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Watershed

Draft Cedar River Watershed Total Maximum Daily Load Report 2026

Addressing three total suspended solids impairments and nine *E. coli* impairments.

MINNESOTA POLLUTION CONTROL AGENCY

CLEAN WATER LAND & LEGACY AMENDMENT

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Abbreviations

1W1P	One Watershed, One Plan
AQC	aquatic consumption
AQL	aquatic life
AQR	aquatic recreation
AU	animal unit
BMP	best management practice
BWSR	Board of Water and Soil Resources
CAFO	concentrated animal feeding operation
CRP	Conservation Reserve Program
CREP	Conservation Reserve Enhancement Program
CWA	Clean Water Act
DNR	Minnesota Department of Natural Resources
DO	dissolved oxygen
E. coli	*Escherichia coli*
EPA	U.S. Environmental Protection Agency
EQuIS	Environmental Quality Information System
FDC	Flow duration curve
HSPF	Hydrologic Simulation Program–Fortran
HUC	Hydrologic Unit Code
ITPHS	imminent threat to public health and safety
IWM	intensive watershed monitoring
LA	load allocation
lb	pound
LDC	load duration curve
LGU	local government unit
m	meter
MAWQCP	Minnesota Agricultural Water Quality Certification Program
mg/L	milligrams per liter
mg/m^2-day	milligrams per square meter per day

mL	milliliter
MDA	Minnesota Department of Agriculture
MOS	margin of safety
MPCA	Minnesota Pollution Control Agency
MS4	municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PWP	Permanent Wetland Preserve
RIM	Reinvest in Minnesota
SDS	state disposal system
SSTS	subsurface sewage treatment systems
SWCD	soil and water conservation district
SWPPP	Stormwater Pollution Prevention Plan
TMDL	total maximum daily load
TN	total nitrogen
TP	total phosphorus
TSS	total suspended solids
USGS	U.S. Geological Survey
WBIF	watershed-based implementation funding
WID	water unit identification
WLA	wasteload allocation
WRAPS	Watershed Restoration and Protection Strategy
WRP	Wetland Reserve Program
WQBEL	water quality-based effluent limit

Executive summary

The Federal Clean Water Act (CWA), Section 303(d) requires total maximum daily loads (TMDLs) to be produced for surface waters that do not meet applicable water quality standards necessary to support their designated uses (i.e., impaired waters). A TMDL determines the maximum amount of a pollutant a receiving water body can assimilate while still achieving water quality standards, and allocates allowable pollutant loads to various sources needed to meet water quality standards. This study is part of the work being completed by the Minnesota Pollution Control Agency (MPCA), as part of the State of Minnesota's Watershed Approach, and is a continuation of initial TMDL efforts in the Cedar River Watershed that were approved by the U. S. Environmental Protection Agency (EPA) Region 5 in 2019. Since the initial TMDLs, the Cedar River Watershed has been re-visited for intensive watershed monitoring (IWM) and re-assessed for meeting water quality standards. This report includes two *Escherichia coli (E. coli)* TMDLs and two total suspended solids (TSS) TMDLs in the Cedar River Watershed in south-central Minnesota affecting streams with aquatic recreation (AQR) and aquatic life (AQL) designated uses. These TMDLs also address upstream impairments in the subwatersheds, for a total of nine *E. coli* and three TSS impairments.

The pollutant load capacity of TSS and *E. coli* in the impaired streams was determined using load duration curves (LDCs). These curves represent the allowable pollutant load at any given flow condition. Water quality data were compared with the LDCs to determine load reduction needs.

The TSS data indicates exceedances occurring most often in very high and high flows. Considering the predominant source of TSS in the area is from tilled cropland—the majority of the land cover in the watershed—best management practices (BMPs) are highlighted in this report to help reduce the sediment loading. The estimated reductions needed to meet TSS water quality standards range from 63% to 84%.

The *E. coli* data show exceedances of the *E. coli* standard occur at all flow conditions, and *E. coli* load reductions are needed to address multiple source types. The estimated percent reductions needed to meet the *E. coli* TMDLs range from 74% to 85%.

This report used a variety of methods to evaluate current loading contributions from various pollutant sources as well as the allowable pollutant loading capacity for each impaired reach. These methods include monitored flow and water quality data, the Cedar River HSPF (Hydrologic Simulation Program–Fortran) model, and the flow and LDC approach. This TMDL report was developed in conjunction with an updated basin-wide watershed restoration and protection strategy (WRAPS) report for the Cedar River (MPCA, 2018; MPCA, 2026). The WRAPS Update report provides an update of ongoing efforts throughout the watershed and addresses multiple nonpollutant impairments.

1. Project overview

1.1 Introduction

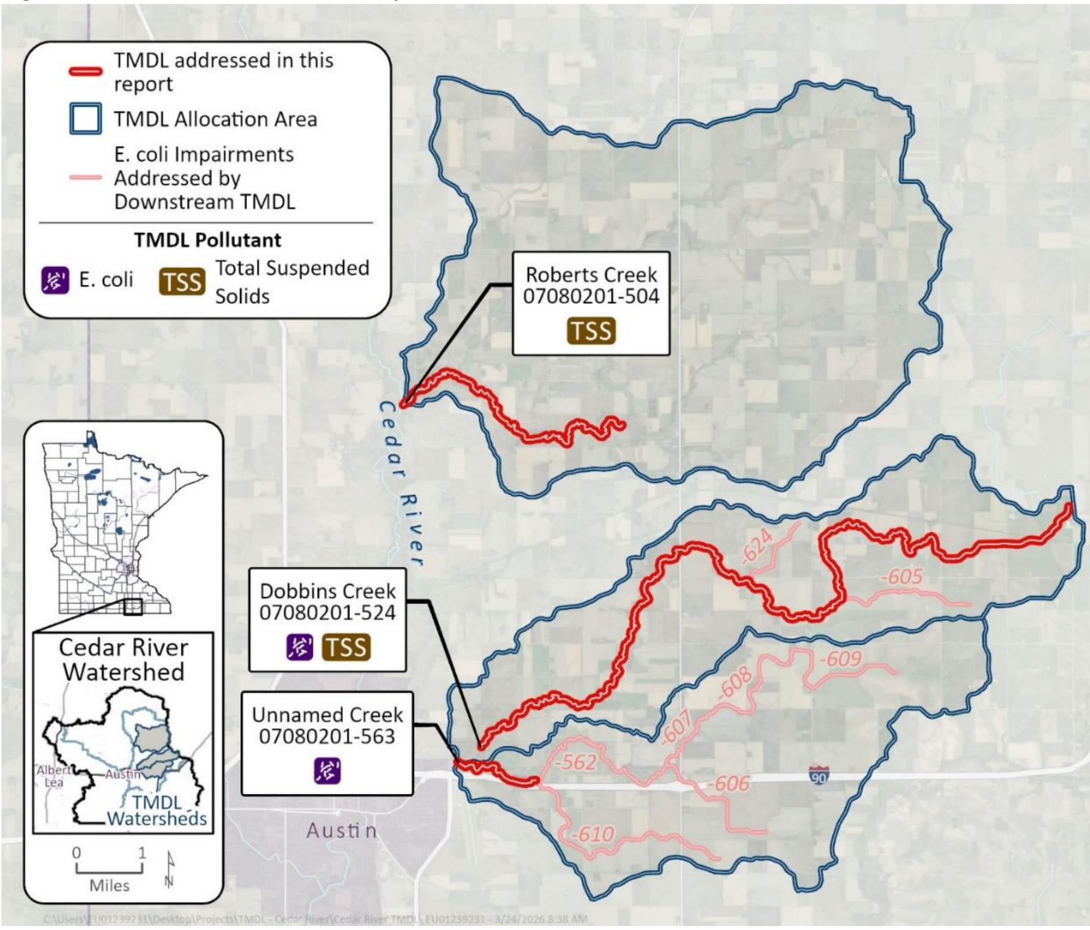
Section 303(d) of the federal CWA requires that TMDLs be developed for waters that do not support their designated uses. These waters are referred to as “impaired” and are included in Minnesota’s list of impaired water bodies. The term “TMDL” refers to the maximum amount of a given pollutant a water body can receive on a daily basis and still achieve water quality standards. A TMDL study determines what is needed to attain and maintain water quality standards in waters that are not currently meeting those standards. A TMDL study identifies pollutant sources and allocates pollutant loads among those sources. The total of all allocations, including wasteload allocations (WLAs) for permitted sources, load allocations (LAs) for nonpermitted sources (including natural background), and the margin of safety (MOS), which is implicitly or explicitly defined, cannot exceed the maximum allowable pollutant load.

The TMDLs included in this report directly address two *E. coli* and two TSS impairments in the Cedar River Watershed (Figure 1). These TMDLs also indirectly address upstream impairments for the same pollutants in the same catchments, resulting in a total of nine *E. coli* and three TSS TMDLs discussed further in Section 1.2. The Cedar River Basin in Minnesota includes parts of Mower, Freeborn, Steele, and Dodge Counties. The Minnesota portion of this basin is the headwaters of the larger system that includes 7,485 square miles of drainage area in Iowa. The Cedar River Basin is characterized by major anthropogenic hydrologic changes that impact pollutant loading and impairments in this area. During high stream flows, there can be significant pollutant loading causing economic impacts in both rural and city locations (Jason Russ, 2022).

This TMDL report is a component of a larger effort to restore and protect the Cedar River Watershed. Other components of the larger effort include the *Cedar River Watershed Restoration and Protection Strategy Report* (MPCA, 2019a) and corresponding *Report Summary* (MPCA, 2018), *Cedar River Watershed Monitoring and Assessment Report* (MPCA, 2012a) and corresponding update *Watershed Assessment and Trends Update: Cedar, Shell Rock, Winnebago and Upper Wapsipinicon* (MPCA, 2022f), *Cedar River Stressor Identification Report* (MPCA, 2016) and updates found in the *Cedar River Watershed: Cycle 2 Stressor Identification Nitrate Summary* (MPCA, 2022b), *SID Update: Turtle Creek Watershed* (MPCA, 2022d), *SID Update: Dobbins Creek Watershed* (MPCA, 2022c), and *SID Update: Roberts Creek Watershed* (MPCA, 2023), *Dobbins Creek Nine Key Element Plan* (MPCA, 2020b), *Revised Region Total Maximum Daily Load Evaluation of Fecal Coliform Bacteria Impairments in the Lower Mississippi River Basin in Minnesota* (MPCA, 2006), *Lower Mississippi River Regional Fecal Coliform TMDL* (MPCA, 2002) *Cedar-Wapsipinicon Comprehensive Watershed Management Plan* (Barr Engineering, 2019b) and lastly the Cycle 1 TMDL report *Cedar River Watershed Total Suspended Solids, Lake Eutrophication and Bacteria Total Maximum Daily Load* (MPCA, 2019b).

In the Cedar River Watershed, there are 10 water bodies with aquatic consumption (AQC) impairments based on mercury in fish tissue that have completed TMDLs. Of these mercury impairments, nine were approved as part of the Minnesota Statewide Mercury TMDL (MPCA, 2007), and one was included in revisions to Appendix A of the Minnesota Statewide Mercury TMDL, which are submitted to the EPA every two years with the impaired waters list.

Figure 1. Cedar River Watershed impaired catchments.



1.2 Identification of water bodies

This report contains *E. coli* and TSS TMDLs for stream reaches with AQR impairments in Dobbins Creek (-504), Roberts Creek (-524) and Unnamed Creek (-563). Table 1 below summarizes Cedar River Watershed impairments that are addressed by TMDLs in this document. Unnamed Creeks -562, -606, -607, -608, -609, and -610 *E. coli* impairments are addressed by the downstream TMDL created for Unnamed Creek -563. The *E. coli* impairment in Unnamed Creek -605 and TSS impairment in Unnamed Creek -624 are addressed by the downstream TMDLs in Dobbins Creek -524. This approach is appropriate because these water bodies have the same use designation, impairment, are in the same catchment, and have similar pollutant sources. General statistics regarding the eight upstream impairments will be addressed in Section 3.4. All impairments in the Cedar River Watershed are summarized in Appendix A. The TMDLs in this report do not replace nor revise previously approved TMDLs.

TMDLs are not developed for nonpollutant stressors to biological impairments (e.g., habitat alteration, flow) because they are not subject to load quantification. The WRAPS update provides an opportunity to call for environmental improvements in situations where TMDLs alone would not.

Table 1. Impaired water bodies and impairments in the Cedar River Watershed addressed in this TMDL report.

WID	Water body name	Water body description	Use class	Listing year	Affected designated use [a]	Listing Parameter	TMDL Pollutant	Applicable downstream TMDL[b]
07080201-524	Dobbins Creek	Headwaters to T103 R17W S31, west line	2Bg	2022	AQR	*E. coli*	*E. coli*	NA
					AQL	TSS	TSS	NA
07080201-563	Unnamed Creek	Unnamed cr to Dobbins cr	2Bg	2022	AQR	*E. coli*	*E. coli*	NA
07080201-504	Roberts Creek	Unnamed cr to Cedar R	2Bg	2022	AQL	TSS	TSS	NA
07080201-562	Unnamed Creek	Unnamed cr to Unnamed cr	2Bg	2022	AQR	*E. coli*	*E. coli*	-563
07080201-605	Unnamed Creek	Headwaters to Dobbins Cr	2Bg	2022	AQR	*E. coli*	*E. coli*	-524
07080201-606	Unnamed Creek	Unnamed cr to Unnamed cr	2Bg	2022	AQR	*E. coli*	*E. coli*	-563
07080201-607	Unnamed Creek	Unnamed cr to Unnamed cr	2Bg	2022	AQR	*E. coli*	*E. coli*	-563
07080201-608	Unnamed Creek	Unnamed cr to Unnamed cr	2Bg	2022	AQR	*E. coli*	*E. coli*	-563
07080201-609	Unnamed Creek	Unnamed cr to Unnamed cr	2Bg	2022	AQR	*E. coli*	*E. coli*	-563
07080201-610	Unnamed Creek	Unnamed cr to Unnamed cr	2Bg	2022	AQR	*E. coli*	*E. coli*	-563
07080201-624	Unnamed Creek	Headwaters to Dobbins Cr	2Bg	2022	AQL	TSS	TSS	-524

a. AQR: aquatic recreation; AQL: aquatic life

b. Impairment will be categorized as 4A (impaired and a TMDL study has been approved by EPA) upon approval of this TMDL and will appear as 4A in the next impaired waters list.

1.3 Tribal lands

The Cedar River Watershed is located on the traditional homelands of the Dakota. However, no part of the Cedar River Watershed is located within the boundary of federally recognized tribal land, and the TMDL does not allocate pollutant load to any federally recognized Tribal Nation in this watershed.

1.4 Priority ranking

The MPCA's TMDL commitments, as indicated on Minnesota's Section 303(d) impaired waters list, reflect Minnesota's priority ranking of the impairments addressed in this report. To meet the needs of EPA's *2022–2032 Vision for the Clean Water Act Section 303(d) Program* (EPA), 2022), the MPCA aligned TMDL commitments with the watershed approach and other statewide strategies and initiatives in *Minnesota's Total Maximum Daily Load Studies Prioritization Framework* (MPCA, 2024c). As part of these efforts, the MPCA identified water quality impaired segments to be addressed by TMDLs through the watershed approach and other statewide strategies and initiatives (MPCA, 2024b).

2. Applicable water quality standards and numeric water quality targets

The federal CWA requires states to designate beneficial uses for all waters and develop water quality standards to protect each use. Water quality standards consist of several parts:

- Beneficial uses—Identify how people, aquatic communities, and wildlife use our waters
- Numeric standards—Amounts of specific pollutants allowed in a body of water that still protect it for the beneficial uses (note that EPA uses the phrase “numeric criteria” whereas Minnesota uses the phrase “numeric standards")
- Narrative standards—Statements of unacceptable conditions in and on the water (note that EPA uses the phrase “narrative criteria” whereas Minnesota uses the phrase “narrative standards")
- Antidegradation protections—Extra protection for high-quality or unique waters and existing uses

Together, the beneficial uses, numeric and narrative standards, and antidegradation protections provide the framework for achieving CWA goals. Minnesota’s water quality standards are in Minn. R. chs. 7050 and 7052.

2.1 Beneficial uses

The beneficial uses for waters in Minnesota are grouped into one or more classes as defined in Minn. R. 7050.0140. The classes and associated beneficial uses are:

- Class 1 – domestic consumption
- Class 2 – AQL and AQR
- Class 3 – industrial consumption
- Class 4 – agriculture and wildlife
- Class 5 – aesthetic enjoyment and navigation
- Class 6 – other uses and protection of border waters
- Class 7 – limited resource value waters

The Class 2 AQL beneficial use includes a tiered AQL uses framework for rivers and streams. The framework contains three tiers—exceptional, general, and modified uses.

All surface waters are protected for multiple beneficial uses, and numeric and narrative water quality standards are adopted into rule to protect each beneficial use. The most sensitive use of a water body is protected in TMDL development.

2.2 Narrative and numeric standards

Narrative and numeric water quality standards for all uses are listed for four common categories of surface waters in Minn. R. 7050.0220. The four categories are:

- Cold water AQL and habitat, drinking water, and associated use classes: Classes 1B; 2A, 2Ae, or 2Ag; 3; 4A and 4B; and 5
- Cool and warm water AQL and habitat, drinking water, and associated use classes: Classes 1B or 1C; 2Bd, 2Bde, 2Bdg, or 2Bdm; 3; 4A and 4B; and 5
- Cool and warm water AQL and habitat and associated use classes: Classes 2B, 2Be, 2Bg, 2Bm, or 2D; 3; 4A and 4B; and 5
- Limited resource value waters: Classes 3; 4A and 4B; 5; and 7

The narrative and numeric water quality standards for the individual use classes are listed in Minn. R. 7050.0221 through 7050.0227. The procedures for evaluating the narrative standards are presented in Minn. R. 7050.0150.

The MPCA assesses surface waters for the following beneficial uses:

- Class 1: Drinking water and AQC (human health-based standards)
- Class 2: AQL (toxicity-based standards, conventional pollutants, biological indicators)
- Class 2: AQR (*E. coli* bacteria, eutrophication)
- Class 2: AQC (fish tissue and wildlife-based standards)
- Class 4A: Waters used for production of wild rice
- Class 7: Limited value resource waters (toxicity-based standards, *E. coli* bacteria, conventional pollutants)

Class 2 waters are further broken down into Class 2A and 2B waters. Class 2A waters are protected for the propagation and maintenance of a healthy community of cold water AQL and their habitats. Class 2B waters are protected for the propagation and maintenance of a healthy community of cool or warm water AQL and their habitats. Both Class 2A and 2B waters are also protected for AQR activities including bathing and swimming, and for human consumption of fish and other aquatic organisms.

