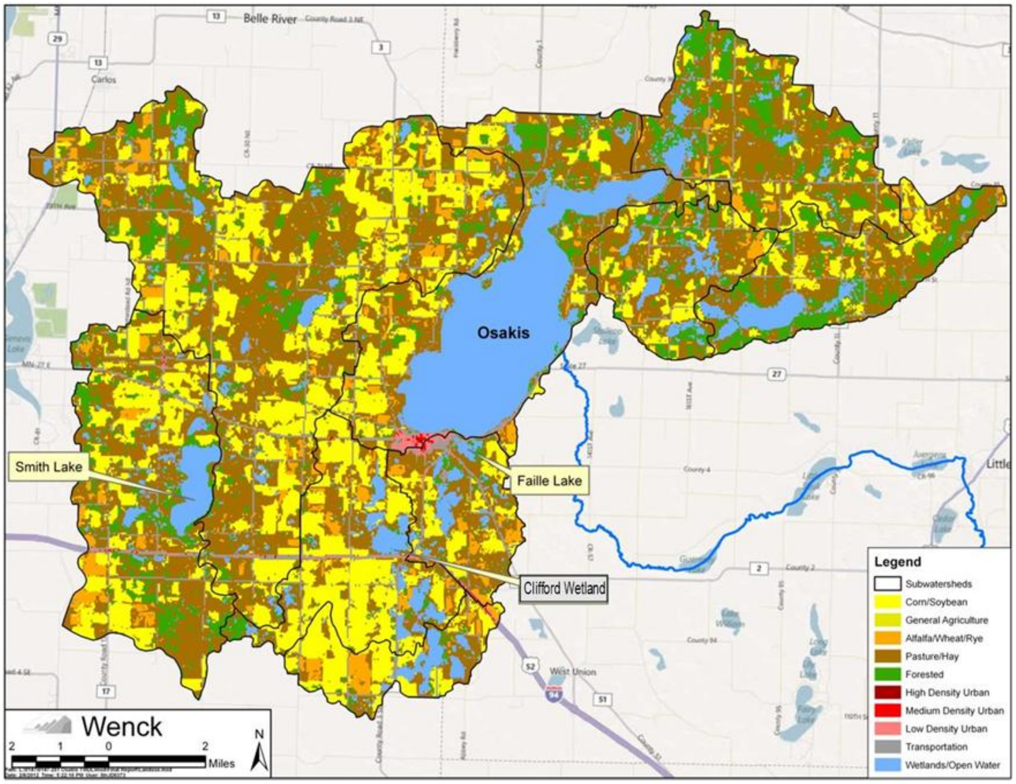


Figure 16 compares annual average TP results for 2024, 2025, and the 10-year average, which is displayed by the vertical bars. It also includes each individual sample result taken in 2025, indicated by the yellow line graph. The dates along the bottom only apply to the line graph. The annual average for TP in 2025 was 181 µg/L, which is considerably higher than the WQS of <100 µg/L. The spikes in the graph when concentrations rose above 300 µg/L correlate with spring snowmelt and large rain events, during which more runoff was entering the system. After July, the TP samples remained hovering around 100 µg/L. The 2025 annual average was above both the 2024 average and the 10-year average.

Figure 16: JD2 TP annual averages

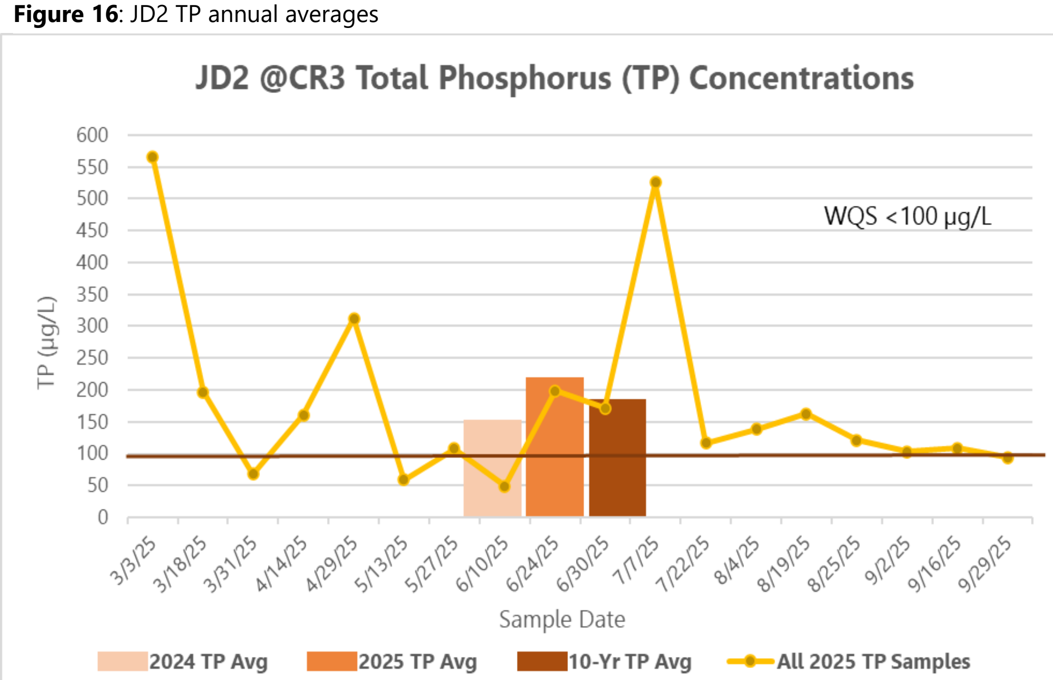
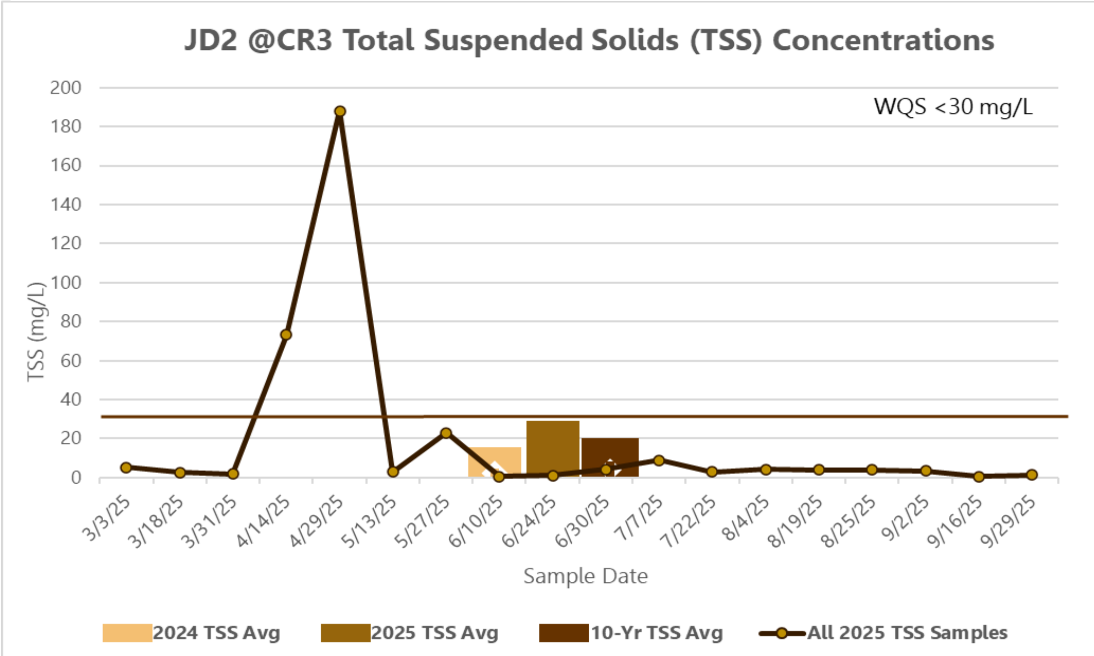


Figure 17: JD2 TSS annual averages



For TSS, there were only two samples that exceeded the WQS of <30 mg/L. Both of those high results are most likely due to spring runoff and the heavy rain event that came at the end of April. These large spikes brought the 2025 annual average up, which is higher than the 2024 and 10-year averages. The 2025 average was 18.4 mg/L, still well below the WQS.

Looking at N+N concentrations, the 2025 annual average was quite lower than the 2024 average. The 2025 average came out to be 0.63 mg/L, which is slightly lower than the 10-year average. The background level of N+N is around 3 mg/L in central MN, so these results are not a concern.

Figure 18: JD2 N+N annual averages

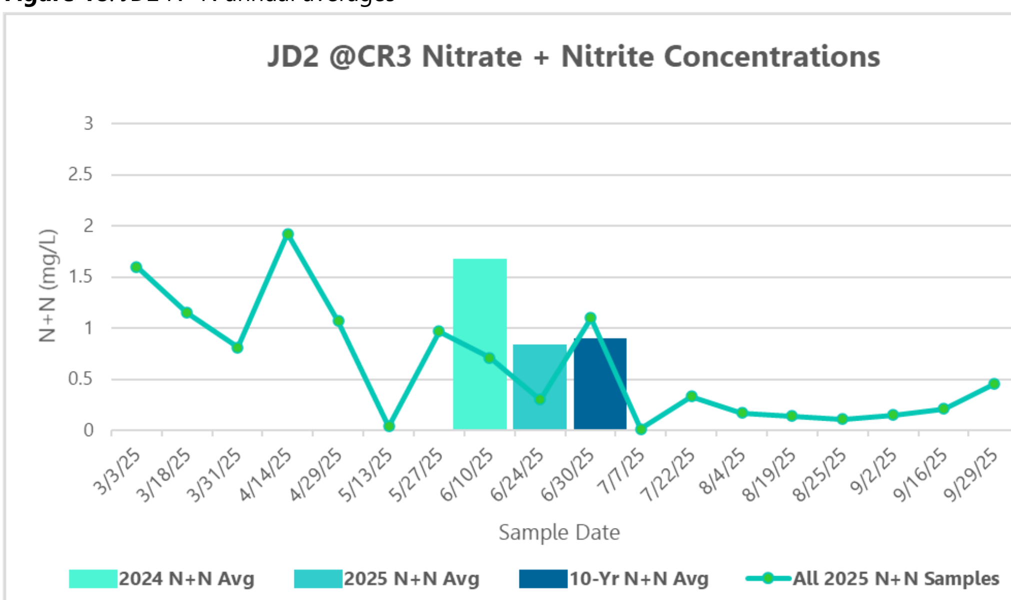
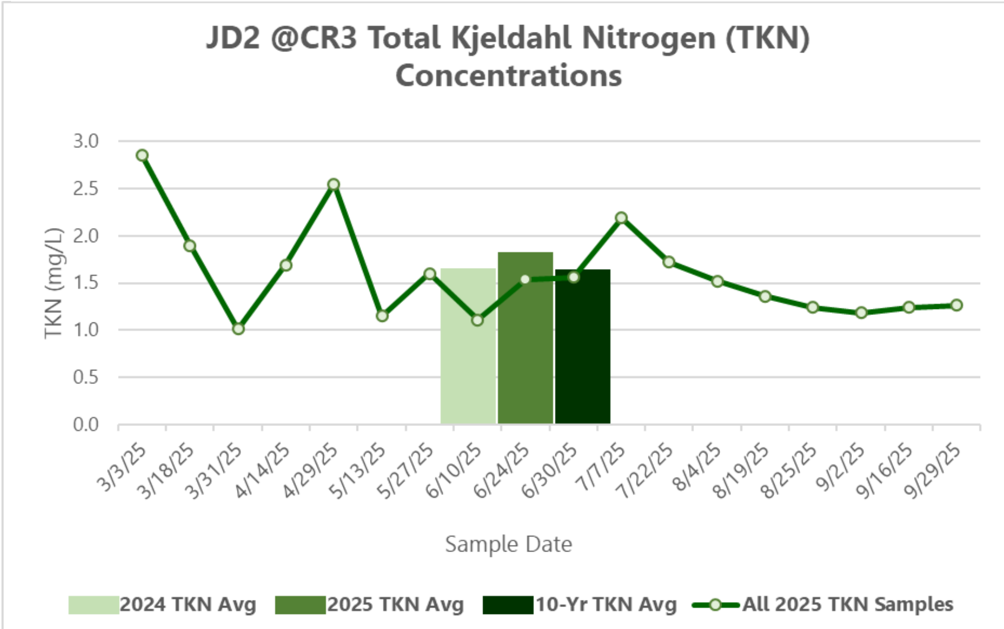


Figure 19: JD2 TKN annual averages



The TKN concentrations at JD2 in 2025 remained fairly stable throughout the year. The highest result was the first sample of the year, which is not uncommon. As for the averages, 2025 was slightly higher than the 2024 and 10-year averages. The 2025 TKN average was 1.59 mg/L, which is actually slightly higher than the 2025 N+N (inorganic nitrogen) average. This suggests that the nitrogen currently present is mostly organically bound and not available for plant uptake. There are high levels of TKN in septic waste and manure. In most healthy and oxygen-rich surface waters, inorganic nitrogen is usually higher than TKN because that would mean bacteria have converted organic nitrogen into nitrate. A higher TKN ratio can indicate a disruption in this natural balance. High TKN often indicates nitrogen is tied up in organic material and correlates with eutrophication.

Ashley Creek (Ashley 11)

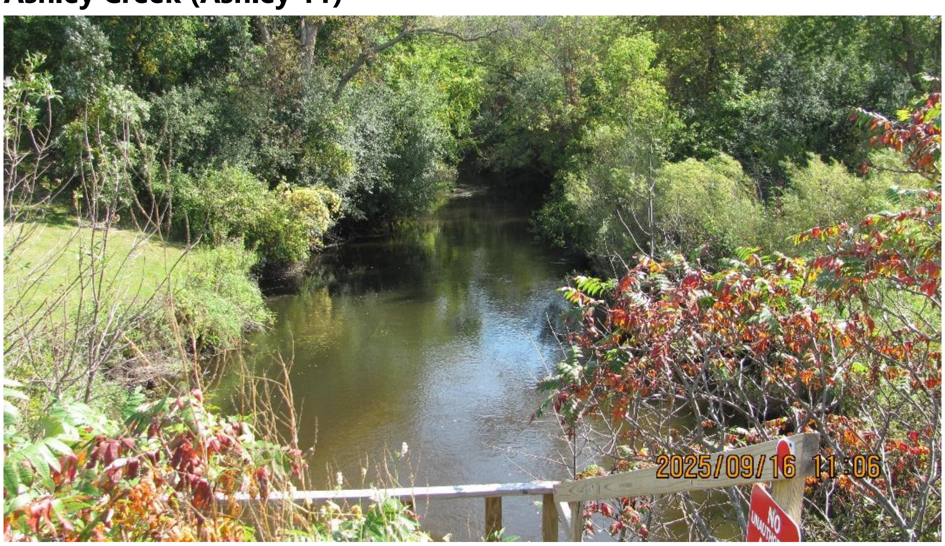


Image 6: Ashley Creek at CR11

The Ashley Creek drainage area is located within the Sauk Lake Management District, which is the largest WMD in the Sauk River Watershed. Ashley Creek's watershed is around 76,160 acres. It starts in a system of wetlands southwest of Swan Lake in Pope County, then flows through Swan and Westport Lakes. Traveling for a total of 27.5 miles, Ashley eventually outlets into Big Sauk Lake just north of Sauk Centre. A smaller stream, Silver Creek, outlets into Ashley near Fairy Lake. The site at County Road 11 was originally established in 2006, but was decommissioned in May of 2021 due to structural instability of the monitoring platform used to access the site. A new site was installed downstream on 415th Ave. in October 2021. Monitoring at the new, 415th Ave. site resumed from March to May of 2022, but equipment theft and damage rendered the site inoperable for the rest of the year. The Ashley 11 site was re-established at CR 11 with a new platform at the end of 2023, and monitoring resumed there for all of the 2024 season.

Much of Ashley Creek's watershed extends into Bonanza Valley, a region with sandy plains in a former glacial river bed that extends close to Alexandria down to Paynesville. It is one of three main areas in the state for which growing demands for groundwater is a high concern, and the Minnesota DNR is actively monitoring here to better manage groundwater use. Around 68% of the land cover in the Bonanza Valley is in row crops or hay/pasture. With farmers using the groundwater to irrigate their fields, groundwater use here over the past 25 years has increased about 5 times faster than the state average. The DNR characterized this region as the Bonanza Valley Groundwater Management Area (GWMA) in 2016 and has since increased monitoring, studied impacts on local surface waters, and established a groundwater management plan. To help ensure a sustainable groundwater supply, local farmers have used practices such as planting cover crops and technology to adjust irrigation systems based on weather.

With that context in mind, the sampling results can be better understood. Looking at TP, Figure 20 indicates that levels were above the WQS for most of the monitoring season. The TP average for 2025 was 153 µg/L, which is above both the 2024 and 9-year averages. The higher peaks correspond with spring runoff and heavy rain events.

Figure 20: Ashley 11 TP annual averages

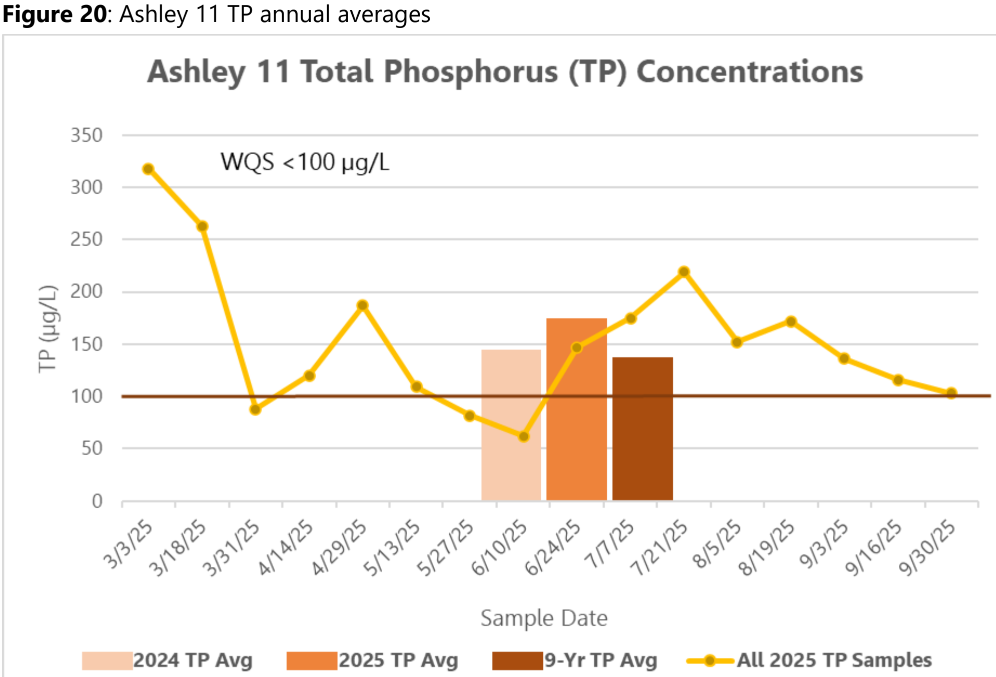
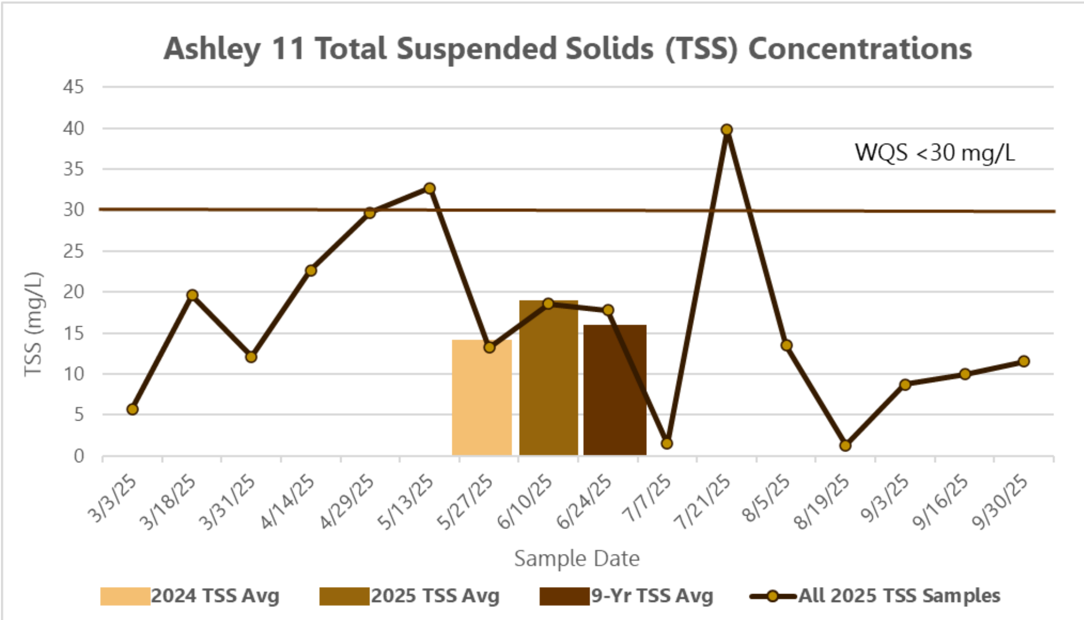


Figure 21: Ashley 11 TSS annual averages



For TSS, 2025 samples only exceeded the WQS twice. The higher results again correspond with major rain events. The 2025 average ended up being 16.2 mg/L; this is higher than the 2024 average and slightly higher than the 10-year average. Bear in mind that TSS levels are greatly influenced by rainfall totals and runoff amounts.