2.3 Antidegradation policies and procedures

The purpose of the antidegradation provisions in Minn. R. ch. 7050.0250 through 7050.0335 is to achieve and maintain the highest possible quality in surface waters of the state. To accomplish this purpose:

- Existing uses and the level of water quality necessary to protect existing uses are maintained and protected.
- Degradation of high water quality is minimized and allowed only to the extent necessary to accommodate important economic or social development.

- Water quality necessary to preserve the exceptional characteristics of outstanding resource value waters is maintained and protected.
- Proposed activities with the potential for water quality impairments associated with thermal discharges are consistent with section 316 of the Clean Water Act, United States Code, title 33, section 1326.

2.4 Cedar River Watershed water quality standards

Table 2. Water quality standards for *E. coli* and TSS in rivers and streams.

Parameter	Water body type	Water quality standard	Numeric standard
E. coli	Class 2 (A and B) streams	Not to exceed 126 organisms per 100 milliliters (org/100 mL) as a geometric mean of not less than five samples representative of conditions within any calendar month, nor shall more than 10% of all samples taken during any calendar month individually exceed 1,260 org/100 mL. The standard applies only between April 1 and October 31.	≤ 126 organisms/100 mL water (monthly geometric mean) ≤ 1,260 organisms/100 mL water (individual sample)
TSS	Class 2B streams in Southern River Nutrient Region as modified for TSS	65 mg/L; TSS standards for class 2B may be exceeded for no more than 10% of the time. This standard applies April 1 through September 30.	≤ 65 mg/L TSS

E. coli

In Minnesota, *E. coli* is used as an indicator species of potential waterborne pathogens. The MPCA uses *E. coli* bacteria, which are commonly found in fecal waste and are easy to measure, as an indicator species of potential waterborne pathogens. Using indicator bacteria to assess the presence of pathogens is not a perfect process though it is the best available at this time. There are two *E. coli* numeric standards for class 2 waters—one is applied to monthly *E. coli* geometric mean concentrations, and the other is applied to individual samples (Table 2). Exceedances of either *E. coli* standard in class 2 waters indicate that a water body does not meet the AQR designated use. The class 2 standards for *E. coli* apply from April through October. The *E. coli* TMDLs in this report are based on the monthly geometric mean standard of 126 org/100 mL. It is assumed that practices implemented to meet the geometric mean standard will also address the individual sample standard (1,260 org/100 mL), and that the individual sample standard will also be met. Although the TMDLs are based on the monthly geometric mean standard, both standards apply.

TSS

Exceedances of the TSS standard in streams indicate that a water body does not meet the AQL designated use. The TSS standard for Class 2B streams in the South River Nutrient Region is 65 mg/L (Table 2). For assessment, this concentration is not to be exceeded in more than 10% of samples within a 10-year period. The TSS standard applies April 1 through September 30.

3. Watershed and water body characterization

3.1 Climate trends

Climate is a foundational ecological condition that influences hydrology and water quality. This report provides an overview of climate conditions based on data from 1895 through 2018. The report focused on trends in seasonal and annual air temperature and precipitation comparing data in the most recent thirty years to the last 120 years. Long-term data show that annual average temperature in the Cedar River Watershed has increased as depicted by the trend line in Figure 2. Winter temperatures on average have increased over time (3.0°F), with less change in the summer months (0.5°F; Figure 3; DNR, 2019).

Annual precipitation in the Cedar River Watershed also shows an upward trend (Figure 4). Monthly precipitation totals vary greatly, though trends related to the record mean precipitation in recent years are more explicit with April-August showing the greatest increase in precipitation related to the mean (Figure 5). Minnesota has also experienced an increase in large-area extreme rainstorms. Climate projections indicate these extreme events will continue increasing into the future (DNR, 2025a).

This increase in the frequency and size of rainfall events affects river and stream flows. Peak flows in this area and downstream have increased over the last few decades with 3 times more high flow years in the last 20 years (Figure 6). Data points in Figure 6 represent water years (October-September) flow while the lines represent the trailing five-year moving average using data from the U.S. Geological Survey (USGS) National Water Information System. Higher flows result in exacerbated stream channel erosion and sediment transport. These in turn impact local pollutant loads and concentrations, downstream habitat for fish and other AQL, and may degrade recreational uses.

Figure 2. Annual average temperature, Cedar River Watershed, 1895–2022 (DNR, 2025b).

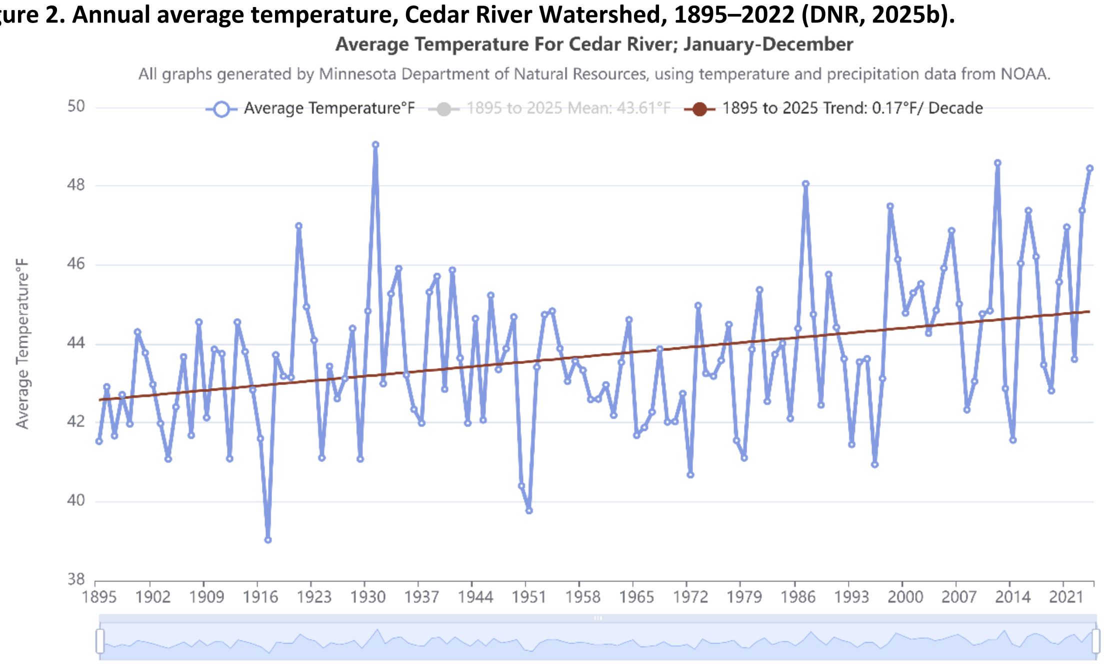


Figure 3. Monthly average temperature distribution and departure from record mean, Cedar River Watershed (DNR, 2019).

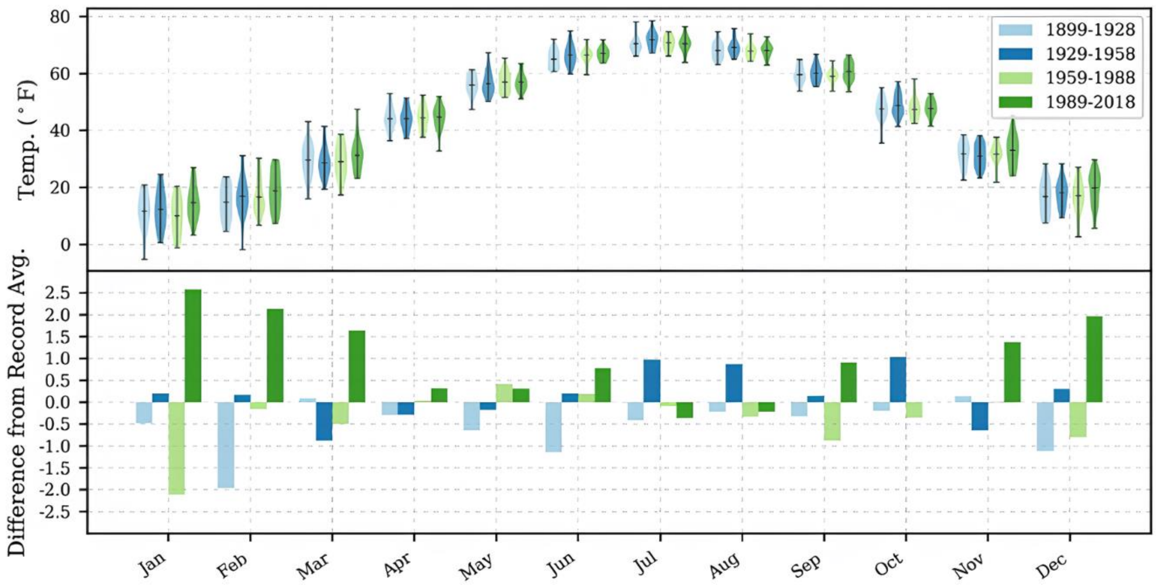


Figure 4. Annual precipitation, Cedar River Watershed (DNR, 2025b).

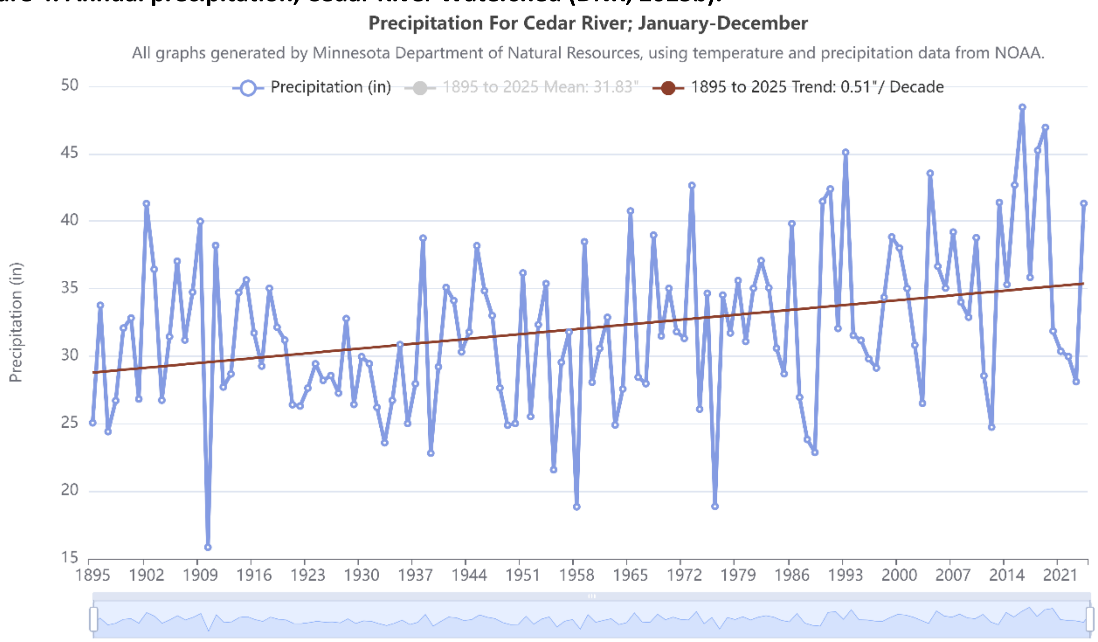


Figure 5. Monthly precipitation and departure from record mean, Cedar River Watershed (DNR, 2019).

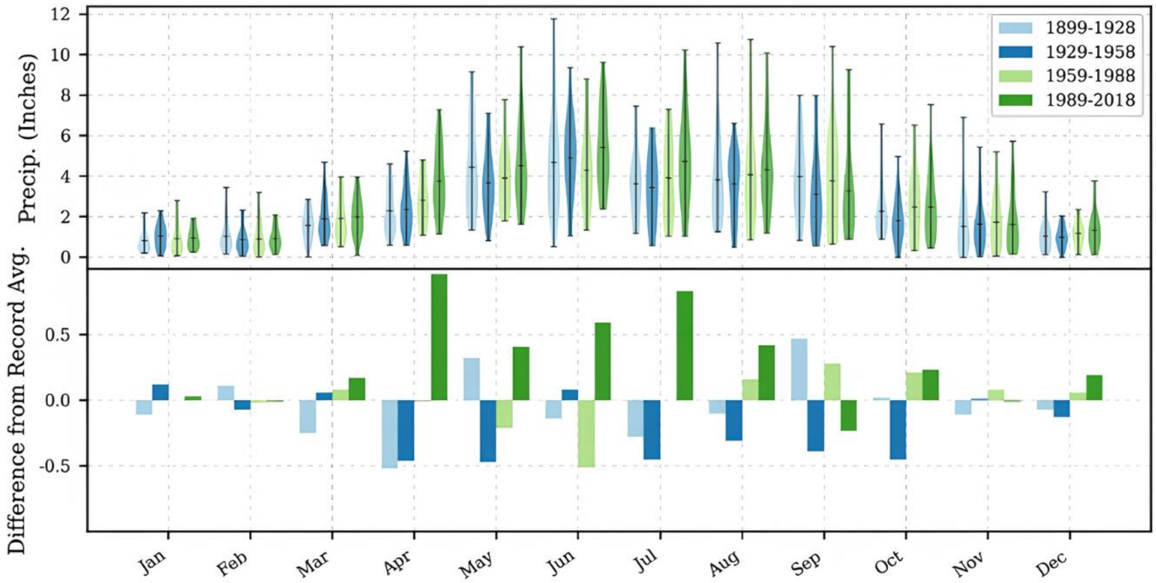
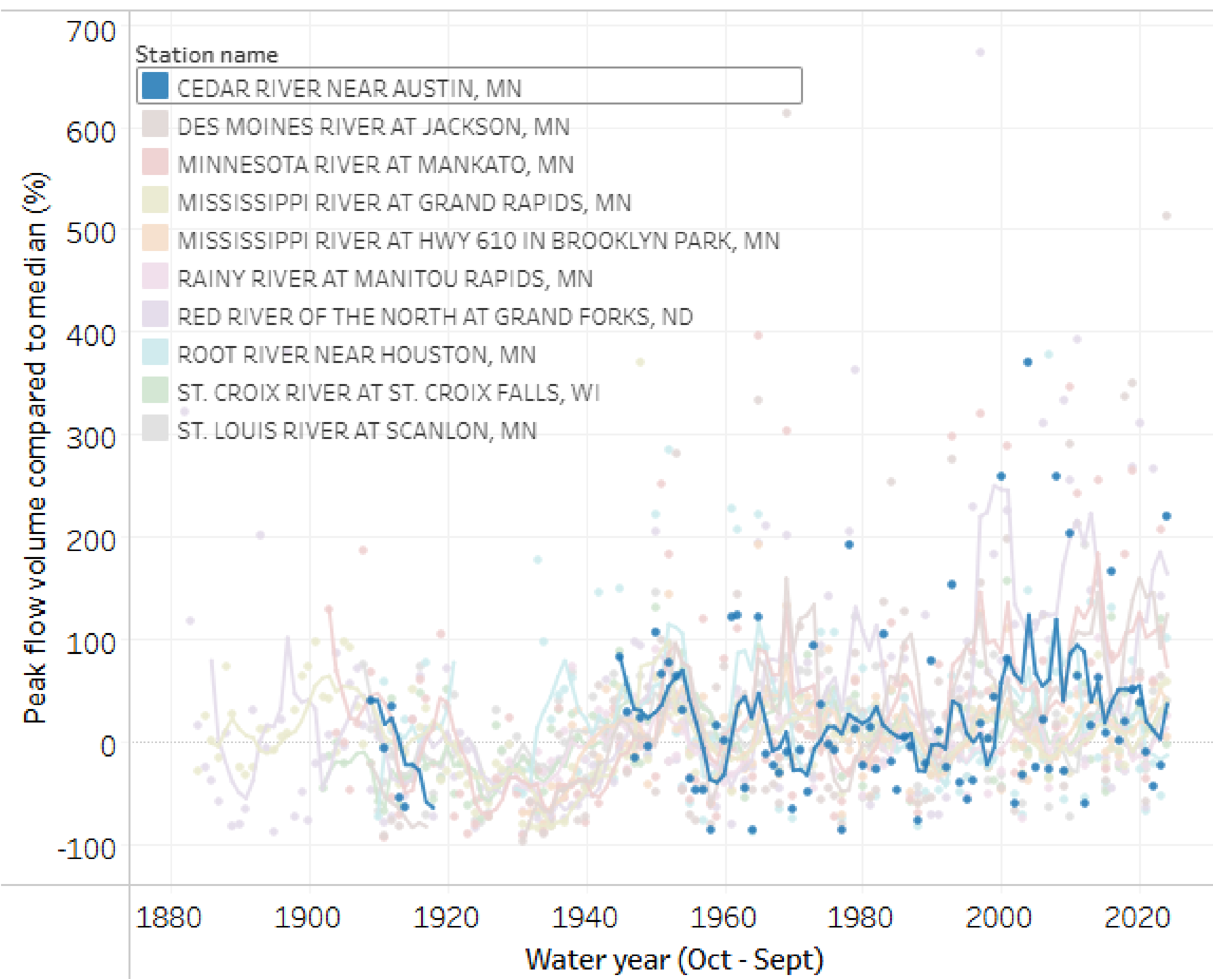


Figure 6. Trends in flood flows in the Upper Midwest, all available data from 1880-2020: Percent difference from median annual peak (MPCA, 2024a).



3.2 Subwatersheds

The Cedar River Watershed boundaries of the impaired streams are from the HSPF model application for the Cedar River Watershed (Table 3) and shown in maps below (Figure 7, Figure 8, and Figure 9).

Table 3. Drainage areas of impaired stream reaches addressed in the Cedar River TMDL.

WID	Stream Name	Reach Length (miles)	Total Drainage Area	
			(acres)	(sq mi)
07080201-524	Dobbins Creek	16.19	12,398	19.4
07080201-563	Unnamed Creek	1.53	11,178	17.5
07080201-504	Roberts Creek	5.78	1937	3.0

Figure 7. Dobbins Creek (07080201-524) Subwatershed boundary.