Figure 22: Ashley 11 N+N averages

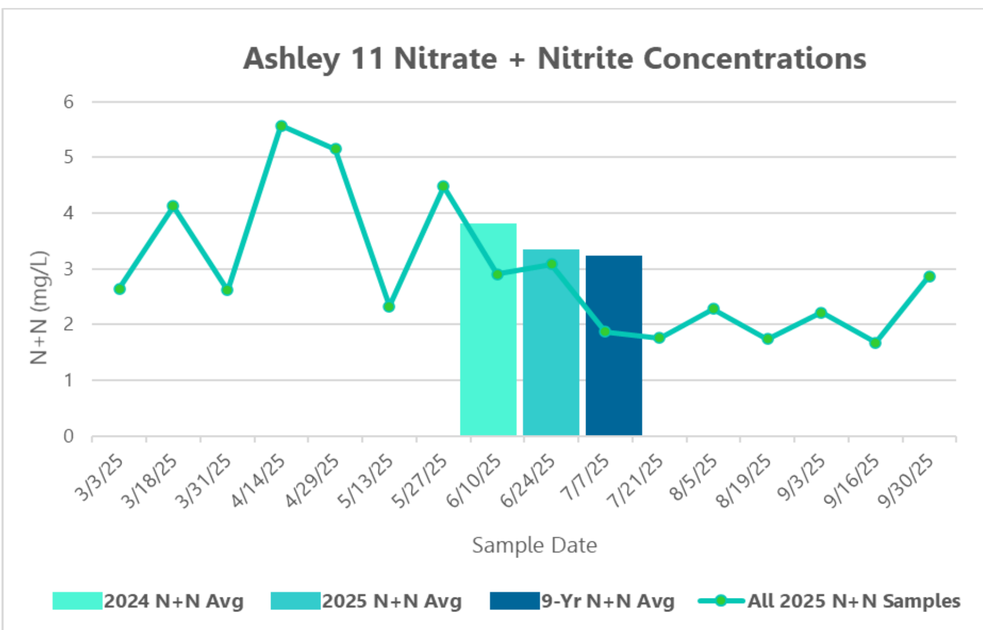
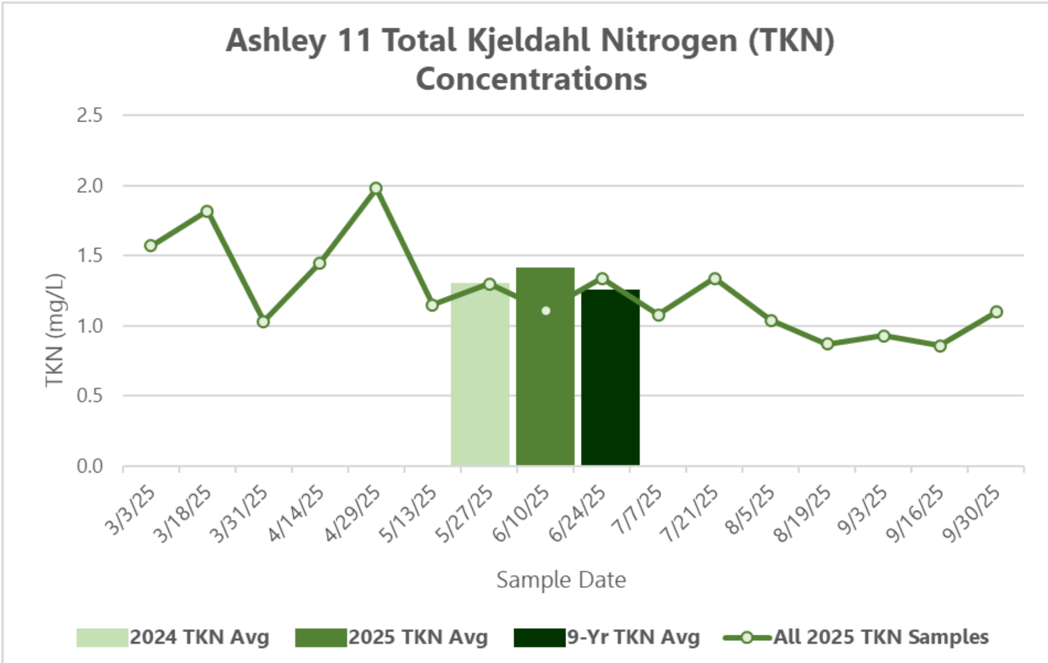


Figure 22 displays that N+N levels started off slightly high at the beginning of the year, but began to taper off in July. The 2025 average of 2.96 mg/L is encouraging since it is below the 2024 average. Since the EPA drinking water standard for nitrates is <10 mg/L, these results are not a concern.

Figure 23: Ashley 11 TKN annual averages



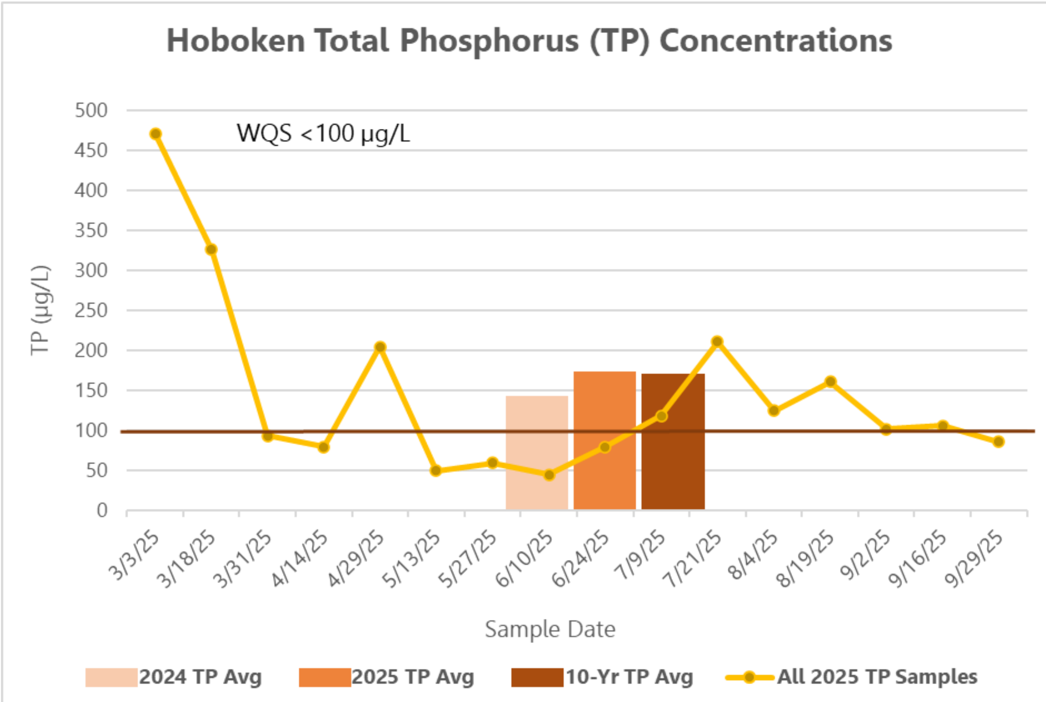
Lastly, TKN levels remained fairly steady throughout the season. The highest result was 1.98 mg/L, and the 2025 average was 1.25 mg/L. These TKN levels are not concerning at this time.

Hoboken Creek (County Road 17)

Image 7: Hoboken Creek monitoring site

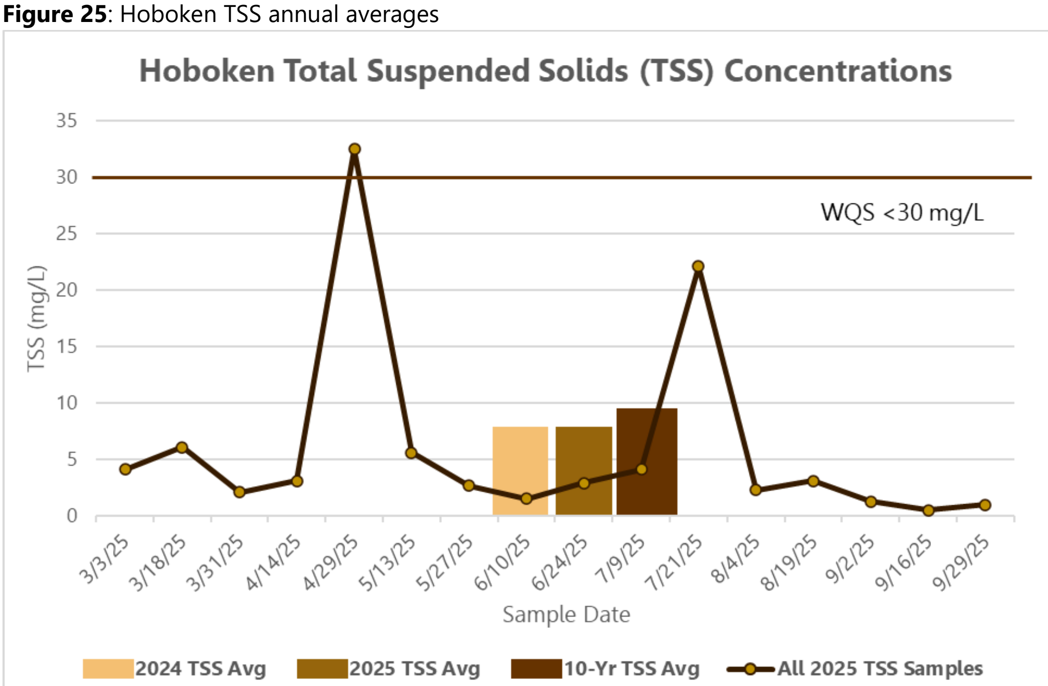
Hoboken Creek is a smaller stream that flows through Sauk Centre. It begins south of town and flows north for nearly 11 miles until the creek outlets into Big Sauk Lake. One of the public ditches managed by the Sauk River Drainage Authority (SRDA), County Ditch #51, outlets into Hoboken in its southern reaches. The SRWD has been monitoring this stream for water quality and quantity since 2001 at multiple sites. Its watershed is around 17,920 acres in size. Hoboken is also in the Sauk Lake WMD.

Figure 24: Hoboken TP annual averages



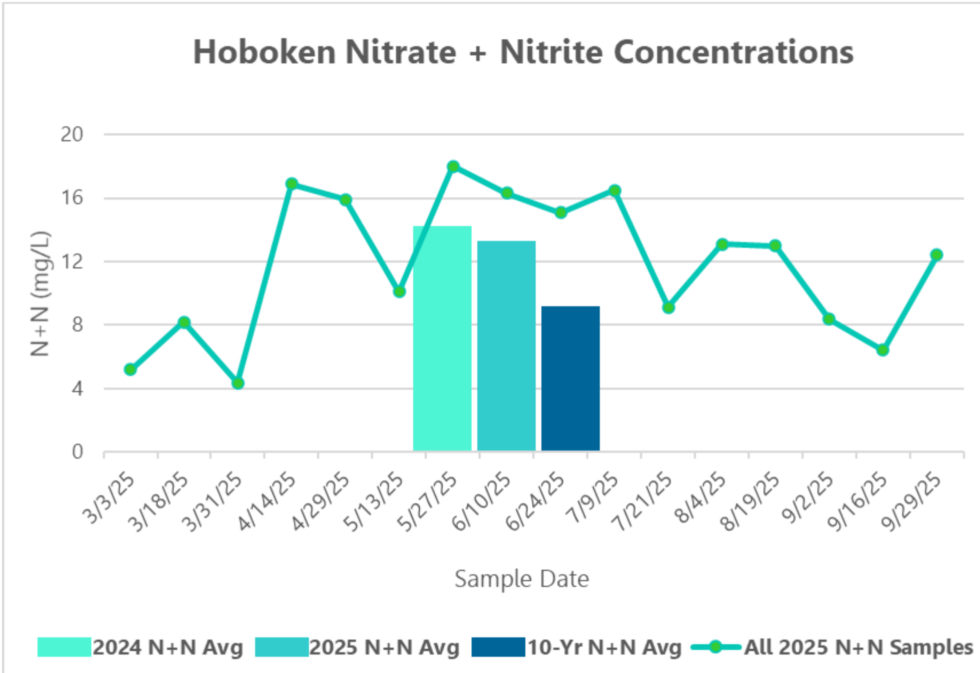
For TP, Hoboken exceeded the WQS for most of the year. The 2025 average did exceed the 2024 average and only slightly exceeded the 10-year average. The annual average was 145 µg/L in 2025. There were a couple especially elevated results at the beginning of the year, which are likely due to spring snowmelt.

Figure 25: Hoboken TSS annual averages



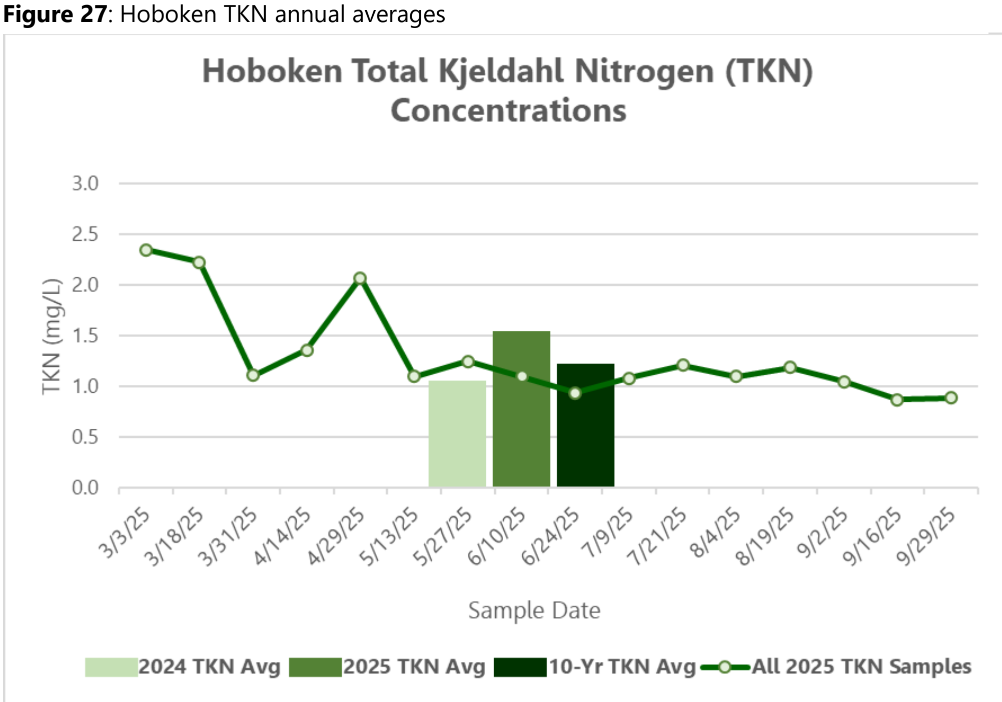
Looking at TSS, Figure 25 shows that concentrations only exceeded the WQS once on 4/29, which was in response to a heavy rain event. Since Hoboken is a "flashy" system, its flow rises and falls quickly after receiving major precipitation. The 2025 average was 5.9 mg/L, which is actually the same as the 2024 average. That average is below the 10-year TSS average.

Figure 26: Hoboken N+N annual averages



What is more concerning are the N+N results. Each 2025 sample was above 4 mg/L, and the average was 11.8 mg/L (Figure 26). Although this is thankfully below the 2024 average, it is still above the 10-year average. There is no surface water standard for N+N, but the annual average is above the EPA drinking water standard of <10 mg/L.

Figure 27: Hoboken TKN annual averages



As for TKN (Figure 27), these results are less concerning, but still higher than they have been in the past. The 2025 TKN average was higher than both the 2024 and 10-year averages. After the influence of spring runoff, TKN levels remained steady throughout the rest of the season. The 2025 average was 1.31 mg/L, which is not a concerning level.

Getchell Creek/CD #26 (County Road 176)

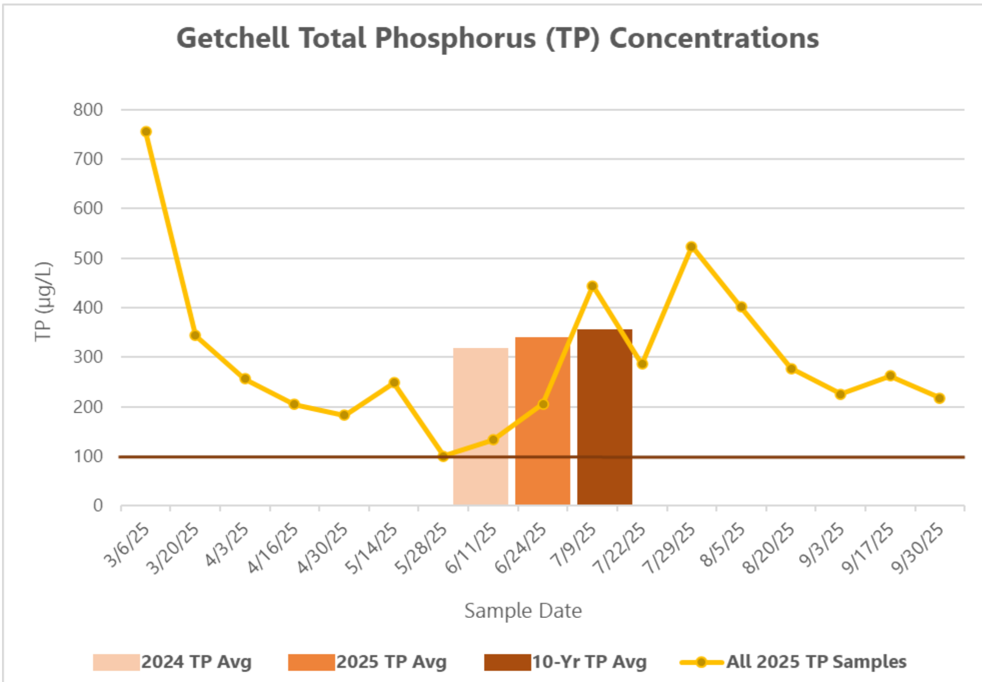
Image 8: Getchell Creek monitoring site

Getchell Creek is a tributary to the Sauk River that has one of the larger drainage areas in the watershed. It begins in St. Anna Lake (east of St. Rosa) and flows south until reaching the Sauk River south of New Munich. Getchell is unique because, for a portion of the creek, it is designated as a public drainage system (Stearns County Ditch #26). It also receives flow indirectly from SCD #15, another drainage system that the SRDA manages. Just south of where SCD #15 indirectly enters Getchell Creek, the creek flows through Getchell Lake. In total, Getchell Creek is approximately 18.7 miles long, and its watershed is 42,880 acres. It is listed as impaired for dissolved oxygen, poor fish and macroinvertebrates bioassessments, and *E. coli*. The Getchell monitoring site is at the CR 176 crossing, which falls within a section of the creek that is also designated as the SCD #26 drainage system.

This tributary is within the GUS Plus WMD, which is ranked second in importance for targeting implementation actions for reducing downstream impacts in our watershed's Comprehensive Watershed Management Plan (CWMP). GUS stands for Getchell, Unnamed, and Stony Creeks, the major tributaries in this WMD. Getchell is the largest of the three creeks and has the highest rate of sediment and phosphorus loading to the Sauk River. Land use in the lower subwatershed of Getchell is dominated by cropland (79.2%), followed by barren land (6.5%) then wetlands (4.8%). Around 87% of the streams in this subwatershed have been channelized, including most of Getchell Creek itself.

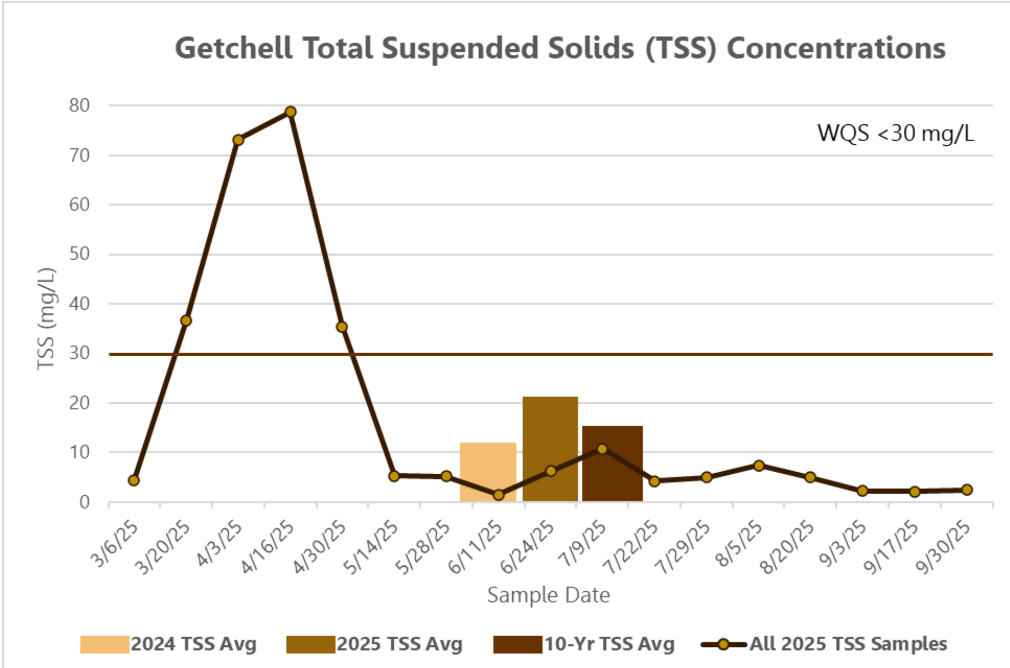
The SRWD has been awarded a $1.19 million Lessard Sams Outdoor Heritage Fund grant to implement streambank restoration projects and re-meander channels in the lower section of the subwatershed, downstream of Getchell Lake. Before moving forward with construction of a two-stage ditch, the SRWD has been communicating with landowners along the section that will be restored. The SRWD first has to secure permanent easements adjacent to the ditch to construct the project, which will mean some landowners taking land out of production. Recognizing that this is a substantial request, the SRWD has been working with the Stearns Conservation District (SCD) to determine the best way forward and what would be best for both the landowners and the protection of the creek/ditch system. The easements are necessary because this project must guarantee permanent protection per the requirements of the Lessard Sams Outdoor Heritage Fund grant.

Figure 28: Getchell TP annual averages



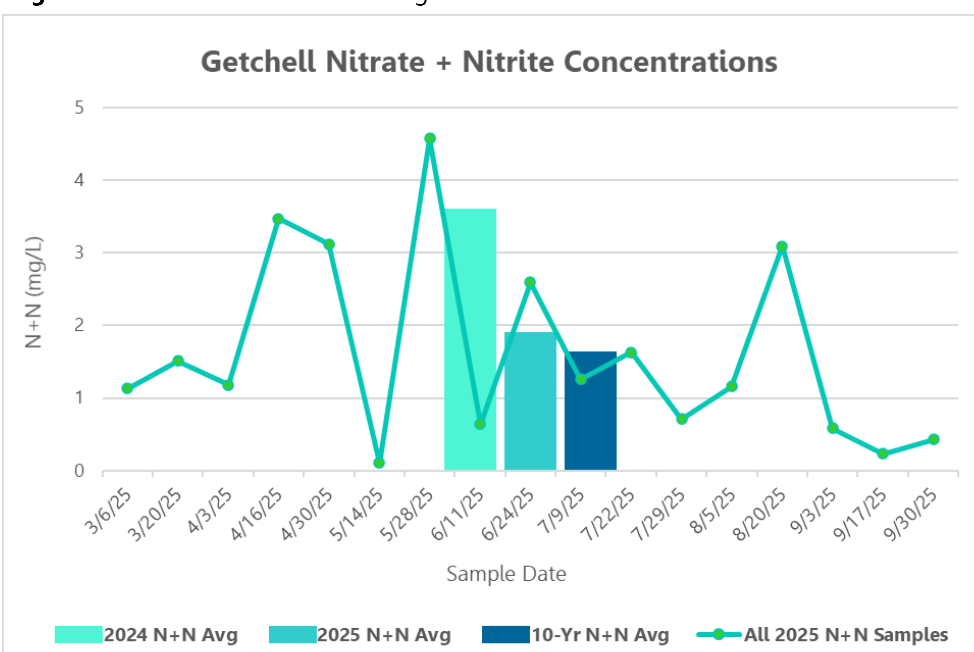
Unsurprisingly, Getchell experienced high TP levels in 2025. Each 2025 sample either exceeded or was right at the TP WQS of <100 µg/L. The 2025 annual average of 298 µg/L is only slightly higher than the 2024 average and is actually below the 10-year average of 315 µg/L. The higher spikes correlate with recent rain events, when more runoff is entering the system.

Figure 29: Getchell TSS annual averages



Looking at TSS, samples exceeded the WQS four times, all at the beginning of the year. The 2025 average of 16.8 mg/L is still well below the WQS, but it is higher than the 2024 and 10-year TSS averages. While not currently an issue in Getchell, there is a TSS impairment in the GUS Plus WMD, that being for a section of Stony Creek. This will be discussed more later in this report.