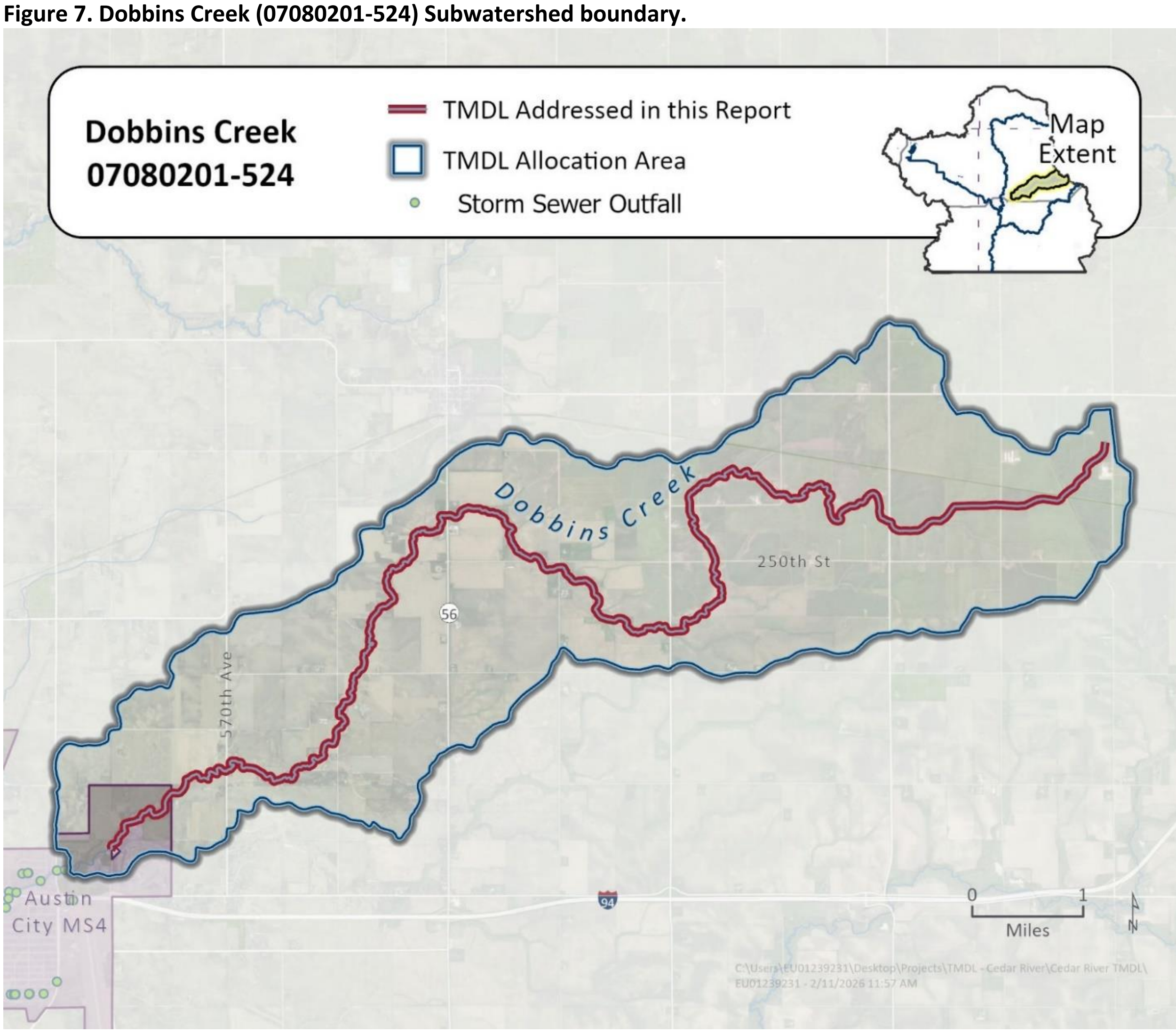


Figure 8. Unnamed Creek (07080201-563) Subwatershed boundary.

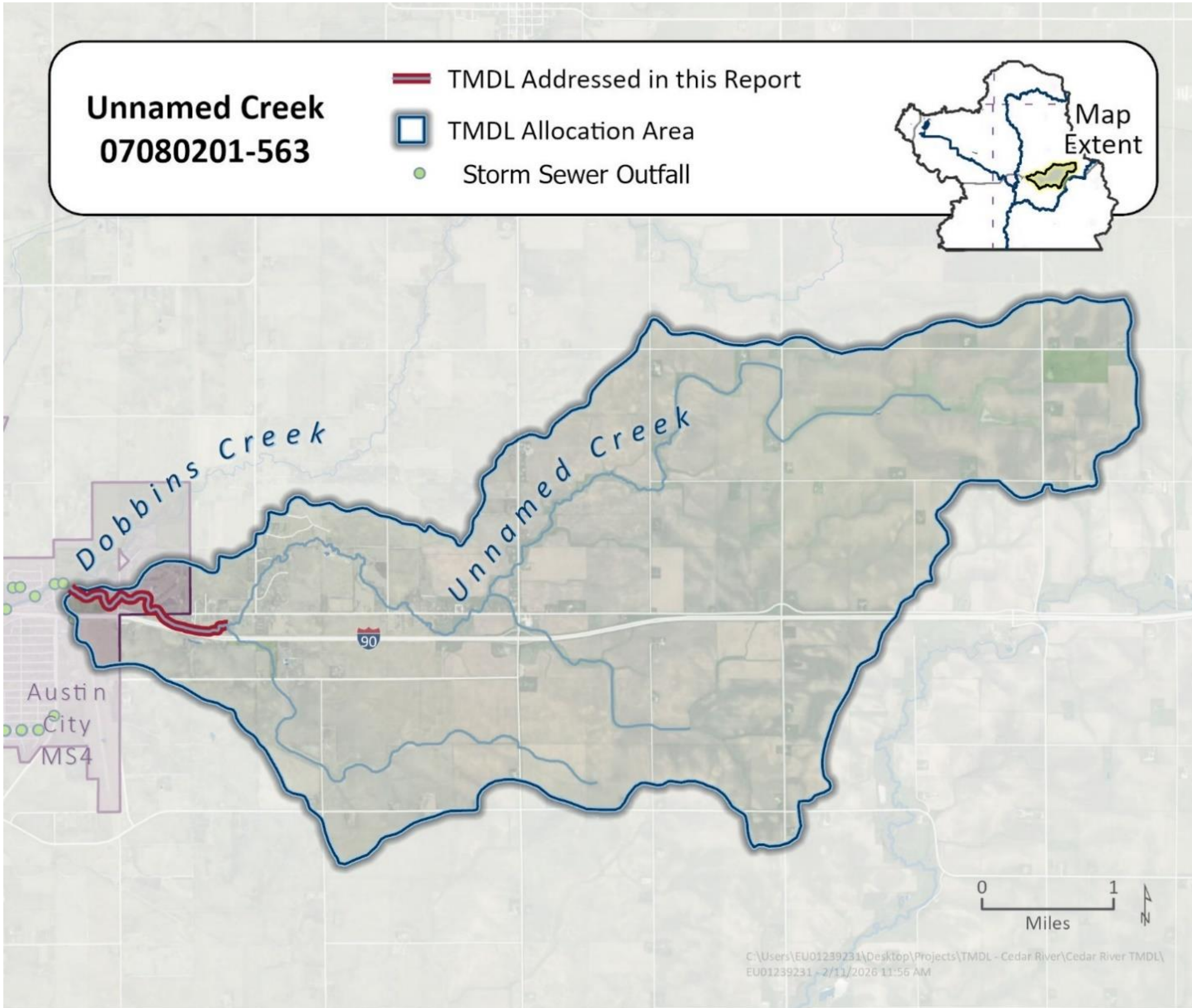
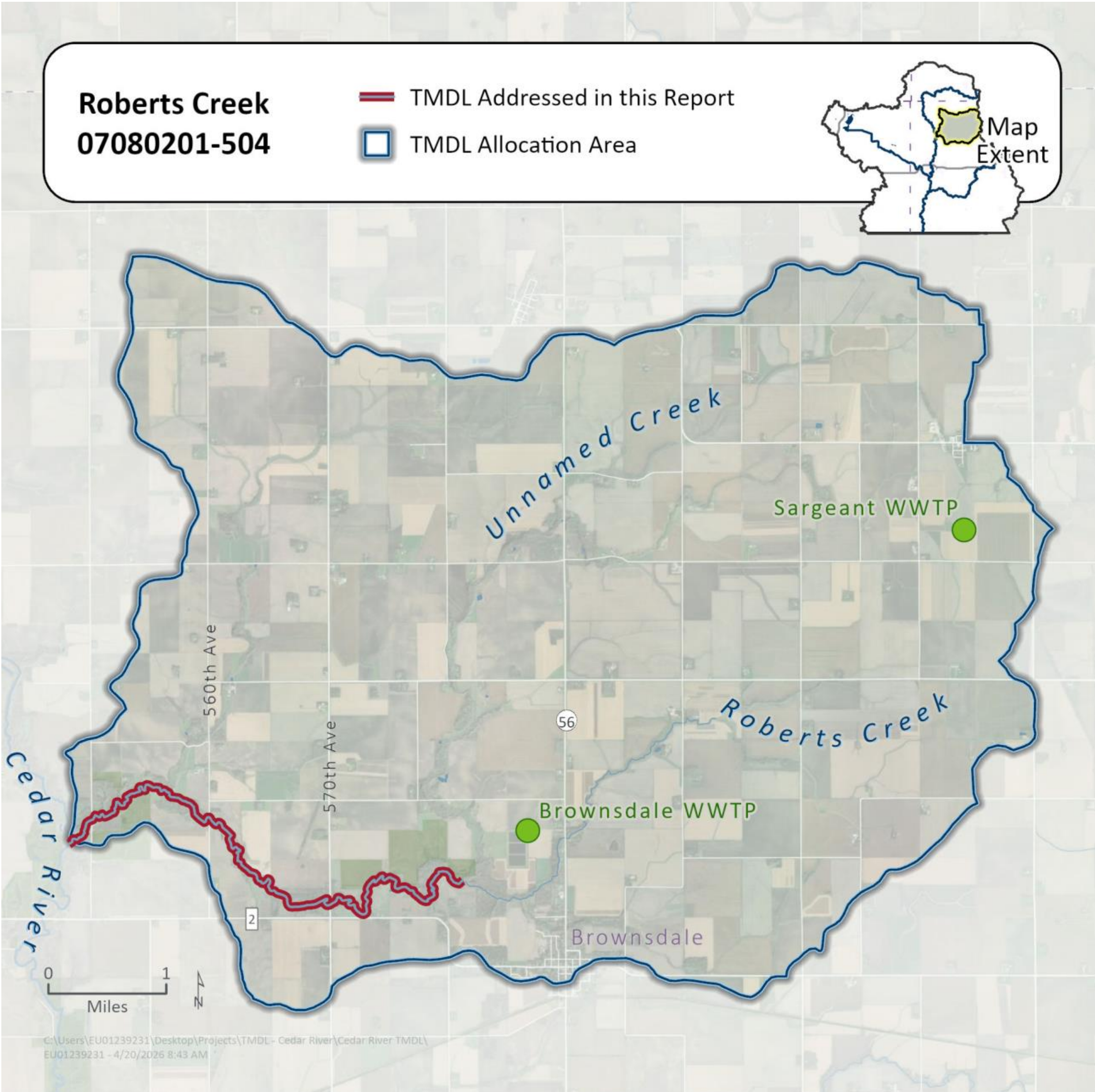


Figure 9. Roberts Creek (07080201-504) Subwatershed boundary.



3.3 Land use and/or land cover

Pre-European settlement land cover in the Cedar River Watershed was primarily prairie/wet prairie and oak openings and barrens making up more than 98% of the land cover (Figure 10; DNR, 2017). The landscape has been heavily influenced by humans, with most of the water courses within the watershed having been altered, though the watershed has less than 2% impervious surfaces. Today, the watershed is covered by mostly cultivated crops (>80%) and developed spaces (<10%) (Figure 11, Table 4). The cultivated crops consist of mainly corn and soybeans (DNR, 2017).

Figure 10. Pre-European settlement land cover map of the Cedar River Watershed.

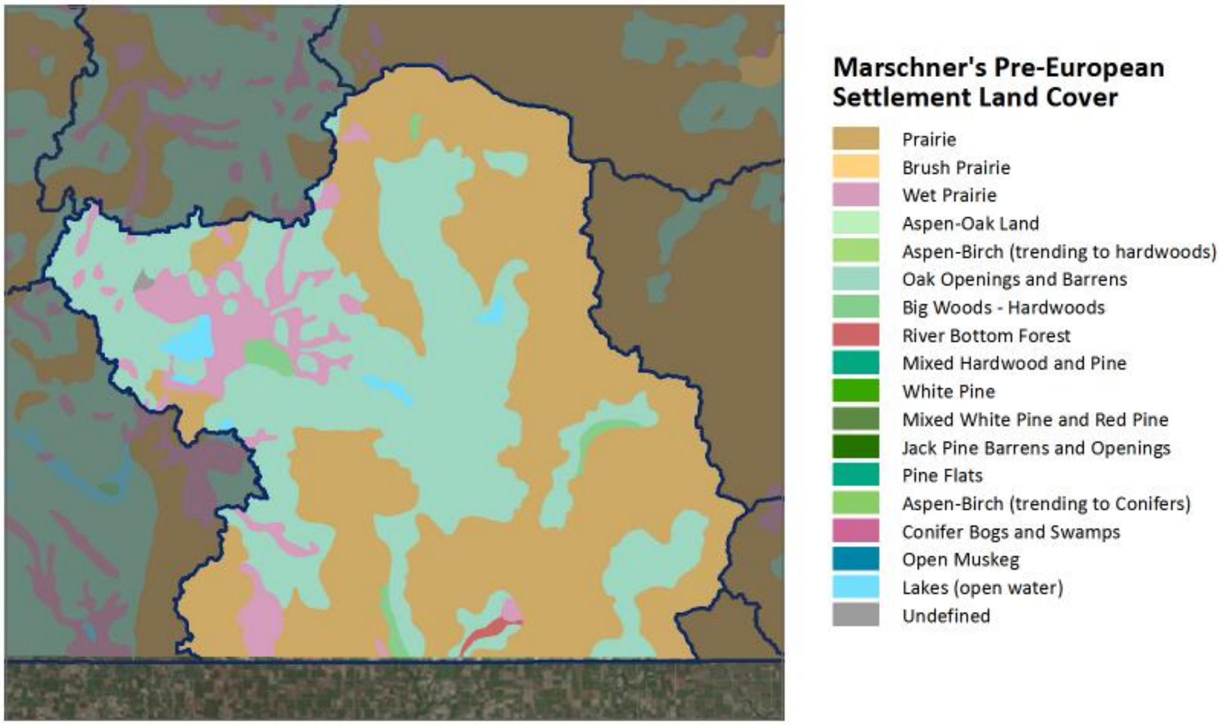


Figure 11. Current land cover map of the Cedar River Watershed.

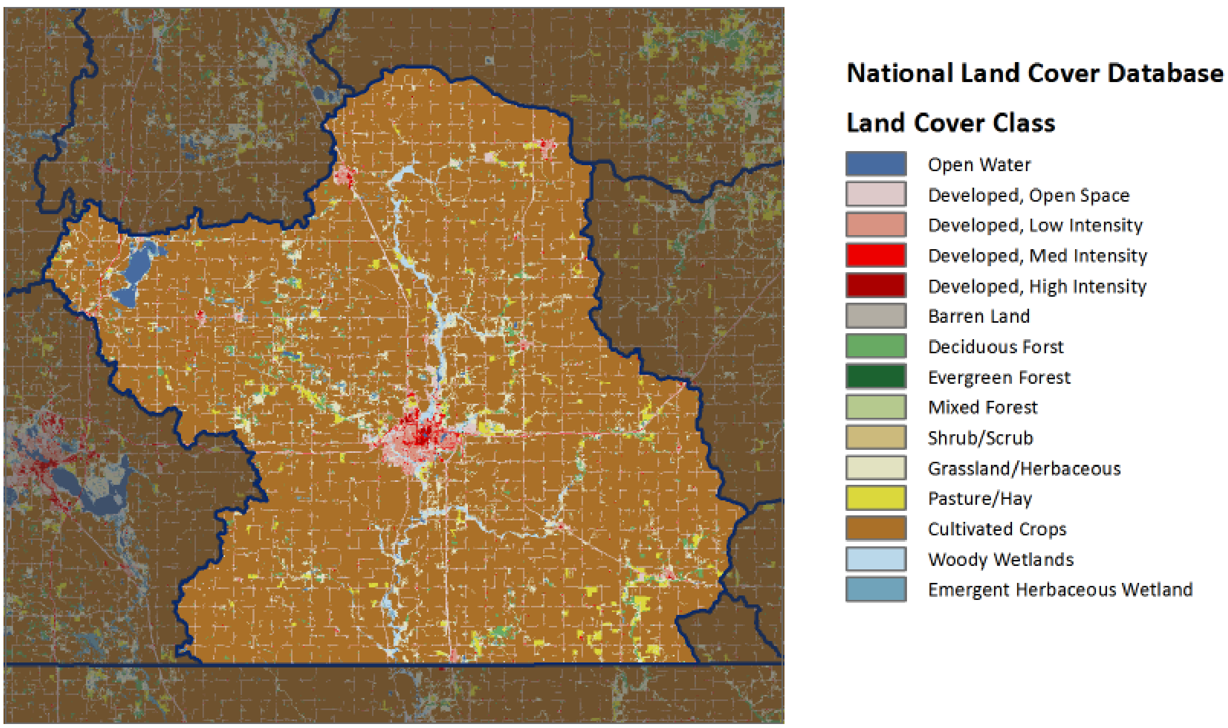


Table 4. Land use/cover within impaired subwatersheds from the National Land Cover Database 2024.

WID	Stream Name	Land Use/Land Cover Percentage of Drainage Area [%]					
		Water/ Wetland	Forest/ Shrub	Pasture/ Hay	Cropland	Barren/ Mining	Developed
07080201-504	Roberts Creek	1.5%	2.0%	4.7%	85.8%	<0.1%	6.1%
07080201-524	Dobbins Creek	0.3%	1.7%	5.5%	87.3%	<0.1%	5.0%
07080201-563	Unnamed Creek	1.1%	0.9%	6.0%	83.5%	<0.1%	8.4%

3.4 Water quality

Water quality data are presented to evaluate impairments and trends in water quality. Unless otherwise noted, data from 2014 through 2024 are summarized to coincide with the data used from the assessment period to create the water quality summary tables. Only water quality data from the MPCA's Environmental Quality Information System (EQuIS) were used for the analyses.

Simulated flow data from the Cedar River Watershed HSPF model were evaluated in addition to *E. coli* and TSS monitoring data to evaluate the impairments. Flow data were used to approximate the stream flow conditions when each water quality sample was taken. These analyses are described in more detail in this section.

3.4.1 Flow data

Simulated daily average flows from the HSPF model (3/31/2022 version) were used in developing the *E. coli* and TSS stream TMDLs (Table 5). The HSPF model is calibrated to flow monitoring data and provides long term, continuous flow estimates. Simulated flows are available at the downstream end of each model reach.

The model reports (MPCA, 2022a; RESPEC, 2024) describe the framework and the data that were used to develop the model. See also the brief summary of HSPF modeling in the MOS section.

Table 5. Model reaches used to simulate stream flow in impaired reaches in the Cedar River Watershed. Reach number refers to the Cedar River Watershed HSPF model.

Reach Name	WID	Model Reach Number
Dobbins Creek	524	313
Unnamed Creek	563	315
Roberts Creek	504	209

Flow duration curves (FDCs) and LDCs were developed for each impaired reach with the simulated flows. FDCs relate mean daily flow to the percentage of time those values have been met or exceeded. For example, an average daily flow at the 50% exceedance value is the midpoint or median flow value; average daily flow in the reach equals the 50% exceedance value 50% of the time. The curve is divided into flow zones, including very high flows (0% to 10%), high flows (10% to 40%), mid-range flows (40% to 60%), low flows (60% to 90%), and very low flows (90% to 100%).