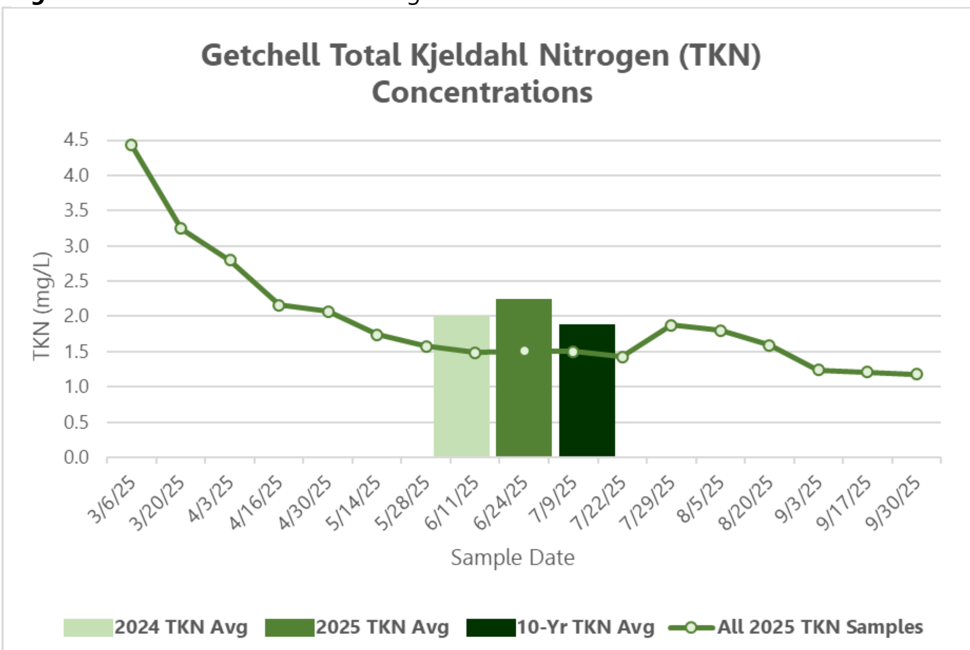
Figure 30: Getchell N+N annual averages



The N+N samples in 2025 were quite variable throughout the monitoring season. The highest result was 4.6 mg/L on 5/28. Encouragingly, the 2025 average (1.61 mg/L) was much lower than the 2024 average.

N+N levels in surface water are highly dependent on rainfall and runoff events. Major sources of N+N are fertilizer, animal waste, and septic systems. Since Getchell Creek doubles as a drainage system in a highly agricultural subwatershed, there are tile outlets directly feeding into the system, often delivering large amounts of excess nutrients. These N+N levels are not a concern at this time, but the SRWD will continue to closely monitor for any increases.

Figure 31: Getchell TKN annual averages



Lastly, TKN levels started slightly high in the beginning of the season, but came down and remained fairly steady after April. The 2025 annual average of 1.93 mg/L is slightly higher than the 2024 and 10-year TKN averages. Similar to the JD2 results, the TKN average in 2025 was higher than the N+N average, indicating low dissolved oxygen levels and negative effects of eutrophication.

Unnamed Creek (318th Ave.)

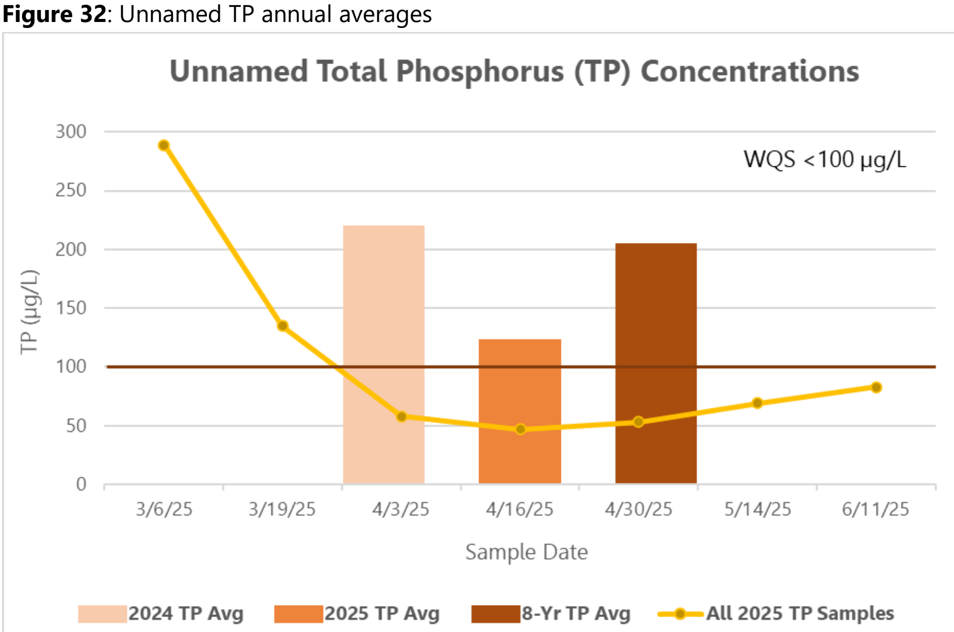
Image 9: Unnamed Creek monitoring site on 10.17.2024

This unnamed creek is one of many in the watershed and is located just off of County Road 14 near Spring Hill. It is the "U" in the GUS Plus WMD. Unnamed Creek is a short system (only around 9 miles) that begins south of Lake Henry. The last 0.6 miles of the stream is listed as impaired for *E. coli* and turbidity. The *E. coli* impairment is due in large part to manure runoff and cattle accessing the stream. It was listed in 2008 for the turbidity impairment (now measured by TSS levels), which is the only listing of its kind in the Sauk River Watershed. The SRWD began routinely monitoring at the site again in 2018 to pursue a delisting if it was found that the TSS levels were falling below the WQS.

After recent review by the MPCA of collected data over the years, they have found the TSS levels on average have fallen below the state standard, meaning it is not consistently reaching impairment levels. After a public comment period, the stream section will likely be excluded from the 2026 Impaired Waters List. The MPCA has also mentioned that previous fish community studies (FIBI) imply a low probability of that section being impaired for turbidity. However, *E. coli* levels continue to be a problem. This stream was only sampled until June in 2025, after which the site was decommissioned.

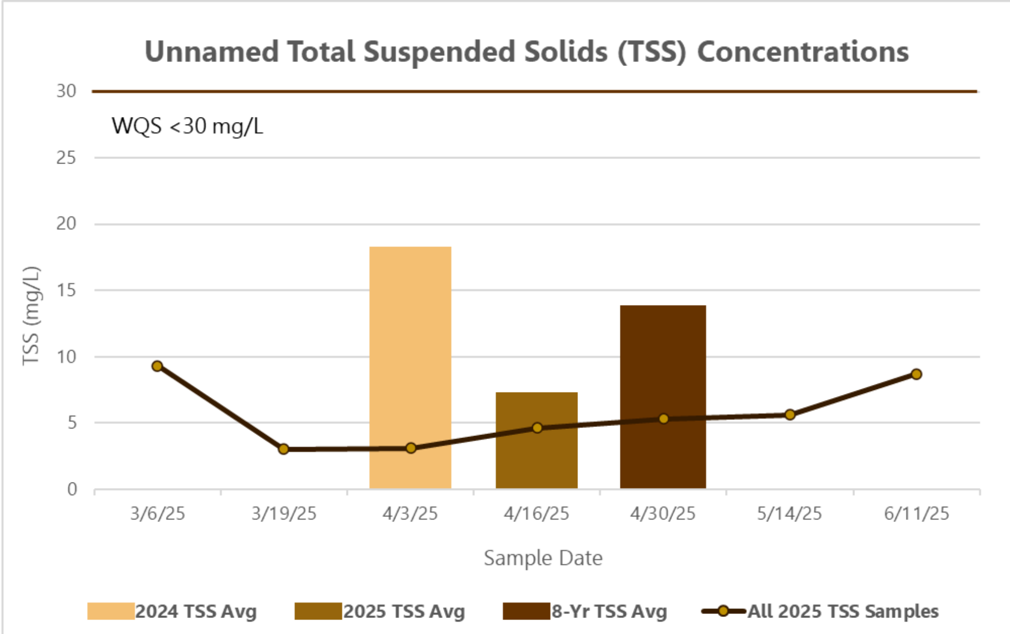
With the freeing up of staff time and sample lab analysis budget, SRWD staff re-established a site on **Stony Creek** just north of County Road 14. The last time this site was monitored by the SRWD was in 2013. The section where the monitoring site is located is listed as impaired for *E. coli* and TSS. This site will be routinely monitored in 2026.

Figure 32: Unnamed TP annual averages



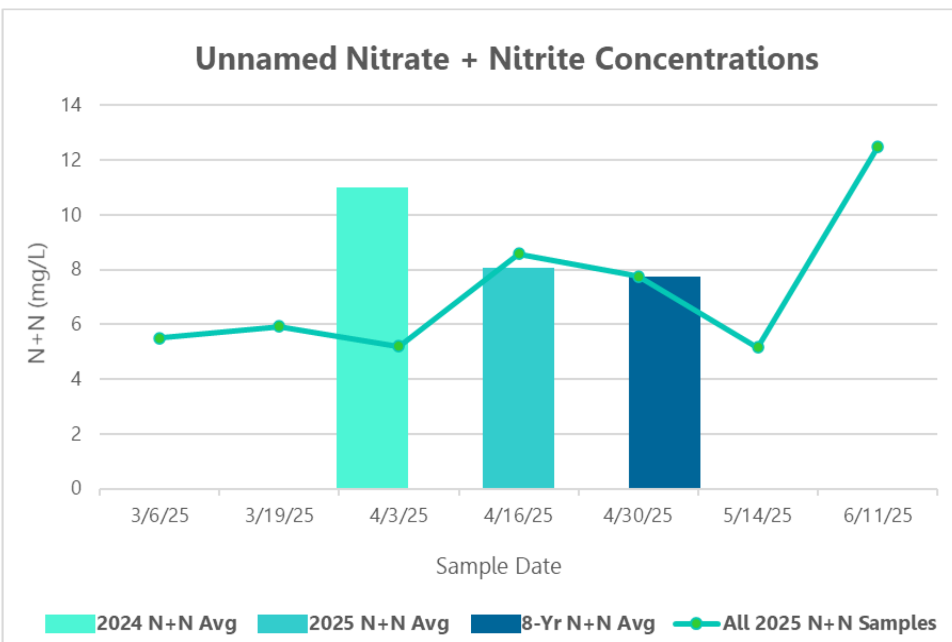
Unnamed Creek was only sampled 7 times in 2025, so that should be taken into account when comparing to results from previous years. The first couple samples in 2025 were elevated and above the WQS, but levels came back down after the snowpack melted. This is often when the highest TP levels are seen. The 2025 TP average of 105 µg/L is much lower than the 2024 average (202 µg/L) and the 8-year average. There is only an 8-year average because SRWD data only goes back to 2018. The 2025 TP average is still slightly above the WQS.

Figure 33: Unnamed TSS annual averages



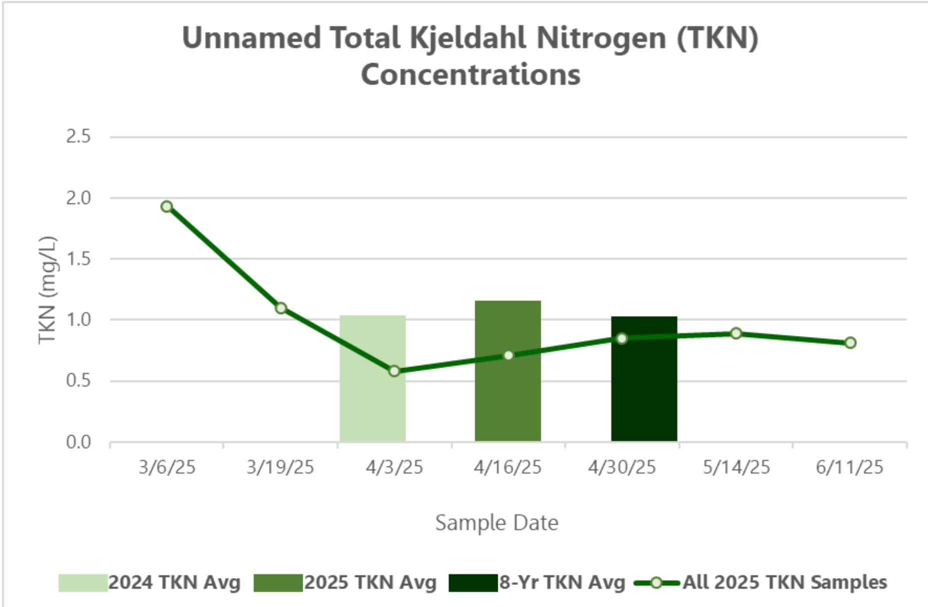
For TSS concentrations, the parameter of interest in regards to the turbidity impairment, levels have been consistently low and not close to reaching the WQS of <30 mg/L. Even during spring runoff, there were no elevated TSS levels. The 2025 average came out to be 5.7 mg/L, which is much lower than the 2024 average. That is also lower than the 8-year TSS average of 12.1 mg/L. Since high TSS levels were not observed, sampling was discontinued.