FDCs were developed using simulated daily average flows (1995 through 2022). When the impaired body of water was not the outpoint of the catchment, the flow data from a similar reach were area-weighted to the impaired reach in question. Simulated flows from all months (even those outside of the time period that the standard is in effect) were used to develop the FDCs. The FDCs were used to develop the *E. coli* and TSS LDCs, described in the following section.

3.4.2 *E. coli* data

The *E. coli* samples in the impaired reaches were collected by the MPCA from 2014-2024 during months April-October. To develop LDCs, all daily average flows were multiplied by the monthly geometric mean water quality standard (i.e., 126 org/100 mL *E. coli*) and converted to a daily load to create "continuous" LDCs that represent the load in the stream when the stream meets its water quality standard under all flow conditions. Loads calculated from water quality monitoring data are also plotted on the LDC, based on the concentration of the sample multiplied by the simulated flow on the day that the sample was taken (see 4.1.1 Loading capacity methodology).

Monitoring sites for each impaired reach are listed in Table 6 and data are summarized in Table 7. Individual samples of *E. coli* ranged from 10 to 2,400 org/100 mL. Water quality summary tables are presented for each impairment in Table 15 and Table 16.

Table 6. Monitoring sites used in *E. coli* TMDL analysis of impaired reaches in Cedar River Watershed 2014 – 2024.

Reach Name	WID	Monitoring site(s)
Unnamed creek	563	S008-955, S009-281
Dobbins creek	524	S007-236, S008-953, S008-958, S008-960, S008-961, S017-527
Unnamed creek	562	S008-954
Unnamed creek	605	S008-968
Unnamed creek	606	S008-952
Unnamed creek	607	S008-957
Unnamed creek	608	S008-962
Unnamed creek	609	S008-959
Unnamed creek	610	S008-956

Table 7. Summary of *E. coli* water quality data (2014-2024) for impaired reaches in Cedar River Watershed.

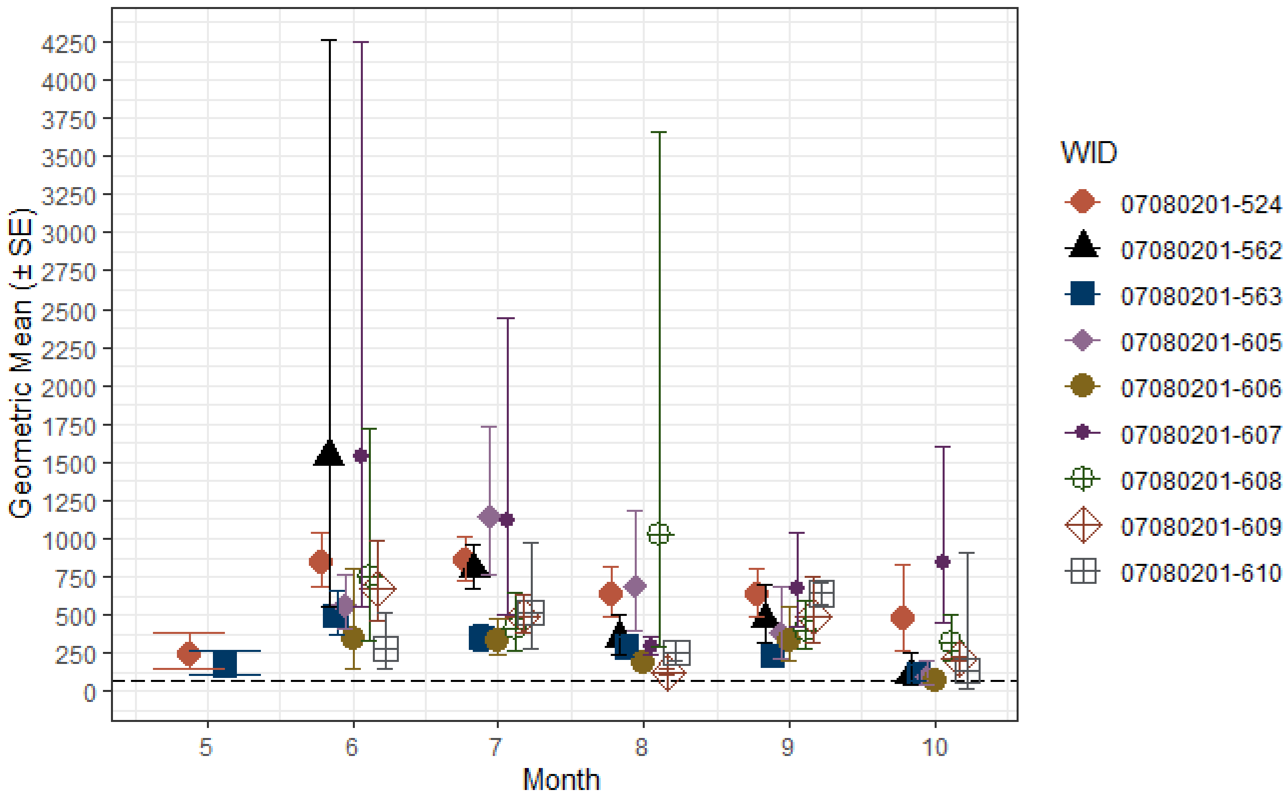
Reach name	WID	Sample count	*E. coli* geometric mean	*E. coli* maximum [a]	Frequency of exceedance [b]
Unnamed creek	563	76	281	2,400	83% / 5%
Dobbins creek	524	125	652	2,400	100% / 29%
Unnamed Creek	562	17	537	2,400	80% / 12%
Unnamed Creek	605	17	531	2,400	80% / 24%
Unnamed Creek	606	17	251	1,700	80% / 18%
Unnamed Creek	607	17	800	2,400	100% / 29%
Unnamed Creek	608	17	520	2,400	100% / 18%
Unnamed Creek	609	17	369	1,400	80% / 6%
Unnamed Creek	610	17	367	2,400	100% / 6%

E. coli geometric mean and maximum units are org/100 mL. All data span from April-October. All impairments addressed in this TMDL are represented here.

a. The maximum recordable value for *E. coli* concentrations depends on the extent of sample dilution and is often 2,400 org/100 mL. Concentrations that are noted as 2,400 org/100 mL are likely higher and the magnitude of the exceedances is not known.

b. Frequencies of exceedance: monthly geometric mean standard/individual sample standard. The monthly frequences are calculated as the number of months (aggregated across all years of data) when the monthly standard was exceeded divided by the number of months of data.

Figure 12. *E. coli* geometric means per month for all impaired WIDs addressed by Unnamed Creek (07080201-563) TMDL.



See Section 1.2 for information on the application of the TMDL for WID 563 to multiple upstream impairments.

3.4.3 TSS data

TSS impairments are based on having no more than 10% of all samples in the assessment period exceed the TSS standard of 65 mg/L for the Cedar River Watershed, which applies from April through September. TSS data was summarized for the TSS impaired reaches requiring TMDLs in the Cedar River Watershed in Table 8 and Table 9. A summary of geometric means for each month using data from 2014-2024 for the impaired reaches are shown in Figure 13.

Table 8. MPCA monitoring sites used in TSS TMDL analysis of impaired reaches in the Cedar River Watershed.

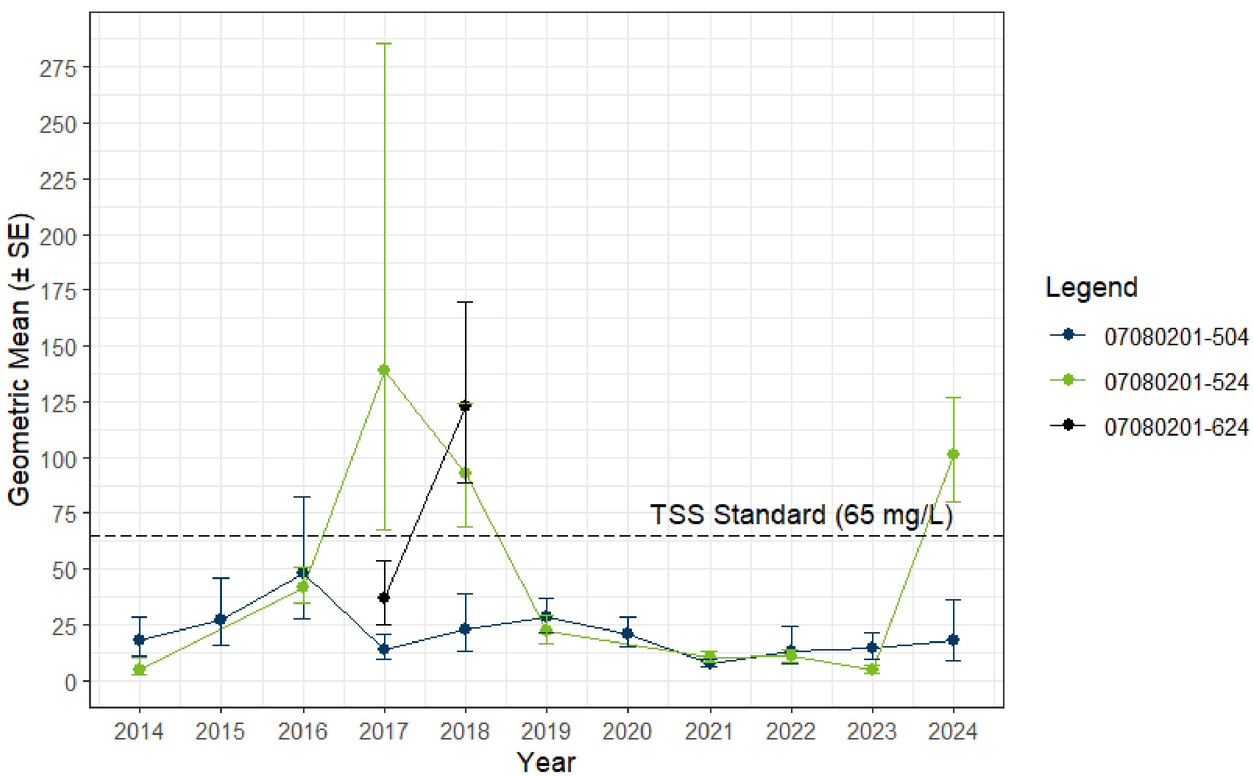
Reach Name	WID	Monitoring site(s)
Roberts Creek	504	S000-746, S001-182, S009-873
Dobbins Creek	524	S008-953, S008-958, S008-960, S012-624, S012-625, S012-626, S017-527
Unnamed Creek	624	S015-023

Table 9. Summary of TSS water quality data (2014-2024) for impaired reaches in Cedar River Watershed.

Reach name	WID	Sample count	TSS geometric mean	TSS maximum	Frequency of exceedance
Roberts Creek	504	124	20	1,390	24%
Dobbins Creek	524	147	43	1,830	42%
Unnamed Creek	624	23	94	3,180	60%

TSS geometric mean and maximum units are mg/L. All data span from April-September. All current impairments addressed in this TMDL are represented here.

Figure 13. Annual TSS geometric means per impaired WID in the Cedar River Watershed, 2014 - 2024.



3.5 Pollutant source summary

Sources of pollutants in the Cedar River Watershed include permitted and nonpermitted sources. The permitted sources discussed here are pollutant sources that require a National Pollutant Discharge Elimination System (NPDES) permit. Nonpermitted sources are pollutant sources that do not require an NPDES permit. Most Minnesota NPDES permits are also state disposal system (SDS) permits; however, some pollutant sources require SDS permit coverage alone without NPDES permit coverage (e.g., spray irrigation, large septic systems, land application of biosolids, and some feedlots).

The phrase “nonpermited” does not indicate that the pollutants are illegal, but rather that they do not require an NPDES permit. Some nonpermitted sources are unregulated, and some nonpermitted sources are regulated through non-NPDES programs and permits such as state and local regulations.

3.5.1 Permitted sources

The permitted sources of TSS and *E. coli* in the impaired watersheds include the city of Austin’s municipal stormwater, industrial and construction stormwater, and two wastewater treatment plants (WWTPs).

Municipal and industrial wastewater

TSS

Permitted municipal and industrial wastewater is a source of TSS in the impaired watersheds. Wastewater is domestic sewage and other wastewater collected and treated by municipalities and industries before being discharged to water bodies as wastewater effluent. Wastewater enters surface water either as treated effluent or sometimes through releases of untreated wastewater.

There are two municipal wastewater discharges, or WWTPs, with TSS effluent limits in the impaired reaches of Cedar River Watershed (Figure 9). Brownsdale and Sargeant WWTP are in the Roberts Creek Watershed (07080201-504). The Brownsdale WWTP consists of three stabilization ponds designed to treat an average wet weather flow of 184,000 gallons per day with a total retention time of 180 days. The facility has a controlled surface discharge to Roberts Creek (Class 2Bg, 3C, 4A, 4B, 5, 6 water) and has a TSS limit of 45 mg/L, which is more restrictive than the water quality standard for the receiving waters. Sargeant WWTP consists of two stabilization ponds designed to treat an average wet weather flow of 0.0106 million gallons per day with a total retention time of 180 days. The facility has a controlled surface discharge (resulting in a few discharge events per year) to Unnamed Creek (07080201-569, Class 2Bg)—a tributary of Roberts Creek—and has a TSS limit of 45 mg/L, which is more restrictive than the water quality standard for the receiving waters.

In the last 20 years, there have been no releases reported at either the Brownsdale or Sargeant WWTP that would impact the receiving waters.

TSS loads were estimated using the HSPF model for the impaired reaches with the results outlined in Table 10 and Table 11. HSPF modeling of the watershed shows less than 0.5% of TSS in Roberts Creek is from the WWTP effluent.

Table 10. Roberts Creek average annual TSS Loads HSPF model reach 201 (2014 – 2022).

Source	TSS load (ton/yr)	TSS load (%)
Feedlots	0.802	0.37%
Developed	0.027	0.01%
Low Till Cropland AB	9.12	4.25%
High Till Cropland A	47.113	21.98%
Low Till Cropland CD	14.665	6.84%
High Till Cropland C	80.302	37.46%
Forest	0.366	0.17%
Grassland	2.191	1.02%
Pasture	0.949	0.44%
Wetlands	0.044	0.02%
Urban Impervious	58.169	27.14%
Brownsdale WWTP	0.51905	0.24%
Sargeant WWTP	0.097812	0.05%
Total	214.4	100%

Table 11. Dobbins Creek average annual TSS Loads HSPF model reach 313 (2014 – 2022).

Source	TSS load (ton/yr)	TSS Load (%)
Feedlots	0.434	0.28%
Developed	3.455	2.27%
Low Till Cropland AB	6.263	4.11%
High Till Cropland A	33.621	22.06%
Low Till Cropland CD	11.349	7.45%
High Till Cropland C	63.309	41.54%
Forest	0.342	0.22%
Grassland	5.27	3.46%
Pasture	1.652	1.08%
Wetlands	0.071	0.05%
Urban Impervious	26.653	17.49%
Total	**152.4**	**100%**

E. coli

There are no wastewater dischargers located within the Cedar River Watershed *E. coli* impaired reach drainage areas.

Municipal separate storm sewer systems

A municipal separate storm sewer system (MS4) is a conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, storm drains, etc.) that is also:

- Owned or operated by a public entity (which can include the state, cities, townships, counties, or other public body having jurisdiction over disposal of stormwater)

- Designed or used for collecting or conveying stormwater
- Not a combined sewer
- Not part of a publicly owned treatment works

MS4s in Minnesota must satisfy the requirements of the MS4 general permit if they are located in an urban area with a population of 50,000 or more people as determined by the latest Decennial Census by the Bureau of the Census or owned by a municipality with a population of 10,000 or more, or a population of at least 5,000 and the system discharges to specially classified bodies of water. Minn. R. 7090 establishes criteria and a process for designating MS4s. The MS4 general permit (MNR040000) is designed to reduce the amount of sediment and other pollutants entering state waters from stormwater systems. Entities regulated by the MS4 general permit must develop a stormwater pollution prevention program and adopt best practices.

The Small MS4 General Permit has been issued to the City of Austin in the Cedar River Watershed. Permitted MS4s can be a source of TSS and *E. coli* to surface waters through the impact of urban systems on stormwater runoff. Stormwater runoff, which delivers and transports pollutants to surface waters, is generated in the watershed during precipitation events.

TSS

The jurisdictional area of the city of Austin overlaps 3% of the downstream end of Dobbins Creek (-524) Subwatershed area. However, according to the data provided by the city, there is no stormwater conveyance discharging to that reach or subwatershed. The developed areas of this impaired reach contribute <3% of the total TSS load (Figure 7).

E. coli

Urban areas may contribute fecal bacteria to surface waters from pet waste and wildlife. The city of Austin's jurisdictional area is partially within Dobbins Creek (-524) and Unnamed Creek (-563) subwatersheds, overlapping 3% and 2% respectively. According to data provided by the city, there are no regulated stormwater conveyances within the Unnamed Creek (-563) subwatershed, though the area of the permitted MS4 still overlaps the impairment catchment (Figure 8).

Construction stormwater

Construction stormwater is regulated through an NPDES/SDS permit. Untreated stormwater that runs off of a construction site often carries sediment to surface water bodies. Phase II of the stormwater rules adopted by the EPA require an NPDES/SDS permit for a construction activity that disturbs one acre or more of soil; a permit is needed for smaller sites if the activity is either part of a larger development or if the MPCA determines that the activity poses a risk to water resources. Coverage under the construction stormwater general permit requires sediment and erosion control measures that reduce stormwater pollution during and after construction activities (see Section 8.1.3). Pollutant loading from construction stormwater is inherently incorporated in the watershed runoff estimates and is not considered a significant TSS source. Construction stormwater is not considered a source of *E. coli* and is not included in *E. coli* TMDLs.

Industrial stormwater

Industrial stormwater is regulated through an NPDES/SDS permit when stormwater discharges have the potential to come into contact with materials and activities associated with industrial activity. Pollutant loading from industrial stormwater is inherently incorporated in the watershed runoff estimates and is not considered a significant TSS source. Industrial stormwater is not considered a source of *E. coli* and is not included in *E. coli* TMDLs.

NPDES and SDS permitted animal feedlots

Animal feedlots are not considered a source of TSS. Feedlots and manure storage areas can be a source of nutrients and other pollutants due to runoff from the animal holding areas or the manure storage areas. Although TMDL reports typically consider only NPDES permitted sources in discussions of permitted sources, this discussion of permitted feedlots includes NPDES and SDS permitted feedlots because of similar discharge requirements.

Concentrated animal feeding operation (CAFO) is a federal definition that implies not only a certain number of animals but also specific animal types. The MPCA uses the federal definition of a CAFO in its permit requirements of animal feedlots along with the state definition of an animal unit (AU). In Minnesota, all CAFOs and non-CAFOs that have 1,000 or more AUs must operate under an NPDES or SDS permit. CAFOs with fewer than 1,000 AUs and are not required by federal law to maintain NPDES permit coverage may choose to operate without an NPDES permit.

A current manure management plan (MMP) that complies with Minn. R. 7020.2225 and the respective permit is required for all permitted CAFOs and feedlots with 1,000 or more AUs.

CAFOs and feedlots with 1,000 or more AUs must be designed to contain all manure, manure contaminated runoff, process wastewater, and the precipitation from a 25-year, 24-hour storm event. Having and complying with an NPDES or SDS permit authorizes discharges to waters of the United States and waters of the state (with NPDES permits) or waters of the state (with SDS permits) due to a 25-year, 24-hour precipitation event (approximately 5.7 inches in the Cedar Watershed [data source: https://hdsc.nws.noaa.gov/pfds/]) when the discharge does not cause or contribute to nonattainment of applicable state water quality standards. Large CAFOs with fewer than 1,000 AUs that have chosen to forego NPDES permit coverage are not authorized to discharge and must contain all runoff, regardless of the precipitation event. Large CAFOs permitted with an SDS permit are authorized to discharge to waters of the state, although they are not authorized to discharge to waters of the U.S. Therefore, many large CAFOs in Minnesota have chosen to obtain an NPDES permit.

For feedlots with NPDES or SDS permits, manure application must meet specific requirements depending on timing and location of application: Manure application at NPDES permitted feedlots. All manure generated from a permitted facility and transferred for land application elsewhere is subject to the same requirements and must follow an approved MMP.

Of the approximately 518 animal feedlots in the Cedar River Watershed, there are 27 CAFOs with NPDES or SDS permits. All NPDES and SDS permitted feedlots are designed to contain all manure, manure-contaminated runoff, process wastewater, and the precipitation from a 25-year, 24-hour storm event, and as such they are not considered a significant source of *E. coli* or TSS. All other feedlots are accounted for as nonpermitted sources. The land application of all manure, regardless of whether the source of the manure originated from permitted (e.g., CAFOs) or nonpermitted feedlots, is also accounted for as a nonpermitted source.

3.5.2 Nonpermitted sources

Watershed runoff

Precipitation that falls in a watershed drains across the land surface, and a portion of it eventually reaches lakes and streams. Pollutants such as fecal bacteria and TSS are carried with the runoff water and delivered to surface water bodies. The sources of pollutants in watershed runoff may include soils, vegetation, and livestock, pet, and wildlife waste. A portion of the fecal bacteria and TSS in watershed runoff can be considered natural background sources, which are inputs that would be expected under natural, undisturbed conditions.

E. coli

The primary source of *E. coli* that is transported to surface water bodies through watershed runoff in the Cedar River Watershed is livestock manure from nonpermitted feedlots, from land application of manure, failing subsurface sewage treatment systems (SSTS), stormwater runoff from developed areas, and wildlife (MPCA, 2020b).

Watershed runoff from developed areas transports *E. coli* through fecal matter from pets and wildlife. Impervious surfaces (e.g. roads, driveways, and rooftops) connect the locations where fecal matter is deposited to surface waters through stormwater that flows across the landscape into lakes, streams and wetlands. Delivery to the watershed from permitted MS4s is discussed under MS4s under Permitted sources (Section 3.5.1).

TSS

Upland sources of sediment are largely the result of sheet, rill, and gully erosion occurring as precipitation falls and then runs off from exposed and unprotected land surfaces. As prairie grasslands were converted to plowed agricultural fields, minimal, near channel sources were augmented with relatively large surface runoff sediment sources, making uplands the largest sediment contributor around the time of European settlement. The subwatersheds of the impaired reaches have >85% cropland area resulting in a large influence of upland sediment sources to these rivers.

Near-channel sources of sediment are those in close proximity to the stream channel, including banks, ravines, and the stream channel itself. Hydrologic changes in the landscape and altered precipitation patterns driven by climate change, such as more intense storms, can lead to increased TSS in surface waters. Subsurface drainage tiling, channelization of waterways, land cover alteration, and increases in impervious surfaces all decrease detention time in the watershed and increase flow from fields and in streams.

Non-NPDES/SDS permitted animal feedlots and manure application

Feedlots under 1,000 AUs do not operate with NPDES or SDS permits. In Minnesota, feedlots with greater than 50 AUs, or greater than 10 AUs in shoreland areas, are required to register at least once in a four-year period with the county feedlot officer if the county is delegated, or with the MPCA if the county is nondelegated. Facilities with fewer AUs are not required to register. Shoreland is defined by Minn. R. 7020.0300 as land within 1,000 feet from the normal high water mark of a lake, pond, or flowage, and land within 300 feet of a river or stream.

Manure that is generated on feedlots is usually stockpiled on site or on crop fields or stored in liquid manure storage areas on site until field conditions and the crop rotation allows for applying the manure as fertilizer. When stored and applied properly, the use of manure provides crop nutrition and builds soil organic matter and soil health, while also lessens the need for commercial fertilizers. However, manure can be delivered to surface waters from failure of manure containment, runoff from the feedlot itself, or runoff from crop fields where the manure is applied. The timing of manure spreading, as well as the application rate and method, affects the likelihood of pollutant loading to nearby water bodies. The spreading of manure on frozen soil in the late winter is likely to result in surface runoff with precipitation and snowmelt runoff events. Deferring manure application until snow has melted and soils have thawed decreases the likelihood of overland runoff associated with large precipitation events. Injecting or incorporating manure is a preferred BMP to reduce the runoff of waste and associated pollutants. Incorporating manure into the soil reduces the risk of surface runoff associated with large precipitation events.

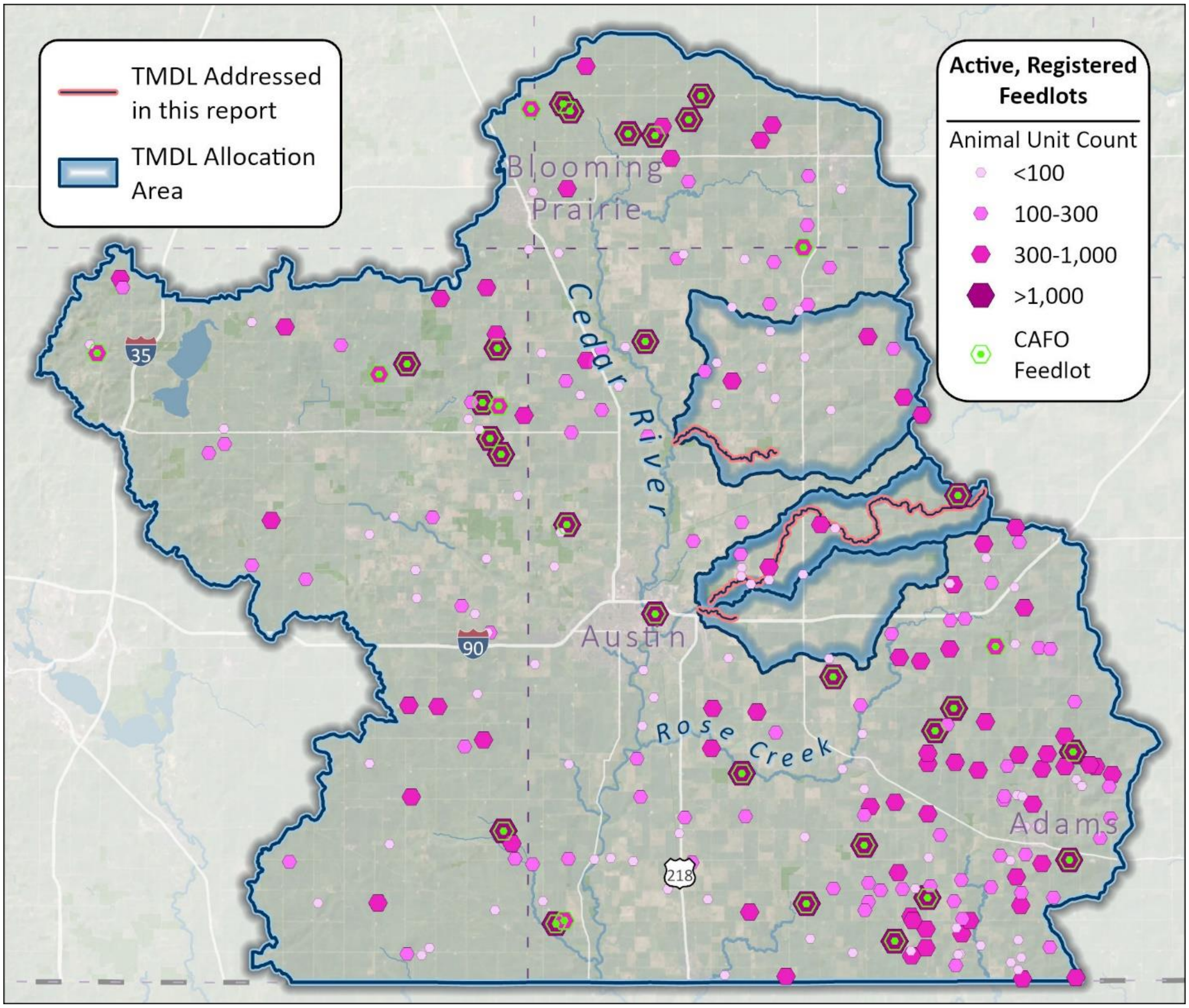
Feedlots, manure storage areas, and land application of manure can be a source of phosphorus and other pollutants due to the runoff of manure or manure-contaminated water. The risk of these pollutant sources can be increased at feedlots, manure storage areas, and manure application fields located within shoreland and riparian areas or near other sensitive features that contribute to surface or groundwater. All feedlots, manure storage areas, and land application fields are subject to rules and regulations under Minn. R. ch. 7020, regardless of the number of AUs (see Section 6.2.2).

Feedlots that obtain a feedlot permit, CAFOs (see Section 8.1.5), and feedlots with 300 or more AUs that do not use a licensed Commercial Animal Waste Technician to apply their manure are required to develop and maintain an MMP. The MMPs helps ensure that manure application rates do not exceed crop nutrient needs and that necessary setbacks from surface waters, drain tile intakes, and other sensitive features are observed (MPCA, 2021).

While a full accounting of the fate and transport of manure was not conducted for this project, a large portion of it is ultimately applied to the land surface and, therefore, this source is of possible concern. Minn. R. 7020.2225 contains several additional requirements for land application of manure that, when followed, should help reduce this concern. However, there are no explicit requirements for treatment of manure prior to land application.

Registered feedlots in the Cedar River Watershed are mapped in Figure 14.

Figure 14. Registered feedlots in Cedar River Watershed.



Pasture

Pasture makes up less than 7% of land use in all impaired reaches, though it is concentrated around Dobbins and Unnamed Creek (-524 and -563 respectively) (Figure 11 and Table 4). Pastures and rangeland are working-land BMPs that are integral part of local economies; well-managed pasture typically includes perennial vegetation and thus often does not contribute significantly to impairments. However, over-grazed pasture and prolonged access/loafing by livestock in streams can contribute significant amounts of *E. coli* in both Dobbins and Unnamed Creek. Livestock disturbances around streambanks can also contribute to TSS in Dobbins Creek.

Nonpermitted wastewater

Individual subsurface sewage treatment systems

Nonpermitted wastewater is not considered to be a significant source of TSS in the Cedar River Watershed but can be a source of *E. coli*.

Adequate wastewater treatment is vital to protecting the health, safety, and environment in Minnesota. More than 650,000 Minnesota homes and businesses use SSTSs. SSTSs that fail to treat wastewater adequately threaten groundwater used for drinking water and surface water used for recreation. Inadequate treatment of wastewater/sewage, which contains bacteria, viruses, parasites, nutrients, and chemicals, can result in contamination of drinking water sources. Additionally, straight-pipe wastewater "systems," which route raw wastewater to the ground or nearby waters, can directly impact lakes, streams, and wetlands.

SSTSs can fail for a variety of reasons, including excessive water use, poor design, physical damage, and lack of maintenance. Common limitations that contribute to failure include seasonal high water table, fine-grained soils, bedrock, and fragipan (i.e., altered subsurface soil layer that restricts water flow and root penetration). Septic systems can fail hydraulically through surface breakouts or hydrogeologically from inadequate soil filtration. Failure potentially results in higher levels of pollutant loading to nearby surface waters. To learn more about SSTSs, visit the All about septics page provided by the University of Minnesota.

Septic systems that are conforming to industry and design standards do not discharge bacteria. Nonconforming, old or failing septic systems fail to protect groundwater from contamination; these systems include seepage pits, cesspools, drywells, leaching pits, or other pits, and any system with less than the required vertical separating distance from the seasonal high water table. However, these types of failing septic systems are not considered sources of *E. coli* due to longer residence times for groundwater. Septic systems that discharge untreated sewage to the land surface or directly to streams are considered imminent threats to public health and safety (ITPHS) and can contribute *E. coli* directly to surface waters. ITPHS typically include straight pipes (i.e., no treatment), effluent ponding at ground surface, effluent backing up into homes, unsafe tank lids, electrical hazards or any other unsafe condition deemed by a certified SSTS inspector. Therefore, not all of the ITPHSs discharge pollutants directly to surface waters.

Currently, the precise number and status of SSTSs in the Cedar River Watershed is unknown. However, each year, counties in the state report estimated SSTS compliance to the MPCA. It should be noted that these rates are county-wide estimates developed using a wide range of methods and resources and are intended for planning purposes only. Estimates of SSTS failure rates in the counties in the Cedar River Watershed range from 16% to 50% over the last seven years, and ITPHS rates from 1% to 15% over the same span of time. Table 12 shows the average percent failing and ITPHS per county over the last seven years. In general, reported compliance has increased in all Cedar River Watershed counties.

Table 12. Average county SSTS failure and ITPHS rates (2017-2024) for counties in the Cedar River Watershed.

County name	Failing	ITPHS
Dodge	22%	10%
Freeborn	30%	14%
Mower	32%	4%
Steele	25%	9%

Rates are provided by counties to MPCA and are estimates only; the data does not represent verified compliance status.

Other potential wastewater sources of *E. coli* in the watershed may include straight pipe discharges, earthen pit outhouses, and land application of septage. Straight pipe systems are unpermitted and illegal sewage disposal systems that transport raw or partially treated sewage directly to a lake, stream, drainage system, or the ground surface. Straight pipe systems are required to be addressed 10 months after discovery (Minn. Stat. § 115.55, subd. 11). Outhouses, or privies, are legal disposal systems and are regulated under Minn. R. 7080.2150, subp. 2F and Minn. R. 7080.2280. Septage disposal is regulated under Minn. R. 7080 as well as in local and federal regulations.

Areas and communities with SSTS concerns

To ensure that effective sewage treatment occurs across the state, the MPCA regularly conducts surveys of local governmental units to identify areas in the state that may be areas of concern; these areas are defined as five or more homes within a half mile of each other that have inadequate sewage treatment. These areas are generally unincorporated communities, may not have an organized structure, may consist of families with limited financial resources, and many times do not qualify for the same financial assistance as large incorporated communities. As of 2025, there were 15 communities in the Cedar River Watershed identified as areas and communities with SSTS concerns, though there are no communities of concern in the impairment subwatersheds addressed in this report. The communities outside of the impairment subwatersheds may have been listed because they were known to be noncompliant (i.e., imminent threat to public health and safety that backs up into the house or surface discharges inadequately treated wastewater, or a treatment system that is failing to protect groundwater and has a leaky tank or not enough soil separation under the SSTS before reaching saturated soil conditions) or due to an unknown status of SSTS compliance and were listed because of poor soils in the area, small lot size, or are older systems that may be out of compliance.

Natural background sources

“Natural background” is defined in both Minnesota statute and rule. The Clean Water Legacy Act (Minn. Stat. § 114D.15, subd. 10) defines natural background as “characteristics of the water body resulting from the multiplicity of factors in nature, including climate and ecosystem dynamics, which affect the physical, chemical, or biological conditions in a water body, but does not include measurable and distinguishable pollution that is attributable to human activity or influence.” Minn. R. 7050.0150, subp. 4 states, “‘Natural causes’ means the multiplicity of factors that determine the physical, chemical, or biological conditions that would exist in a water body in the absence of measurable impacts from human activity or influence.”

Natural background sources are inputs that would be expected under natural, undisturbed conditions. Natural background sources can include inputs from natural geologic processes such as soil loss from upland erosion and stream development, atmospheric deposition, and loading from wildlife, etc. However, for each impairment, natural background levels are implicitly incorporated in the water quality standards used by the MPCA to determine/assess impairment, and therefore natural background is accounted for and addressed through the MPCA’s water body assessment process. Natural background conditions were evaluated within the source assessment portion of this study, which indicates that natural background inputs are generally low compared to livestock, cropland, streambank, wastewater treatment facilities, ITPHS, and other anthropogenic sources.

Based on the MPCA's water body assessment process and the TMDL source assessment, there is no evidence at this time to suggest that natural background sources are a major driver of any of the impairments and/or affect the water bodies' ability to meet state water quality standards.

Naturalized *E. coli*

The adaptation and evolution of naturalized *E. coli* that allows survival and reproduction in the environment make naturalized *E. coli* physically and genetically distinct from *E. coli* that cannot survive outside of a warm-blooded host. This naturalized *E. coli* may be a source of *E. coli* to the impairments.

The relationship between *E. coli* sources and *E. coli* concentrations found in streams is complex, involving precipitation and flow, temperature, sunlight and shading, livestock management practices, wildlife contributions, *E. coli* survival rates, land use practices, and other environmental factors. Research in the last 15 years has found the persistence of *E. coli* in soil, beach sand, and sediments throughout the year in the north central United States without the continuous presence of sewage or warm-blooded host sources. This *E. coli* that persists in the environment outside of a warm-blooded host is referred to as naturalized *E. coli* (Jang, 2017). Naturalized *E. coli* can originate from different types of *E. coli* sources, including 1) natural background sources such as wildlife and 2) human attributed sources such as pets, livestock, and human wastewater. Therefore, whereas naturalized *E. coli* can be related to natural background sources, naturalized *E. coli* are not always from a natural background source.

An Alaskan study (Adhikari, 2007) found that total coliform bacteria in soil were able to survive for six months in subfreezing conditions. Two studies near Duluth, Minnesota found that *E. coli* were able to grow in agricultural field soil (Ishii, 2010) and temperate soils (Ishii, 2006). A study by Chandrasekaran et al. (Chandrasekaran, 2015) of ditch sediment in the Seven Mile Creek Watershed in southern Minnesota found that strains of *E. coli* had become naturalized to the water−sediment ecosystem. Survival and growth of fecal coliform has been documented in storm sewer sediment in Michigan (Marino, 1991) and *E. coli* regrowth was documented on concrete and stone habitat within an urban Minnesota watershed (Burns and McDonnell Engineering Company, 2017). This ability of *E. coli* to survive and persist naturally in watercourse sediment can increase *E. coli* counts in the water column, especially after resuspension of sediment (e.g., (Jamieson, 2005)).