Figure 34: Unnamed N+N annual averages



N+N concentrations in 2025 were also lower than 2024 levels. The highest result in 2025 was 12.5 mg/L, and the 2025 average was 7.2 mg/L. This is only slightly higher than the 8-year average of 6.9 mg/L.

Figure 35: Unnamed TKN annual averages



TKN levels remained low in 2025 and never exceeded 2 mg/L. The 2025 TKN average was 0.98 mg/L, which is slightly higher than the 2024 and 8-year averages. These concentrations are not at a concerning level.

Mill Creek (Broadway St.)

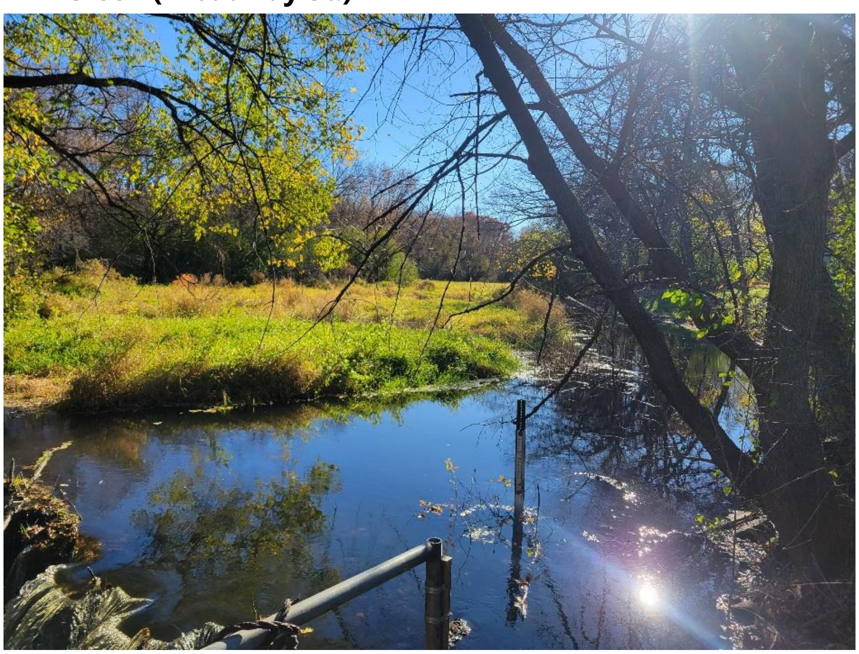
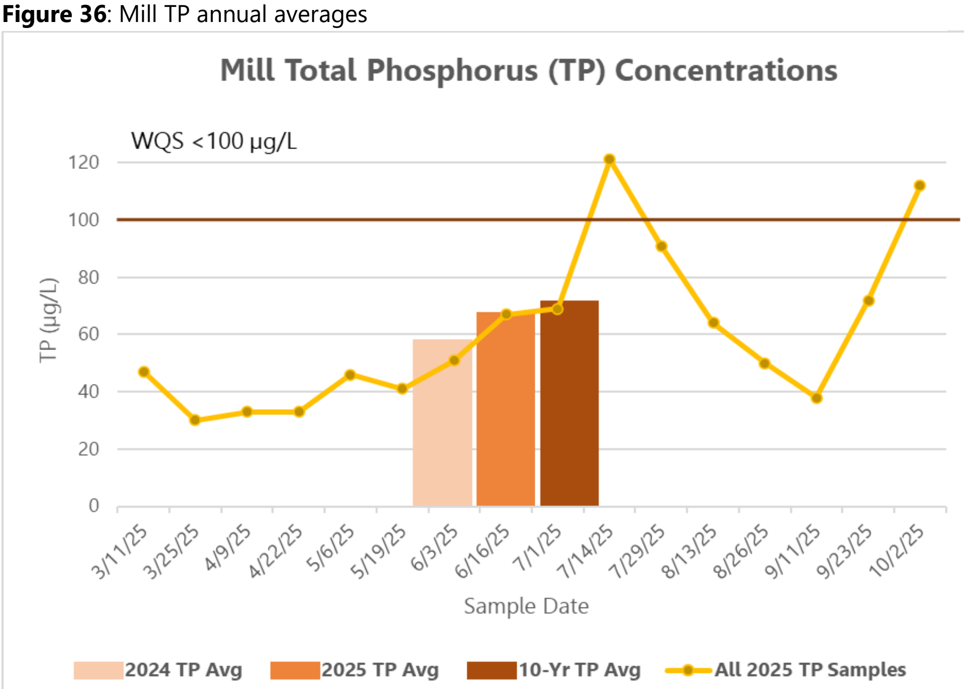


Image 10: Mill Creek on 11.03.2025

Mill Creek begins south of Rockville at the outlet of Goodners Lake and is about 11 miles long. It is the furthest downstream tributary that the SRWD routinely monitors. The creek flows northeast, passes through Pearl Lake, then continues north toward the Sauk River. Named after the major lakes in the area, Mill Creek falls in the Grand Pearl WMD. This WMD is ranked second highest priority in the watershed for groundwater availability and groundwater quality concerns. The entire length of Mill Creek is impaired for aquatic recreation and *E. coli*. The SRWD has been monitoring this stream site since 2003.

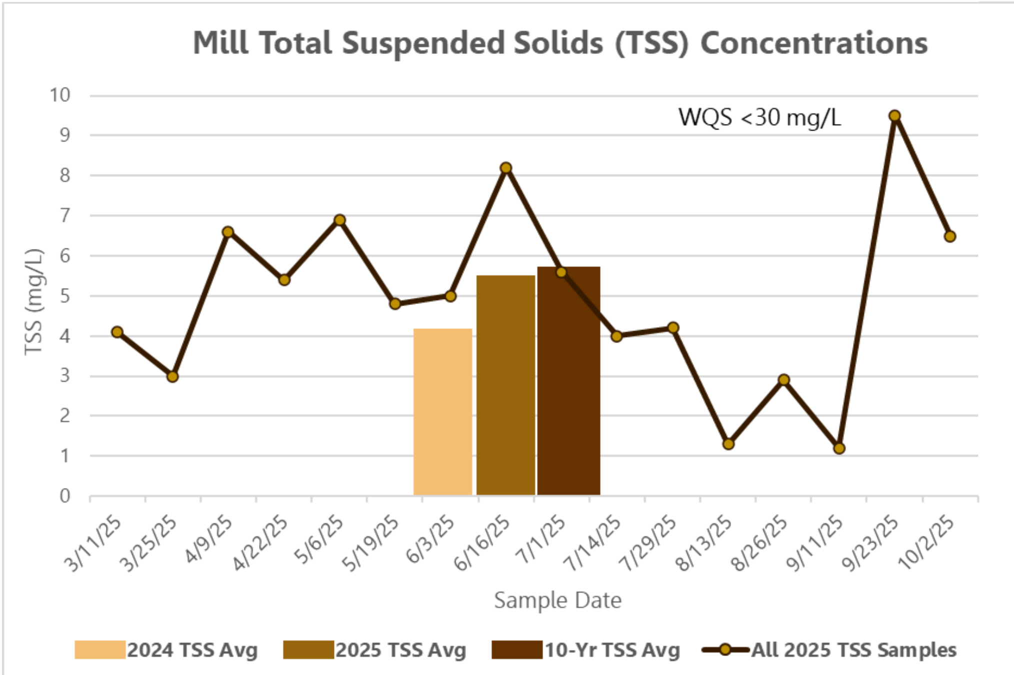
Mill Creek's watershed is about 30,720 acres in size. The Grand Pearl subwatershed is 15.2% forested, 8.8% wetlands, and 59.2% row crops and pasture, according to the 2021 NLCD data. In the stream section between Pearl and Grand Lake, the creek runs through several large wetlands and forests that provide buffering/protection from direct cropland runoff and developed areas. In this section, there are few residences or farms near the creek. Another note about this site is that it is a split site; the samples are not collected in the same place the water level is measured. Since there is a weir at the water gauging site (south of Broadway Street), it is not safe to collect samples there. The water level is measured by a pressure transducer that stays submerged in the stream near the weir. Staff first take a depth-to-water measurement on the upstream side of the weir to verify what the pressure transducer is reading, then cross the road to the downstream side of Mill Creek to collect a grab sample and water quality meter readings (temperature, dissolved oxygen, conductivity, and pH). Flow measurements are taken in the culvert on the downstream side.

Figure 36: Mill TP annual averages



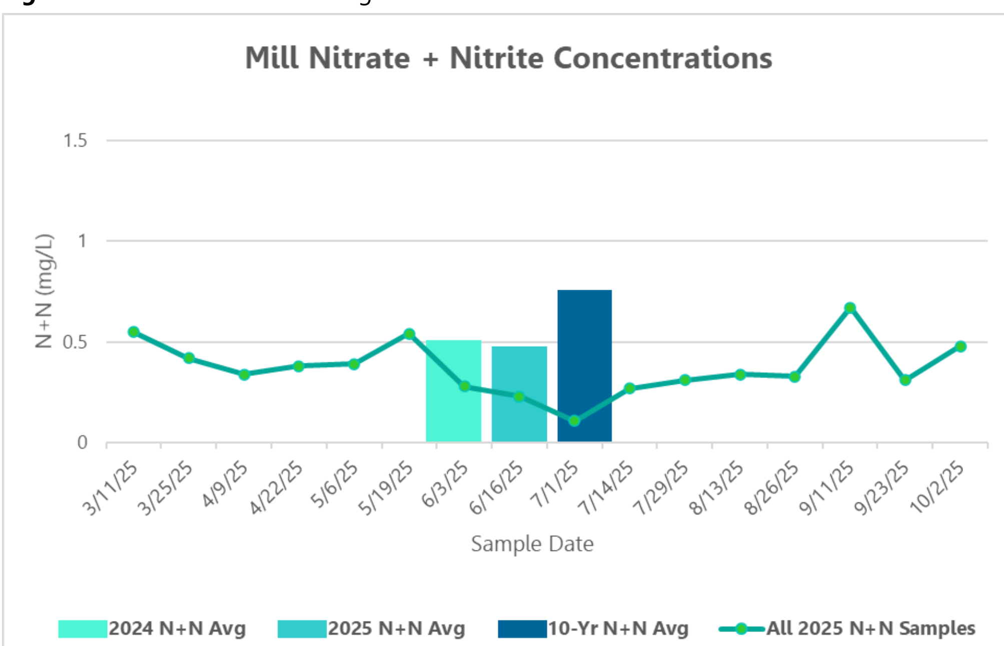
Compared to the other tributaries monitored by the SRWD, Mill Creek has historically had low nutrient levels. In the case of TP, Mill Creek is the only stream with an annual average below the WQS of <100 µg/L. In 2025, the TP average was 60.3 µg/L, and only two samples were above 100 µg/L. That is slightly above the 2024 average, but it is lower than the 10-year average.