Although naturalized *E. coli* might exist in the watershed, there is no evidence to suggest that naturalized *E. coli* are a major driver of impairment and/or affect the water bodies' ability to meet state water quality standards. For more information, visit the *Water quality and bacteria frequently asked questions* page.

3.5.3 Summary

TSS

External loading of TSS is dependent on land cover and land use and is worse in areas of unprotected soil due to cropland, development, and poorly vegetated pastures. Internal loading of TSS such as streambank erosion and bank slumping due to decreased bank stability are also important sources of TSS in the Cedar River Watershed. TSS loading is also impacted by frequency and type of rainfall events that can move more sediment across the landscape (MPCA, 2020b).

E. coli

Sources of *E. coli* in the watershed include livestock and grazing areas, manure-applied cropland, SSTS that are ITPHS, stormwater runoff from developed areas, and minimally from wildlife. During wet conditions, runoff-driven sources associated with animal agriculture—such as feedlots and manure application—are the primary contributors of *E. coli* to surface waters. During dry periods, dominant sources include SSTS that are ITPHS and pastureland located near waterways that can directly introduce *E. coli* into surface waters (MPCA, 2006, 2018, 2020b).

4. TMDL development

A water body's TMDL represents the loading capacity, or the amount of pollutant that a water body can assimilate while still meeting water quality standards. The loading capacity is divided up and allocated to the water body's pollutant sources. The allocations include WLAs for NPDES-permitted sources, LAs for nonpermitted sources (including natural background), and an MOS, which is implicitly or explicitly defined. The sum of the allocations and MOS cannot exceed the loading capacity, or TMDL.

4.1 *E. coli*

Because the *E. coli* standards for the impairments addressed in this report apply April through October, the *E. coli* TMDLs and allocations also apply April through October.

4.1.1 Loading capacity methodology

The loading capacities for the *E. coli* impairments were developed using LDCs. See 3.4.1 Flow data for a description of LDC development. The loading capacity was calculated as simulated flow at the downstream end of each impaired reach multiplied by the *E. coli* monthly geometric mean standard (126 org/100 mL). The LDC provides loading capacities for all flows observed in the stream along with observed loads calculated from monitoring data and simulated flow. For any given flow in the LDC, the loading capacity is determined by selecting the point on the LDC that corresponds to the flow exceedance (along the x-axis).

The LDC method is based on an analysis that encompasses the cumulative frequency of historical flow data over a specified period. Because this method uses a long-term record of daily flow volumes, virtually the full spectrum of allowable loading capacities is represented by the resulting curve. In the TMDL equation tables of this report, only five points on the entire loading capacity curve are depicted (the midpoints of the designated flow zones). However, the entire curve represents the TMDL and is what the EPA ultimately approves.

4.1.2 Load allocation methodology

The LA is allocated to existing or future nonpermitted pollutant sources. The LA was calculated as:

$$LA=TMDL-MOS-WLA$$

Natural background conditions were also evaluated, where possible, within the modeling and source assessment portion of this study (Section 3.5). For all impairments addressed in this TMDL report, natural background sources are implicitly included in the LA portion of the TMDL tables, and reductions should focus on the major human attributed sources identified in the source assessment.

4.1.3 Wasteload allocation methodology

The WLA is allocated to existing or future NPDES-permitted pollutant sources. If a permittee that is assigned a WLA in this report has previously been assigned one or more WLAs for the same pollutant for another TMDL, the applicable permit(s) and/or associated planning documents will need to address the most restrictive WLA.

4.1.3.1 Municipal and industrial wastewater

There are no permitted municipal or industrial wastewater discharges in the *E. coli* impaired watersheds.

4.1.3.2 Municipal separate storm sewer systems

WLAs were developed for the City of Austin MS4 using the jurisdictional area of the city within each impaired reach watershed. This approach accommodates future growth of the city's regulated stormwater conveyance by taking into account the entire city area instead of only the areas with currently regulated stormwater conveyance. The approximated WLA area of the MS4 was divided by the total area of the watershed to represent the percent coverage of the permitted MS4 within the impairment watershed (Table 13). The WLAs for the permitted MS4 were calculated as the percentage coverage of the permitted MS4 multiplied by the loading capacity minus the MOS. The city currently has no stormwater conveyance in either impairment subwatershed, therefore no reductions are required for either *E. coli* WLA. The City of Austin MS4 was assigned WLAs in downstream *E. coli* TMDLs (MPCA 2019b and MPCA 2006), and therefore the MS4 WLAs assigned in this report will not result in additional MS4 permit requirements per the next MS4 General Permit.

Table 13. Permitted MS4s and estimated regulated area for *E. coli* TMDLs.

MS4 name and permit number	Estimated WLA area (ac)	Impaired water body	Impaired water body WID	Pollutant
City of Austin, MS400251	383	Dobbins Creek	524	*E. coli*
City of Austin, MS400251	230	Unnamed Creek	563	*E. coli*

4.1.3.3 Industrial and construction stormwater

Industrial stormwater receives a WLA only if the pollutant is part of benchmark monitoring for an industrial site in the watershed of an impaired water body. There are no fecal bacteria or *E. coli* benchmarks associated with the industrial stormwater general permit (MNR050000), and therefore industrial stormwater *E. coli* WLAs were not assigned.

WLAs for regulated construction stormwater (MNR100001) are not developed in Minnesota because *E. coli* is not a typical pollutant from construction sites.

4.1.3.4 NPDES/SDS permitted animal feeding operations

WLAs are not assigned to CAFOs, including CAFOs with NPDES or SDS permits, and CAFOs not requiring permits; this is equivalent to a WLA of zero. Although the NPDES and SDS permits allow discharge of manure and manure contaminated runoff due to a precipitation event greater than or equal to a 25-year, 24-hour precipitation event, the permits prohibit discharges that cause or contribute to nonattainment of water quality standards.

All other non-CAFO feedlots and the land application of all manure are accounted for in the LA for nonpermitted sources.

4.1.4 Margin of safety

The MOS accounts for uncertainty concerning the relationship between water quality and allocated loads. The MOS may be implicit (i.e., incorporated into the TMDL through conservative assumptions in the analysis) or explicit (i.e., expressed in the TMDL as a load set aside). An explicit MOS of 10% was included for the Cedar River Watershed *E. coli* TMDLs to account for these uncertainties. The use of an explicit MOS accounts for uncertainty in water quality monitoring, environmental variability in flow and pollutant loading, calibration and validation of modeling efforts, uncertainty in modeling outputs, and limitations associated with the drainage area-ratio method used to extrapolate flow data. This MOS is sufficient given the robust flow dataset and the calibration results of the HSPF model. Simulated flows from the HSPF model were used to develop the LDCs for the *E. coli* impairments (the HSPF model does not simulate *E. coli* loads). The hydrological model conditions were compared to the USGS Gages E48020001 (date range 1996-2022), and H48027001 (date range 2005-2022) in the Cedar River Watershed. The sediment model conditions were compared to the same USGS stations as the hydrology but for years 2013-2020 and 2013-2017 respectively. Calibration results indicate that the HSPF model is a valid representation of hydrologic conditions in the watershed.

4.1.5 Seasonal variation and critical conditions

The application of LDCs in the *E. coli* TMDLs addresses seasonal variation and critical conditions. LDCs evaluate pollutant loading across all flow regimes including high flow, which is when pollutant loading from watershed runoff is typically the greatest, and low flow, which is when loading from direct sources to the stream typically has the most impact. Because flow varies seasonally, LDCs address seasonality through their application across all flow conditions in the impaired water body.

Seasonal variation and critical conditions are also addressed by the water quality standards. The *E. coli* standards for AQR apply from April through October. These time periods are when AQR is more likely to occur in Minnesota waters and when high *E. coli* concentrations generally occur.

4.1.6 Reserve capacity

A reserve capacity was not assigned in these TMDLs. Reserve capacity in Minnesota *E. coli* TMDLs is not needed for new or expanding wastewater dischargers whose permitted effluent limits are at or below the instream target.

4.1.7 Baseline year

The monitoring data used to calculate the percent reductions are from 2014-2024. The baseline year for implementation is 2019 (end of year), the midpoint of the time period. BMPs present on the landscape during the model simulation time period are implicitly accounted for in the model.

4.1.8 Percent reduction

The estimated percent reductions provide a rough approximation of the overall reduction needed for the water body to meet the TMDL. The percent reduction is a means to capture the level of effort needed to reduce *E. coli* concentrations in the watershed. The percent reductions should not be construed to mean that each of the separate sources listed in the TMDL table needs to be reduced by that amount.

The existing concentration was calculated as the maximum monthly observed geometric mean *E. coli* concentration for the impaired reach. The percent reduction needed to meet the standard was calculated as the maximum monthly observed geometric mean concentration minus the geometric mean standard (126 org/100 mL) divided by the maximum monthly observed geometric mean concentration (Table 14). By using the highest observed monthly geometric mean, the percent reduction calculation approximates the reduction in concentration (as opposed to load) needed to meet the monthly geometric mean standard overall, aggregated across all flow conditions.

Table 14. Summary of percent reductions needed to meet the *E. coli* standard in impaired reaches of the Cedar River Watershed.

Reach name	WID	Maximum observed monthly geometric mean (org/100 mL)	Percent reduction needed to meet *E. coli* standards
Dobbins Creek	524	854	85%
Unnamed Creek	563	492	74%

4.1.9 TMDL summary

The estimated percent reductions needed to meet the *E. coli* TMDLs is 85% for Dobbins Creek (-524) and 74% for Unnamed Creek (-563) (Table 14). The LDCs and other *E. coli* analyses were taken as a whole and indicate that the exceedances of the *E. coli* standard occur during all flows and remains consistent through the WQS season (Figure 15, Figure 16, Figure 17, Figure 18). Load reductions from the landscape will be necessary to see a reduction in *E. coli* concentrations (see Section 3.5).

Figure 15. Dobbins Creek (07080201-524) *E. coli* LDCs.

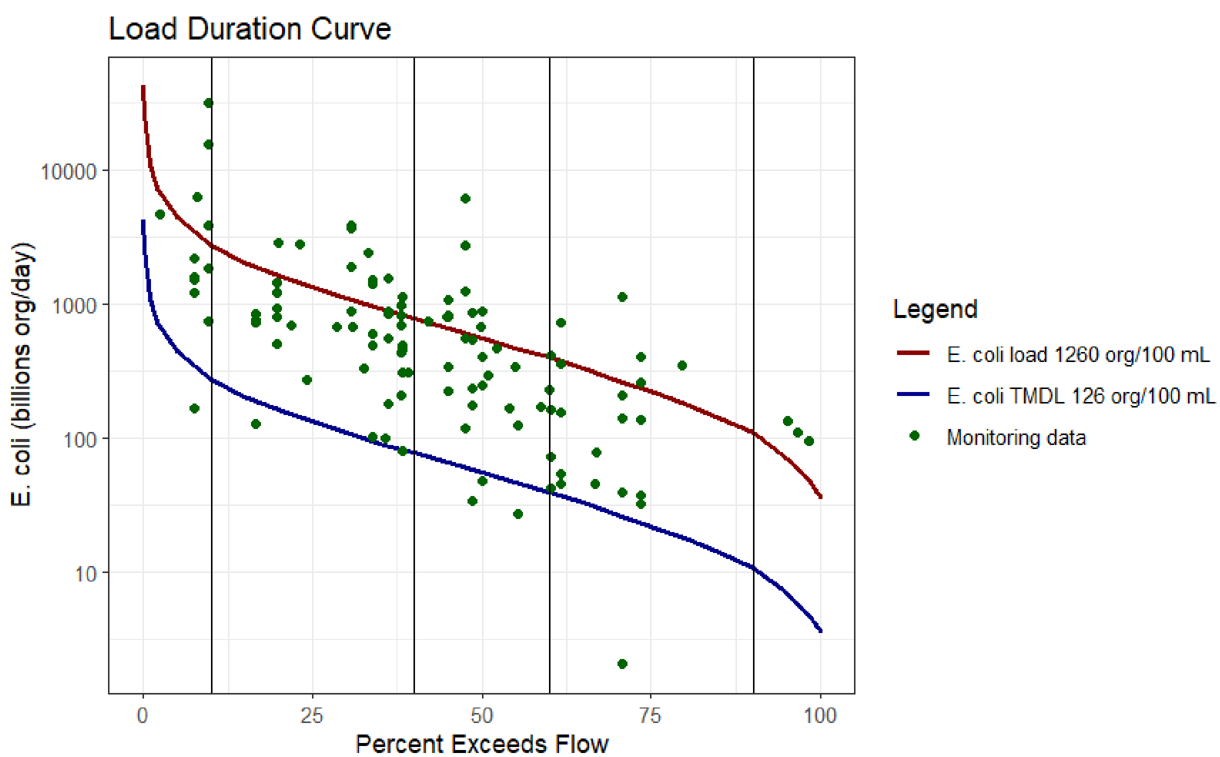


Figure 16. Dobbins Creek (07080201-524) *E. coli* concentrations with monthly geometric means.

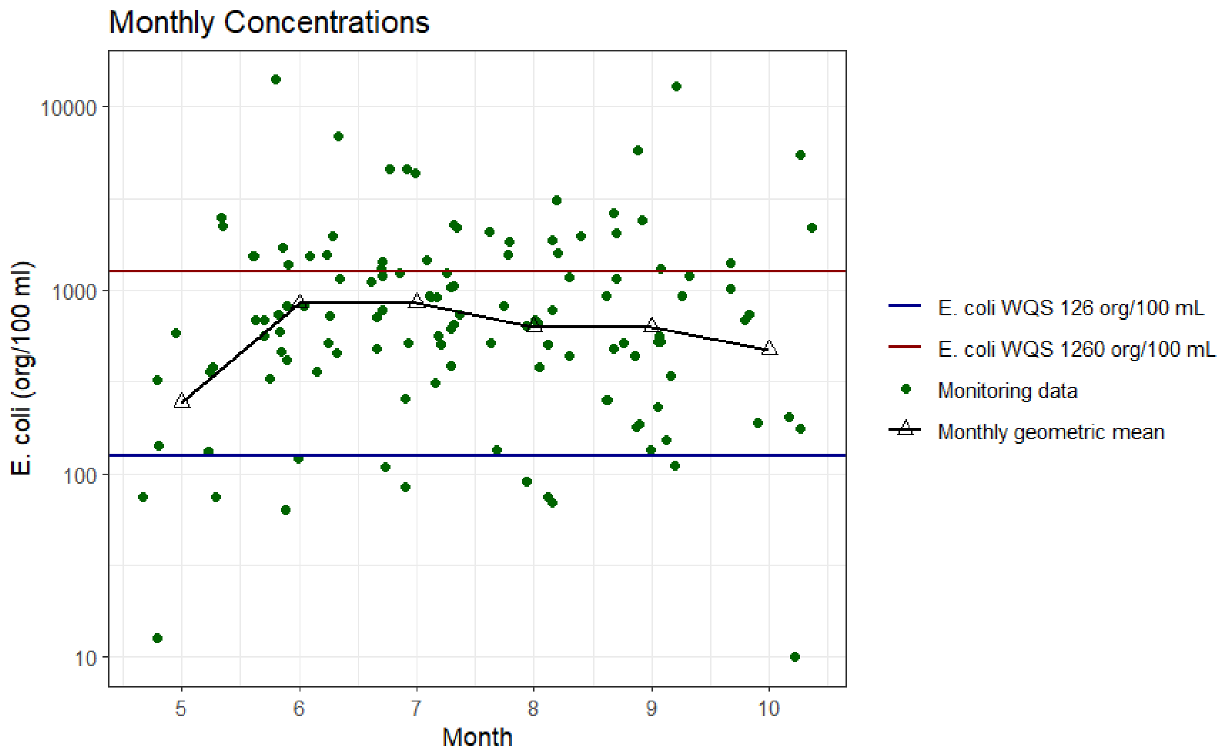


Table 15. Dobbins Creek (07080201-524) *E. coli* TMDL summary.

- Impairments addressed by this TMDL: -524, -605
- Listing year: 2022
- Baseline year: 2019
- Numeric standard used to calculate TMDL: 126 org/100 mL *E. coli*
- TMDL and allocations apply Apr–Oct

TMDL parameter	TMDL *E. coli* load (billion org/day) by flow zone				
	Very high	**High**	**Mid**	**Low**	**Very low**
Total LA	382.1	115.0	47.4	19.1	6.16
City of Austin MS4 (MS400251)* WLA	11.8	3.54	1.47	0.59	0.19
MOS	43.8	13.2	5.43	2.19	0.71
TMDL	437.7	131.7	54.29	21.9	7.10

Important statistics	
Maximum monthly geometric mean (org/100 mL)	882
Estimated percent reduction	86%

*no reductions required

Figure 17. Unnamed Creek (07080201-563) *E. coli* LDCs.

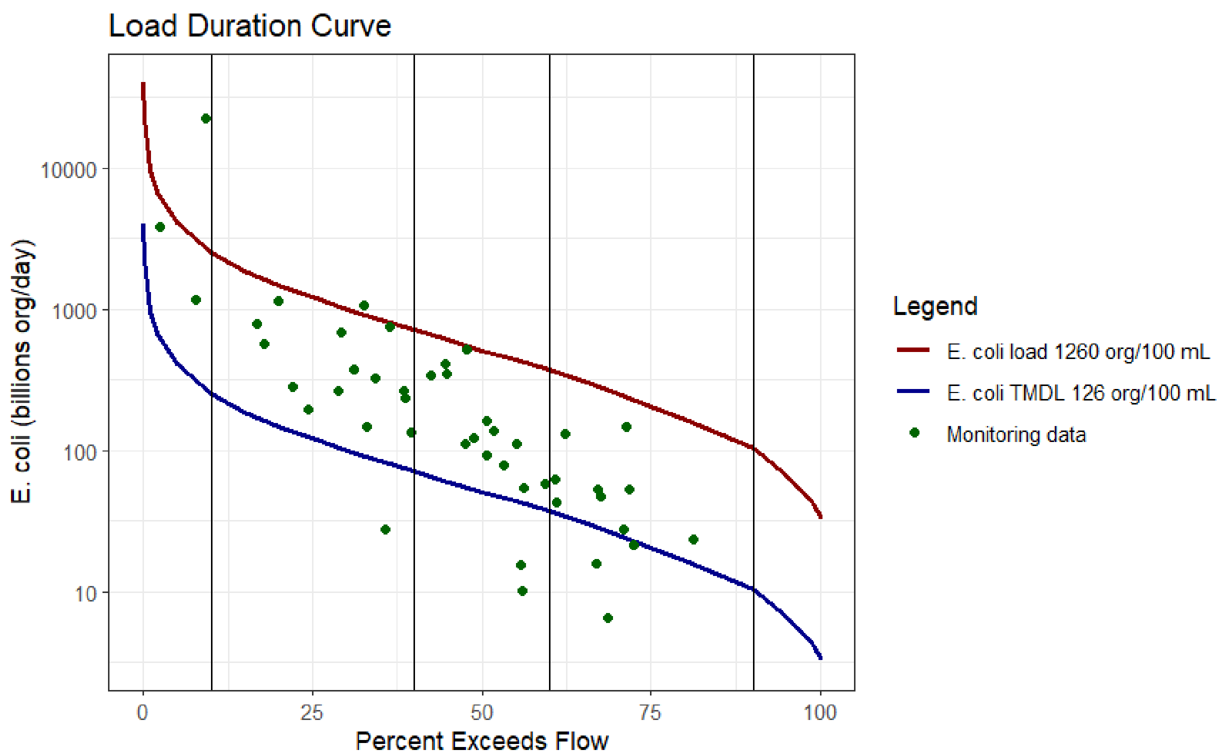


Figure 18. Unnamed Creek (07080201-563) *E. coli* concentrations with monthly geometric means.