Figure 37: Mill TSS annual averages



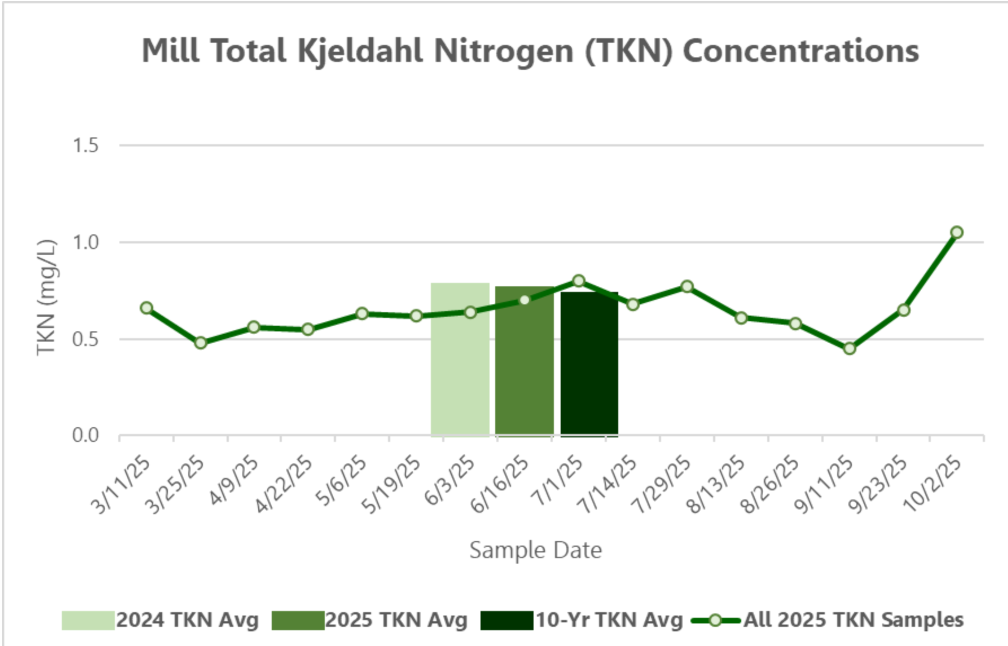
Mill Creek also had low TSS concentrations in 2025. Sample results never exceeded 10 mg/L. The 2025 average of 5 mg/L is slightly higher than the 2024 average, but it is below the 10-year average and well below the WQS of <30 mg/L.

Figure 38: Mill N+N annual averages



N+N results in 2025 were extremely low, even falling below the 2024 annual average. Concentrations never exceeded 1 mg/L. The average N+N for 2025 was 0.37 mg/L, which is the lowest out of all monitored tributaries.

Figure 39: Mill TKN annual averages



For TKN levels, the 2025 average also fell below the 2024 average. Remaining fairly steady throughout the year, the 2025 annual average was 0.65 mg/L. That is slightly above the 2025 average for N+N, but since concentrations were so low for both parameters, neither of them is a concern.

2025 SAUK RIVER & TRIBUTARIES MONITORING SUMMARY

Image 11: Flow measurement at Cold Spring site

Monitoring in 2025 was marked by an abundance of rain during the growing season followed by a warm and dry fall. 2025 experienced the second warmest fall on record in Minnesota. First considering the mainstem of the Sauk River, TP averages were generally high; the 2025 average was above the 10-year average at four sites. Only two sites (Osakis Outlet and SR Edge) had TP averages in 2025 that fell below the WQS. Average transparency tube results were encouraging and well above the WQS, which indicates good clarity. Each 2025 T-tube average was above the 10-year average except for at Osakis Outlet, which was only slightly below. TSS averages were also encouraging and well below the WQS. All of the 2025 TSS averages fell below the 10-year average except, again, at Osakis Outlet. For N+N, all 2025 averages were below the 2024 averages except for at SR12 near St. Martin. The 2025 N+N averages were below the 10-year average at three sites. Thankfully, nitrate levels are continuing to remain low in the Sauk River.

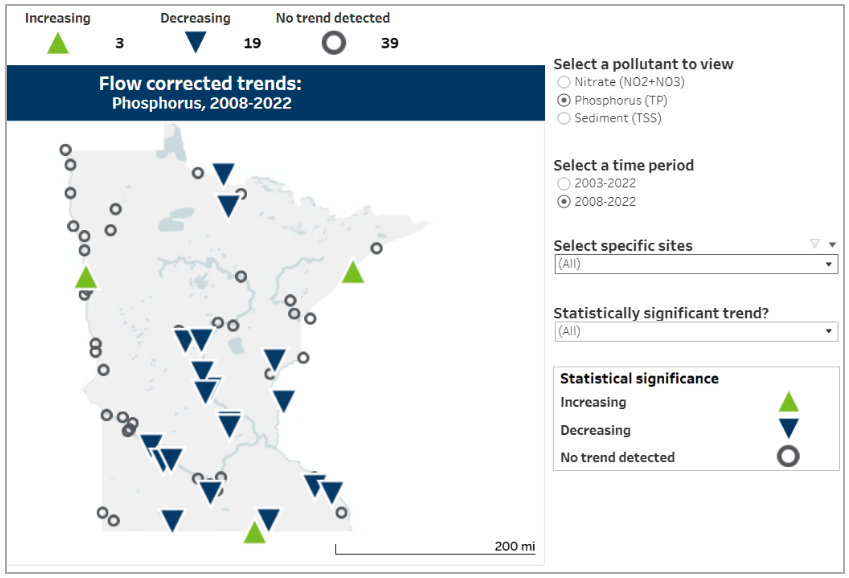
Turning to the tributaries, there were also increases in TP, but other parameters were lower compared to past years. T-tube averages across the board were well above the WQS. Three streams (JD2, Unnamed, and Mill) had 2025 T-tube averages above the long-term averages. **JD2** had the highest TSS average in 2025 at 18.4 mg/L and the second highest TP average at 181 µg/L. However, there was a significant drop in N+N at JD2 compared to the 2024 average. **Ashley Creek** had 2025 TP and TSS averages that were higher than the 2024 averages, but TSS was still well below the WQS. There were once again high N+N results at **Hoboken** (2025 average of 11.8 mg/L), but that is a drop from the 2024 average. The 2025 TP average was slightly higher than the 2024 average at Hoboken. Looking at **Getchell**, TP was high throughout the monitoring season and was slightly higher than the 2024 average; however, it did fall below the 10-year average. The average TP in 2025 was 298.1 µg/L, which is the highest out of all the tributaries. The 2025 TSS average was also slightly higher than the 2024 average at Getchell. Thankfully, there was a significant drop in the 2025 N+N average compared to the 2024 average.

Unnamed Creek was only sampled seven times in 2025, and monitoring ended after June 11th. This stream section was listed as impaired for turbidity in 2008, and that listing is being proposed for removal from the 2026 IWL. The 2025 TSS data had very low values, and TSS has consistently been well below the WQS since 2018. TP and N+N averages in 2025 were also lower than the previous year. Lastly, at **Mill Creek**, each 2025 average was the lowest out of the tributaries for each sampled parameter, and the T-tube average was the highest. There were slight increases in the 2025 averages for TP and TSS compared to 2024, but they are still below the WQS and 10-year averages.

FUTURE CONSIDERATIONS

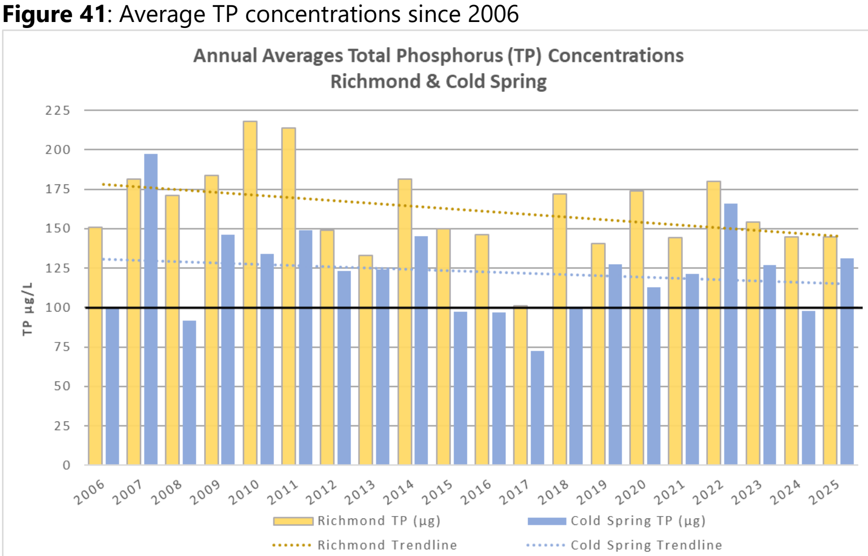
The SRWD is making progress towards its goals, but there is still much work to be done. When considering the health of the watershed, phosphorus is the primary nutrient of concern because excess phosphorus can drive a wide array of aquatic biological responses that negatively affect how a waterbody functions. There have been decreases in phosphorus levels, not only in our watershed, but generally across the state, specifically in the Mississippi River drainage basin. While TP concentrations are still not consistently falling below the WQS, there is a pattern of decreasing TP at monitored stations throughout Minnesota. Figure 40 is taken from the MPCA online dashboard for long-term Minnesota stream trends. As stated on the website, flow-corrected trends are considered the definitive analytical result and demonstrate in a simplified way the changes that would occur if flow remained the same from year to year. According to the 2025 MN Nutrient Reduction Strategy update put out by the MPCA, phosphorus loads in the Mississippi River leaving Minnesota are down 32% compared to baseline, and nitrate loads are down 6%. In addition, Minnesotans have added nutrient-reducing practices to 4 million cropland acres.

Figure 40: Long term flow-corrected TP trends in MN (Source: MPCA)

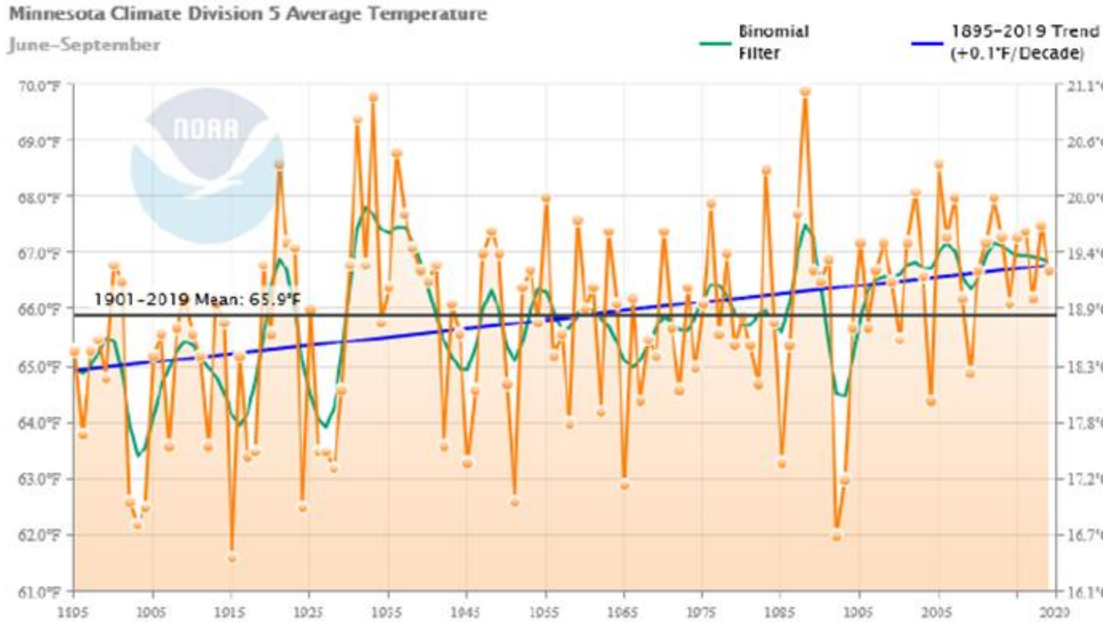


As for our own watershed, Figure 41 is a graph showing annual average TP concentrations at the Richmond and Cold Spring monitoring sites since 2006. The yellow dashed trendline is for Richmond, and the blue dashed line is for Cold Spring. The solid black line across the graph represents the TP WQS of <100 µg/L. Although there has been variation over the years, there is a general decline in TP concentrations for both sites, more apparent at Richmond. These two sites were specifically chosen because Richmond is the last location before the river flows into the Sauk River Chain of Lakes system, and Cold Spring is just downstream of the Chain of Lakes outlet. Notice that Cold Spring's concentrations are consistently below Richmond's because flow is considerably reduced in the Sauk River Chain of Lakes thanks to the dam in Cold Spring. This means that nutrients and sediments have a chance to settle out of the slower-flowing water.

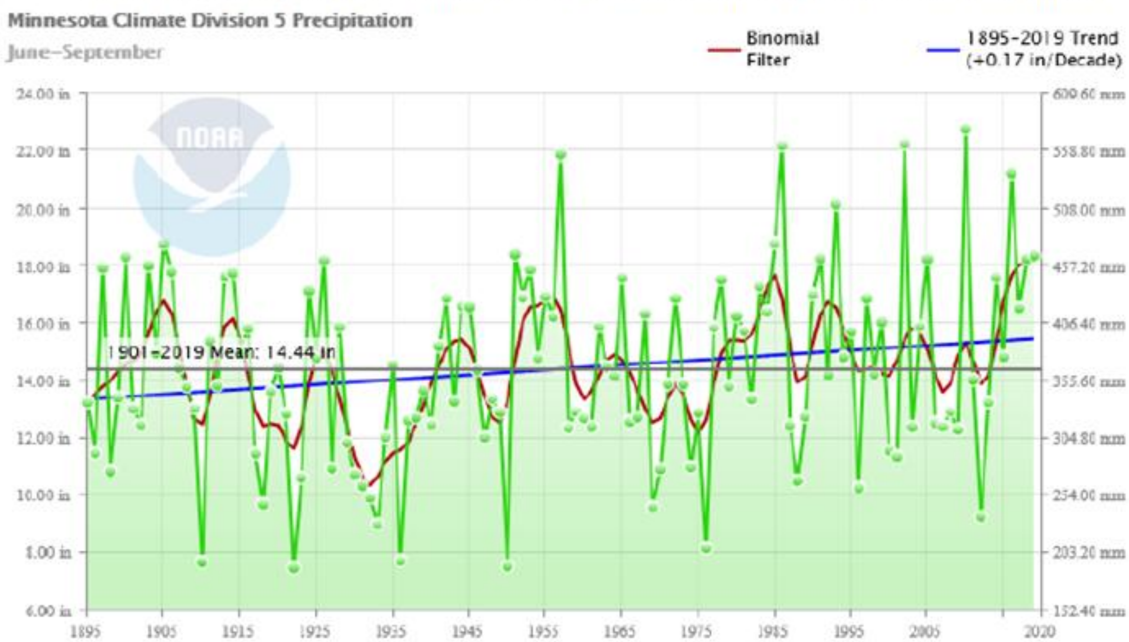
Figure 41: Average TP concentrations since 2006



Growing season (June to September) temperatures for 1895–2019 from NOAA [2020a] for Minnesota Climate Division 5



Growing season (June–Sept) precipitation for 1895–2019 from NOAA [2020a] for Minnesota Climate Division 5



When considering future restoration/conservation work and monitoring program design in the Sauk River Watershed, it is important to bear in mind the substantial climate variations Minnesota has been experiencing. Overall, growing season temperatures and precipitation have been increasing, especially since 2005 (see above graphs). Because of this considerable year-to-year variation, it is crucial to understand the flow conditions that existed when samples were collected in a certain year and ensure that all ranges of flow conditions are represented during the monitoring period. For the Sauk River Watershed, monthly average flows are typically highest during early spring months when major snowmelt is happening (March and April), and lowest during winter months (December to February). Average monthly precipitation is generally highest during late spring and summer (June to August). These localized storms contribute significant runoff amounts that potentially increase pollutant concentrations for short pulses, especially from events in spring and early summer.

Following that logic, it is reported in the 2023 Sauk River TMDL that average TP concentrations are highest in July and August compared to June and September. Nutrient runoff usually peaks during spring and summer, with the resulting algae growth occurring during the summer months. Aside from overland runoff from the general surrounding watershed, an additional nonpoint source in our lakes, streams, and rivers is internal phosphorus loading in upstream lakes. This can be both human-derived and natural in origin, and it is mainly caused by phosphorus being released into the water column from lake bottom sediments and aquatic plants. Release of phosphorus from bottom sediments typically peaks in July to September, when there are low dissolved oxygen levels at the lake bottom paired with warmer water temperatures and increased bacterial decomposition. Even when external phosphorus sources have been addressed by BMP implementation, the internal recycling of phosphorus can continue feeding explosive algal growth. As the SRWD continues to establish capital improvement projects and work towards the nutrient reduction goals laid out in our Comprehensive Watershed Management Plan, the monitoring department will continue tracking changes in water quality over time and evaluating the effectiveness of efforts to improve our water resources.

GLOSSARY

Average – This monitoring summary uses the arithmetic averages for all annual data displayed. The arithmetic mean is commonly referred to as the average, or simply the mean, of a set of values. It is calculated by adding all the values together and then dividing them by the number of values (n) that were added. This is commonly used to consolidate many measurements into one representative measurement.

Chloride (Cl^-) – Regularly analyzed in water quality monitoring to evaluate salinity levels. The use of road salt (sodium chloride) for deicing is a major manmade source of chloride to surface water and groundwater. Application of road salt in the United States has tripled since the 1970s. Elevated concentrations of chloride in streams can be toxic to aquatic life. The WQS for Class 2 waters is 230 mg/L for chronic levels and 860 mg/L for acute levels.

Comprehensive Watershed Management Plan (CWMP) – Synonymous with the One Watershed, One Plan (1W1P), which is a planning program run through the Board of Water and Soil Resources (BWSR) to work at a watershed level to improve water quality. The purpose of a CWMP is as follows:
- Align local water planning purposes and procedures
- Acknowledge and build off existing local government structure, water plan services, and local capacity
- Solicit input and engage experts from agencies, citizens, and stakeholder groups
- Focus on implementation of prioritized and targeted actions capable of measurable progress.

Ecoregion – A region defined by distinctive geography, plant and animal communities, land uses, soil profiles, and sun and moisture patterns. Ecoregions are used by the Environmental Protection Agency (EPA) and Minnesota Pollution Control Agency (MPCA) to characterize regional differences in the state and their effects on water quality. The Minnesota ecoregion the Sauk River Watershed resides in is the **North Central Hardwood Forest** (NCHF). The NCHF ecoregion is a transitional zone between the predominantly forested northern lakes region and the corn belt plains in southern Minnesota.

Fish Index of Biotic Integrity (FIBI) – An index to measure aquatic vertebrate communities and the surrounding conditions using fish species as indicators. Overall, there are 12 fish community variables that can be broken down into three main categories: species richness and composition, trophic composition, and fish abundance & condition. By assessing the variables within these parameters, scientists can compare a sampled site with a relatively undisturbed site with similar geographical and climatic conditions.

Macroinvertebrate Index of Biotic Integrity (MIBI) – In 2003 and 2004, IBIs based on macroinvertebrate communities were developed for streams in specific major basins of Minnesota and used to conduct Aquatic Life Use assessments. Development of the MIBI utilized a standardized protocol developed by researchers from the Environmental Protection Agency (EPA) and elsewhere. The stream classification system and macroinvertebrate-based Indices of Biological Integrity (IBI) document have been utilized (in concert with other indicators) since 2010 to annually assess the condition of aquatic life in Minnesota's rivers and streams.

Nitrate + Nitrite (N+N) – A water quality parameter that is often sourced from fertilizers, animal/human waste, industrial waste, or decaying organic matter. These are inorganic forms of nitrogen, with nitrates in particular being an essential plant nutrient since plants can only take up inorganic nitrogen. Excessive nitrates can become toxic to warm-blooded animals at concentrations around 10 mg/L.

Ortho-phosphate (OP) – A dissolved, inorganic form of phosphorus that is easily taken up by plants and bacteria. Ortho-phosphate is a portion of the forms of phosphorus found in the environment, and high levels of OP have been correlated with poor water quality, algae blooms, and reduced viability of certain aquatic species.

Point Source & Nonpoint Source – These terms are used when referring to how a pollutant enters a waterbody. **Point sources** are single and identifiable locations, such as the end of a pipe, and are regulated by state and federal agencies. **Nonpoint sources** can be rain and snow runoff, which accumulates pollutants as water flows across the landscape. Places like parking lots, farmland, construction sites, and eroding streambanks are considered nonpoint sources of pollution and are harder to track, control and, regulate.

Pollutant Load – The amount or mass of a substance that passes a particular point of a river (such as a monitoring station) in a specified amount of time (e.g., daily, annually).

Rating Curve – A rating curve represents the relationship between river stage/level and streamflow or discharge. Each channel is different and, because the stage-discharge relation is a function of the stream geometry and bed material, each rating curve will be unique to a site for a particular period of time. Existing rating curves should be validated every year by collecting additional data at least every 4-5 weeks throughout the monitoring season and a range of high and low flows.

Specific Conductance (SpC) – Also referred to as specific conductivity or just conductivity, SpC is a measure of the ability of water to conduct an electrical current. It is an important water quality measurement because it gives a good idea of the amount of dissolved material in the water. High SpC indicates high dissolved-solids concentration, which can affect the suitability of water for domestic, industrial, and agricultural uses. A normal conductivity value is roughly twice the total hardness in unsoftened water samples.

Total Kjeldahl Nitrogen (TKN) – A method for measuring organic nitrogen plus ammonia in a water sample. Nitrate and ammonia are the major forms of dissolved inorganic nitrogen and are the only forms that are available for algal and plant uptake.

Total Maximum Daily Loads (TDML) – The amount of a pollutant that can be present and still have a waterbody meet water quality standards. A TMDL allocates pollutant loading to four separate metrics:
TMDL = Waste load allocation (WLA) + Load Allocation (LA) + Margin of Safety (MOS) + Reserve Capacity (RC)

WLA includes pollutant loading from permitted sources (point sources), LA includes sources not covered by a permit (nonpoint sources), MOS accounts for uncertainty in these estimates, and RC allows for future growth.

Total Phosphorus (TP) – A measure of all forms of phosphorus, both the organic and inorganic. Organic phosphorus is not commonly found in suspension in the water column and is not as chemically available as food for plants and animals. Inorganic phosphorus, referred to as ortho-phosphate (OP), is commonly dissolved in water and is readily available to plants and animals. Phosphorus is an essential nutrient for growth, but is only necessary in small concentrations to sustain life. Phosphorus can also be found in the water column and embedded in water bottom materials. Point sources of phosphorus include wastewater and industrial releases, and nonpoint sources from agricultural fertilizers and contaminated groundwater.

Water Management District (WMD) – Closely tied to hydrologic boundaries, district boundaries may additionally consider ecological, economic, social, geopolitical, and land use factors for boundary purposes. In Minnesota, watershed districts have the authority to create WMDs and develop a fee structure to fund WQ improvement projects based on a specific pollution problem or water resource issue in the region. For example, the fee can be based on land contribution to runoff volume if there is a flooding or water storage issue. Alternatively, if nutrients and phosphorus are the water quality issue, land use and impervious surface area would be factored into how the fee is developed. Defining WMDs is the optional mechanism for funding specific watershed projects.

Water Quality Standards (WQS) – Numeric or narrative pollutant standards that, when met, describe the desired condition of a waterbody. Water quality standards are critical regulatory tools for protecting aquatic resources from adverse pollutant impacts. Commonly, WQS are set to protect human and aquatic life health. WQS form a legal basis for controlling pollutants entering the waters of the United States and are legally enforceable. The Clean Water Act and Minnesota Rules provide the flexibility to tailor WQS to waterbodies where unique circumstances alter the typical or expected relationship between a pollutant and the protected beneficial use.