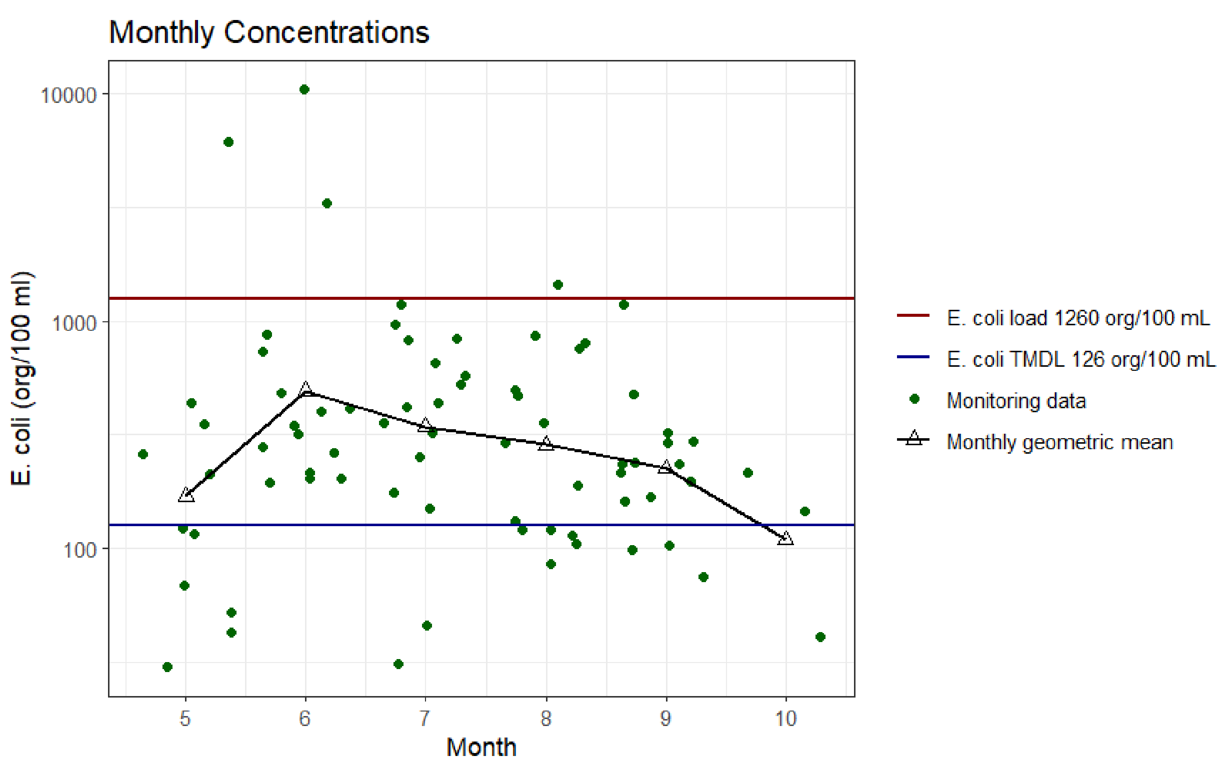


Table 16. Unnamed Creek (07080201-563) *E. coli* TMDL summary.

- Impairments addressed by this TMDL: -563, -562, -606, -607, -608, -609, and -610
- Listing year: 2022
- Baseline year: 2019
- Numeric standard used to calculate TMDL: 126 org/100 mL *E. coli*
- TMDL and allocations apply Apr–Oct

	TMDL *E. coli* load (billion org/day) by flow zone				
TMDL parameter	**Very high**	**High**	**Mid**	**Low**	**Very low**
Total LA	358.0	108.0	45.0	17.9	6.0
City of Austin MS4 (MS400251)* WLA	7.30	2.21	0.92	0.37	0.12
MOS	40.5	12.3	5.1	2.03	0.68
TMDL	405.8	122.5	51.0	20.3	6.8
Important statistics					
Maximum monthly geometric mean (org/100 mL)	492				
Estimated percent reduction	74%				

*no reductions required

4.2 TSS

Because the TSS standards for the impairments addressed in this report apply April through September, the TSS TMDLs and allocations also apply April through September.

4.2.1 Loading capacity methodology

The Cedar River HSPF model was calibrated for years 2012 to 2022 and validated between 2013 to 2020 at USGS Station ID E48020001 and 2013-2017 at USGS Gage H48027001. Calibration results indicate that the HSPF model is a valid representation of hydrologic conditions in the watershed.

The LDC method is based on an analysis that encompasses the cumulative frequency of historical flow data over a specified period. Because this method uses a long-term record of daily flow volumes, virtually the full spectrum of allowable loading capacities is represented by the resulting curve. In the TMDL equation tables of this report, only five points on the entire loading capacity curve are depicted (the midpoints of the designated flow zones). However, the entire curve represents the TMDL and is what the EPA ultimately approves.

4.2.2 Load allocation methodology

The LA is allocated to existing or future nonpermitted pollutant sources. The LA was calculated as:

LA=TMDL-MOS-WLA (if present)

Natural background conditions were also evaluated, where possible, within the modeling and source assessment portion of this study (Section 3.7.1.2). For all impairments addressed in this TMDL report, natural background sources are implicitly included in the LA portion of the TMDL tables, and reductions should focus on the major human attributed sources identified in the source assessment.

4.2.3 Wasteload allocation methodology

The WLA is allocated to existing or future NPDES-permitted pollutant sources. If a permittee that is assigned a WLA in this report has previously been assigned one or more WLAs for the same pollutant for another TMDL, the applicable permit(s) and/or associated planning documents will need to address the most restrictive WLA.

4.2.3.1 Municipal and industrial wastewater

The WLA flow is based on the WWTP secondary treatment pond area with a 6-inch per day drawdown. The WLAs for the two wastewater discharges were calculated as the WLA flow multiplied by the permitted concentration limit (45 mg/L). The two wastewater discharges have existing permit limits that are consistent with the WLA. The TSS permit limit for municipal facilities in impaired waters in this report is 45 mg/L, which is lower than the standard of 65 mg/L.

Table 17. Individual wastewater wasteload allocations for Roberts Creek.

Facility name	Permit number (surface discharge station)	Design flow [a]	Impaired water body WID	Pollutant	Permit limit (mg/L)	Wasteload allocation (tons/d)	Existing permit consistent with WLA assumptions
Brownsdale WWTP	MN0022934 (SD 001)	1.377	07080201-504	TSS	45	0.26	Y
Sargeant WWTP	MNG585214 (SD 001)	0.081	07080201-504	TSS	45	0.02	Y

a. Flow used to calculate the WLA: maximum daily flow.

4.2.3.2 Municipal separate storm sewer systems

WLAs were developed for the City of Austin MS4 using the jurisdictional area of the city within each impaired reach watershed. This approach accommodates future growth of the city's regulated stormwater conveyance by taking into account the entire city area instead of only the areas with currently regulated stormwater conveyance. The approximated WLA area of the MS4 was divided by the total area of the watershed to represent the percent coverage of the permitted MS4 within the impairment watershed (Table 18). The WLAs for the permitted MS4 were calculated as the percent coverage of the permitted MS4 multiplied by the loading capacity minus the MOS. The city currently has no stormwater conveyance in either impairment subwatershed, therefore no reductions are required for the TSS WLA. The City of Austin MS4 was assigned WLAs in downstream TSS TMDLs (MPCA 2019b and MPCA 2006), and therefore the MS4 WLAs assigned in this report will not result in additional MS4 permit requirements per the next MS4 General Permit.

Table 18. Permitted MS4s and estimated regulated area for TSS TMDL for Dobbins Creek.

MS4 name and permit number	Estimated regulated acres	Impaired water body	Impaired water body WID	Pollutant
MS400251	383	Dobbins Creek	524	TSS

4.2.3.3 Construction and industrial stormwater

TSS impairments in Mower County have been identified in Roberts Creek (-504), and Dobbins Creek (-524). According to Construction Stormwater Permit information from the MPCA, the annual average percent of land area under construction in the Cedar River Watershed ranged from 0% to 0.08% over the last five years, an average of 0.03%. Construction stormwater WLAs were calculated as 0.03% multiplied by the loading capacity minus the MOS and wastewater WLAs.

To allow for current and future permitted industrial stormwater activities, the WLAs for industrial stormwater were calculated as equal to the construction stormwater WLAs: 0.03% multiplied by the loading capacity minus the MOS and wastewater WLAs.

Industrial and construction stormwater were combined into one WLA because they make up a very small fraction of the watershed area. Both construction and industrial stormwater are regulated under a general permit program in Minnesota (MNR100001, MNR500000, and MNG490000).

4.2.3.4 NPDES/SDS permitted animal feeding operations

WLAs are not assigned to CAFOs, including CAFOs with NPDES or SDS permits, and CAFOs not requiring permits; this is equivalent to a WLA of zero. Although the NPDES and SDS permits allow discharge of manure and manure contaminated runoff due to a precipitation event greater than or equal to a 25-year, 24-hour precipitation event, the permits prohibit discharges that cause or contribute to nonattainment of water quality standards.

All other non-CAFO feedlots and the land application of all manure are accounted for in the LA for nonpermitted sources.

4.2.4 Margin of safety

The MOS accounts for uncertainty concerning the relationship between water quality and allocated loads. The MOS may be implicit (i.e., incorporated into the TMDL through conservative assumptions in the analysis) or explicit (i.e., expressed in the TMDL as a load set aside). An explicit MOS of 10% multiplied by the loading capacity was included for the Cedar River Watershed TSS TMDLs to account for these uncertainties. The use of an explicit MOS accounts for uncertainty in water quality monitoring, environmental variability in flow and pollutant loading, calibration and validation of modeling efforts, uncertainty in modeling outputs, and limitations associated with the drainage area-ratio method used to extrapolate flow data. This MOS is sufficient given the robust flow dataset and the calibration results of the HSPF model. Simulated flows from the HSPF model were used to develop the LDCs for the TSS impairments and simulated TSS loading. The hydrological model conditions were compared to the U.S. Geological Survey (USGS) Gages E48020001 (date range 1996-2022), and H48027001 (date range 2005-2022) in the Cedar River Watershed. The sediment model conditions were compared to the same USGS stations as the hydrology but for years 2013-2020 and 2013-2017 respectively. Calibration results indicate that the HSPF model is a valid representation of hydrologic conditions in the watershed.

4.2.5 Seasonal variation and critical conditions

Seasonal variation and critical conditions are accounted for in this TMDL report through the application of LDCs. LDCs evaluate water quality conditions across all flow zones including high flow, runoff conditions where sediment transport tends to be greatest. Seasonality is accounted for by addressing all flow conditions in a given reach. The greatest load reduction needs for the TSS TMDL occur during very high flow conditions.

4.2.6 Reserve capacity

A reserve capacity was not assigned in these TMDLs. Reserve capacity in Minnesota TSS TMDLs is not needed for new or expanding wastewater dischargers whose permitted effluent limits are at or below the instream target.

4.2.7 Baseline year

The monitoring data used to calculate the percent reductions are from 2014 through 2024. The baseline year for implementation is 2019 (end of year), the midpoint of the time period. BMPs present on the landscape during the model simulation time period are implicitly accounted for in the model.

4.2.8 Percent reduction

The estimated percent reductions provide a rough approximation of the overall reduction needed for the water body to meet the TMDL. The percent reduction is a means to capture the level of effort needed to reduce TSS concentrations in the watershed. The percent reductions should not be construed to mean that each of the separate sources listed in the TMDL table needs to be reduced by that amount.

The existing concentration for each impairment was calculated as the 90th percentile of observed TSS concentrations from the months that the standard applies (April through September). The 90th percentile was used because the TSS standard states that the numeric criterion (65 mg/L) may be exceeded for no more than 10% of the time. The estimated percent reduction needed to meet each TMDL was calculated as the existing concentration minus the TSS standard (65 mg/L) divided by the existing concentration. This calculation approximates the reduction in concentration needed to meet the standard.

Table 19. Summary of percent reductions needed to meet the TSS standard in impaired reaches of the Cedar River Watershed.

Reach name	WID	90^{th} percentile value (mg/L)	Percent reduction needed to meet TSS standards
Dobbins Creek	524	398	84%
Roberts Creek	504	174	63%

4.2.9 TMDL summary

The estimated percent reductions needed to meet the TSS TMDLs are 84% for Dobbins Creek (-524) and 63% for Roberts Creek (-504) (Table 19). The LDCs and other TSS analyses were taken as a whole and indicate that the exceedances of the TSS standard occur during high and very high flows suggesting landscape and erosion influence (Figure 19, Figure 20, Figure 21, Figure 22). Load reductions from the landscape and reduction in erosion will be necessary to see changes in TSS concentrations (see Section 3.5). The WRAPS explores further analysis modeling continuous data from USGS gauge in a downstream water unit identification (WID) to determine patterns of TSS in streams in the Cedar River Watershed District (CRWD; MPCA, 2026b).

Table 20. Roberts Creek (07080201-504) TSS TMDL summary.

- Listing year: 2022
- Baseline year: 2019
- Numeric standard used to calculate TMDL: 65 mg/L TSS
- TMDL and allocations apply Apr–Sep

TMDL parameter	TMDL TSS load (tons/day) by flow zone				
	Very high	High	Mid	Low	Very low
Total LA	6.56	1.88	0.625	0.087	*
Total WLA	0.278	0.275	0.275	0.274	*
Brownsdale WWTP (MN0022934) WLA	0.259	0.259	0.259	0.259	*
Sargeant WWTP (MNG585214) WLA	0.0153	0.0153	0.0153	0.0153	*
Industrial Stormwater (MNR500000, and MNG490000) WLA	0.00197	0.00057	0.00019	0.000026	*
Construction Stormwater (MNR100001) WLA	0.00197	0.00057	0.00019	0.000026	*
MOS	0.76	0.24	0.1	0.04	0.01
TMDL	7.6	2.4	1	0.4	0.1
Important statistics					
Existing 90th percentile concentration (mg/L)	174				
Estimated percent reduction	63%				

* The permitted wastewater design flows exceed the stream flow in the indicated flow zone(s). The allocations are expressed as an equation rather than an absolute number: allocation = (flow contribution from a given source) x 65 mg/L (or NPDES/SDS permit concentration). See Section 4.2.1 for more detail.

Figure 19. Roberts Creek (07080201-504) TSS LDCs.

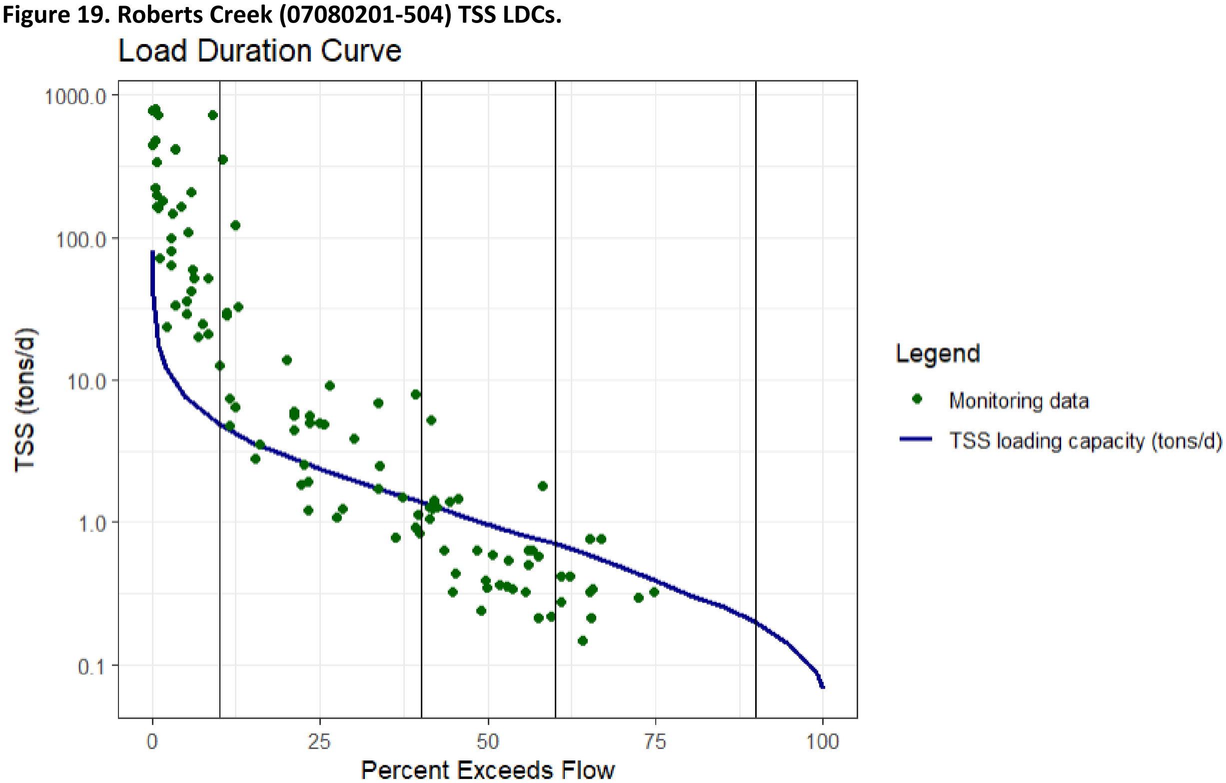


Figure 20. Roberts Creek (07080201-504) TSS concentration duration curve.

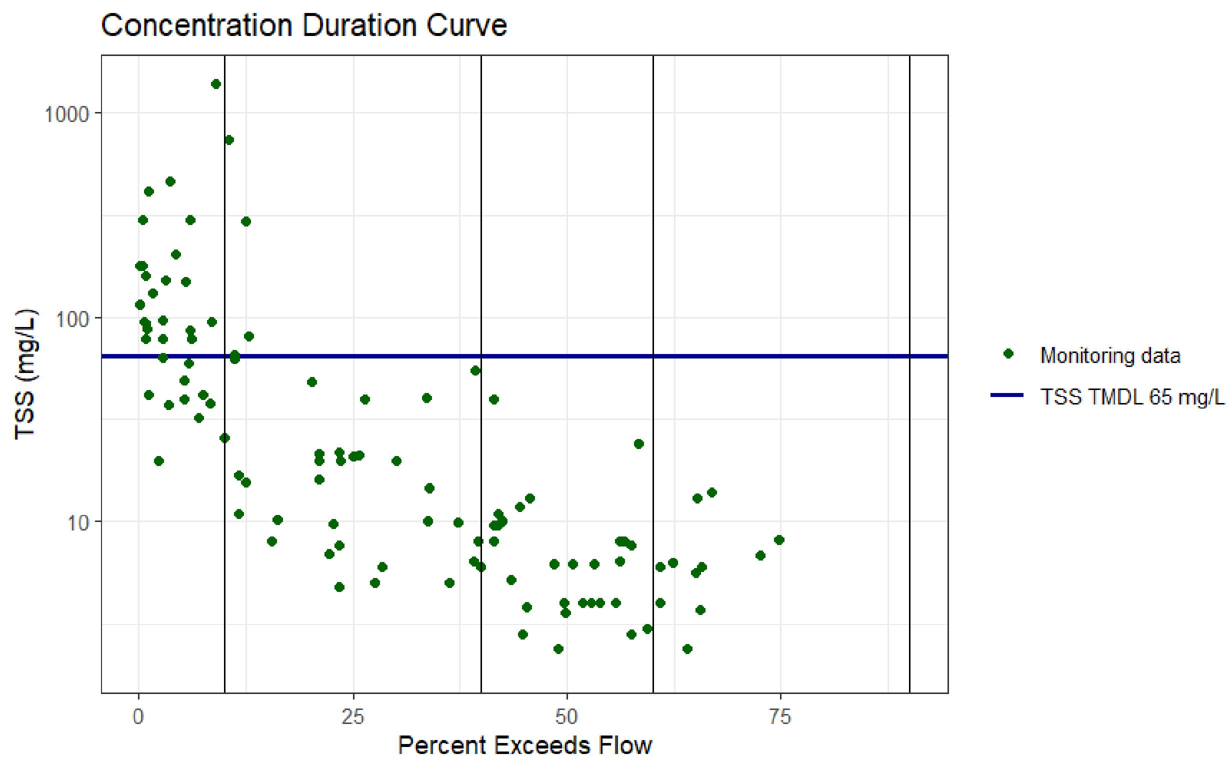


Table 21. Dobbins Creek (07080201-524) TSS TMDL summary.

- Impairments addressed in this TMDL: -524, -624
- Listing year: 2022
- Baseline year: 2019
- Numeric standard used to calculate TMDL: 65 mg/L TSS
- TMDL and allocations apply Apr–Sep

TMDL parameter	TMDL TSS load (tons/day) by flow zone				
	Very high	**High**	**Mid**	**Low**	**Very low**
Total LA	3.33	1.03	0.43	0.17	0.09
City of Austin (MS400251)** MS4 WLA	0.10	0.032	0.013	0.0053	0.0027
Industrial Stormwater WLA	0.00103	0.00032	0.00013	0.00005	0.00003
Construction Stormwater(WLA	0.0010	0.00032	0.00013	0.00005	0.00003
MOS	0.38	0.12	0.05	0.02	0.01
TMDL	3.81	1.18	0.49	0.20	0.10
Important statistics					
Existing 90th percentile concentration (mg/L)	398				
Estimated percent reduction	84%				

**no MS4 reduction required

Figure 21. Dobbins Creek (07080201-524) TSS LDCs.

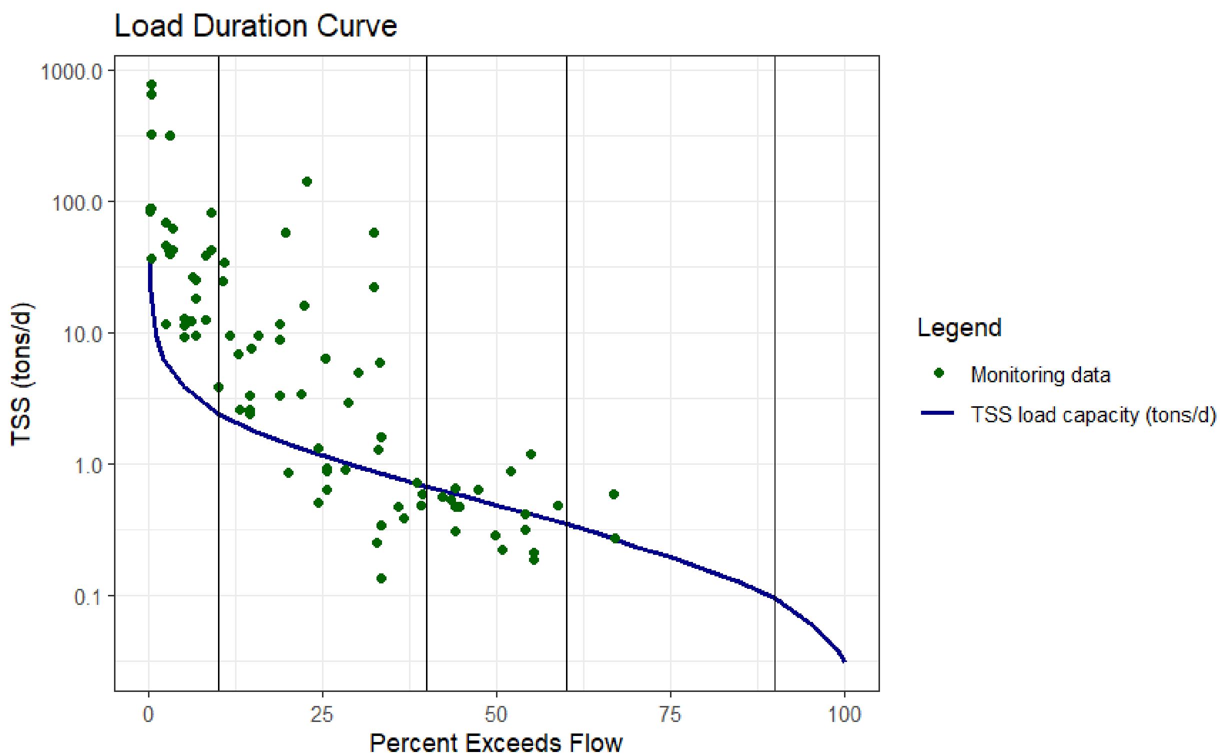
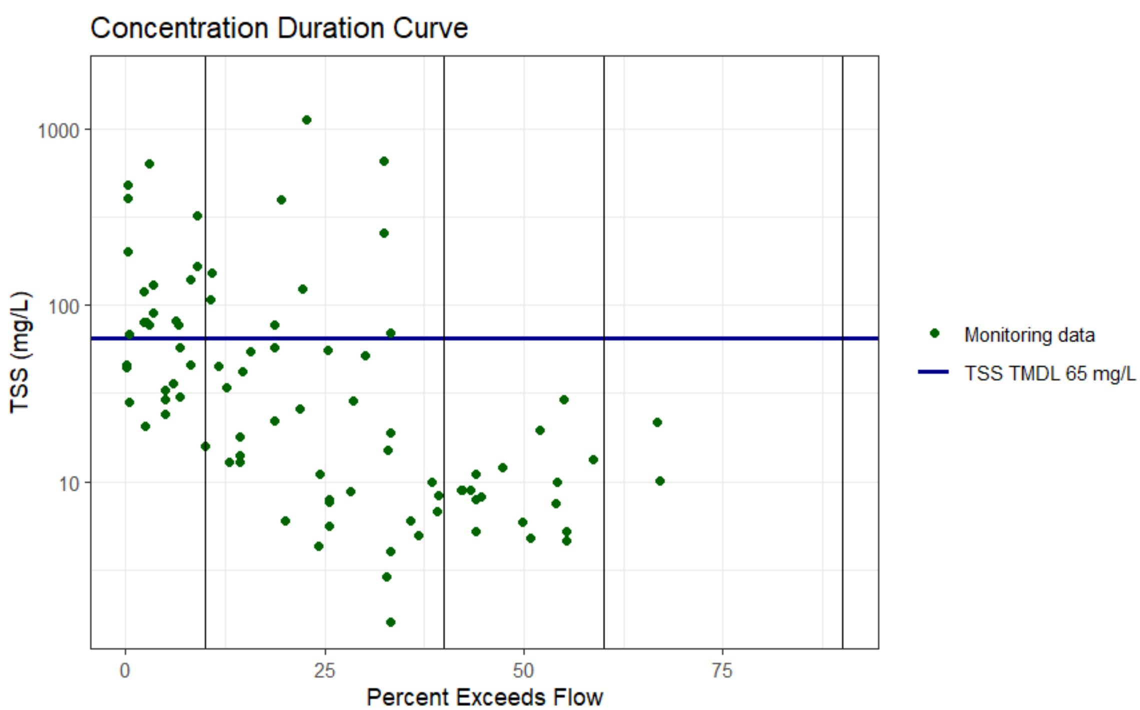


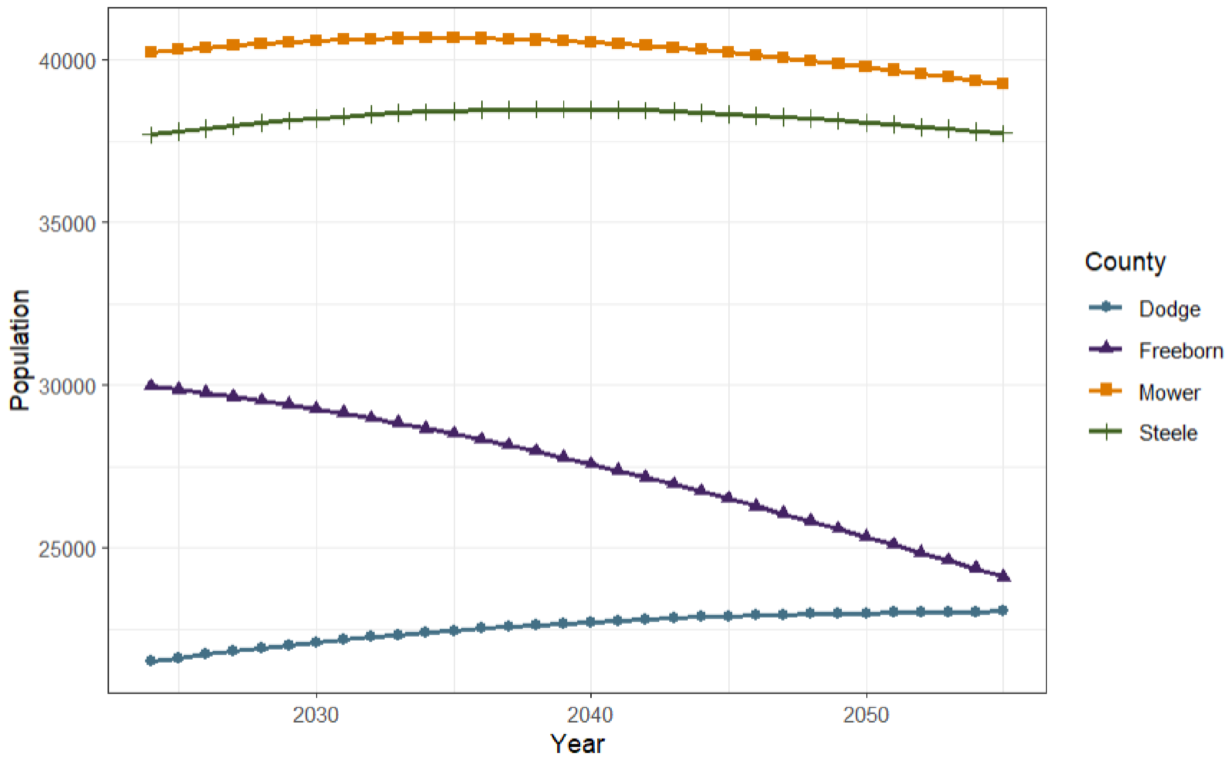
Figure 22. Dobbins Creek (07080201-524) TSS concentration duration curve.



5. Future growth considerations

Changes in population and land cover over time in the Cedar River Watershed could result in changing pollutant sources and water quality conditions. According to the Minnesota State Demographic Center (2024), the populations in three counties are expected to decrease in population and Dodge County will increase in population (Figure 23). There are only slight decreases in Mower and Steele counties and a larger decrease in Freeborn County.

Figure 23. Population projection by county in the Cedar River Watershed (2024-2055).



5.1 New or expanding permitted MS4 WLA transfer process.

Future transfer of watershed runoff loads in this TMDL may be necessary if any of the following scenarios occur within the project watershed boundaries.

1. New development occurs within a permitted MS4. Newly developed areas that are not already included in the WLA must be transferred from the LA to the WLA to account for the growth.
2. One permitted MS4 acquires land from another permitted MS4. Examples include annexation or highway expansions. In these cases, the transfer is WLA to WLA.
3. One or more nonpermitted MS4s become permitted. If this has not been accounted for in the WLA, then a transfer must occur from the LA.
4. Expansion of a U.S. Census Bureau Urban Area with population over 50,000 encompasses new regulated areas for existing permittees. An example is existing state highways that were outside an

urban area at the time the TMDL was completed, but are now inside a newly expanded urban area. This will require either a WLA to WLA transfer or a LA to WLA transfer.

5. A new MS4 or other stormwater-related source is identified and is covered under an NPDES/SDS permit. In this situation, a transfer must occur from the LA.

Load transfers will be based on methods consistent with those used in setting the allocations in this TMDL. In cases where WLA is transferred from or to a permitted MS4, the permittees will be notified of the transfer and have an opportunity to comment.

5.2 New or expanding wastewater

The MPCA, in coordination with the EPA Region 5, has developed a streamlined process for setting or revising WLAs for new or expanding wastewater discharges to water bodies with an EPA approved TMDL for TSS or *E. coli* (described in (MPCA, 2012b)). This procedure will be used to update WLAs in approved TMDLs for new or expanding wastewater dischargers whose permitted effluent limits are at or below the instream target and will ensure that the effluent concentrations will not exceed applicable water quality standards or surrogate measures. The process for modifying any and all WLAs will be handled by the MPCA, with input and involvement by the EPA, once a permit request or reissuance is submitted. The overall process will use the permitting public notice process to allow for the public and EPA to comment on the permit changes based on the proposed WLA modification(s). Once any comments or concerns are addressed, and the MPCA determines that the new or expanded wastewater discharge is consistent with the applicable water quality standards, the permit will be issued and any updates to the TMDL WLA(s) will be made.

6. Reasonable assurance

"Reasonable assurance" shows that elements are in place, for both permitted and nonpermitted sources, that are making (or will make) progress toward needed pollutant reductions.

6.1 Reduction of permitted sources

6.1.1 Permitted MS4s

The MPCA is responsible for applying federal and state regulations to protect and enhance water quality in Minnesota. The MPCA oversees stormwater management accounting activities for all permitted MS4 entities listed in this TMDL report. The MS4 General Permit requires regulated municipalities to implement BMPs that reduce pollutants in stormwater to the maximum extent practicable. A critical component of permit compliance is the requirement for the owners or operators of a permitted MS4 conveyance to develop a Stormwater Pollution Prevention Program (SWPPP). The SWPPP addresses all permit requirements, including the following six measures:

- Public education and outreach
- Public participation
- Illicit discharge detection and elimination program
- Construction site runoff controls
- Post-construction runoff controls
- Pollution prevention and municipal good housekeeping measures

A SWPPP is a management plan that describes the MS4 permittee's activities for managing stormwater within their regulated area. In the event of a completed TMDL study, MS4 permittees must document the WLA in their future NPDES/SDS permit application and provide an outline of the BMPs to be implemented that address needed reductions. The MPCA requires MS4 owners or operators to submit their application and corresponding SWPPP document to the MPCA for a completeness review. Once the application and SWPPP are deemed complete by the MPCA, all application materials are placed on 30-day public notice, allowing the public an opportunity to review, comment, or request a hearing on the prospective program. Once NPDES/SDS permit coverage is granted, permittees must implement the activities described within their SWPPP and submit an annual report to the MPCA documenting the implementation activities completed within the previous year, along with an estimate of the cumulative pollutant reductions achieved by those activities.

This TMDL report assigns WLAs to permitted MS4s in the study area. Depending on the pollutant, the MS4 General Permit either requires permittees to implement specific permit items or to develop compliance schedules for EPA approved TMDL WLAs not already being met at the time of permit application. A compliance schedule includes BMPs that will be implemented over the permit term, a timeline for their implementation, and a long-term strategy for continuing progress towards achieving assigned WLAs. For WLAs believed to be met at the time of permit application, the same level of treatment must be maintained in the future. Regardless of WLA attainment, all permitted MS4s are still required to reduce pollutant loadings to the maximum extent practicable.

The MPCA's stormwater program and its NPDES/SDS permit program are regulatory activities providing reasonable assurance that implementation activities are initiated, maintained, and consistent with WLAs assigned in this study.

6.1.2 Permitted construction stormwater

Regulated construction stormwater was given a categorical WLA is this study. Construction activities disturbing one acre or more are required to obtain NPDES/SDS permit coverage through the MPCA. Compliance with TMDL requirements is assumed when a construction site owner/operator meets the conditions of the Construction General Permit and properly selects, installs, and maintains all BMPs required under the permit, including any applicable additional BMPs required in Section 23 of the Construction General Permit for discharges to impaired waters, or compliance with local construction stormwater requirements if they are more restrictive than those in the State General Permit.

6.1.3 Permitted industrial stormwater

Industrial stormwater was given a categorical WLA in this study. Industrial activities require permit coverage under the state's NPDES/SDS Industrial Stormwater Multi-Sector General Permit (MNR050000) or NPDES/SDS Nonmetallic Mining and Associated Activities General Permit (MNG490000). If a facility owner/operator obtains stormwater coverage under the appropriate NPDES/SDS permit and properly selects, installs, and maintains BMPs sufficient to meet the benchmark values in the permit, the stormwater discharges would be expected to be consistent with the WLA in this TMDL report.

6.1.4 Permitted wastewater

Any NPDES/SDS permitted wastewater discharges cause, or have a reasonable potential to cause or contribute to an exceedance of water quality standard, permits for those discharges must include water quality-based effluent limits (WQBELs) consistent with the assumptions and requirements of the WLAs in this TMDL report. Attaining the WLAs, as developed and presented in this TMDL report, is assumed to ensure meeting the water quality standards for the relevant impaired waters listings. During the permit issuance or reissuance process, wastewater discharges are evaluated for the potential to cause or contribute to violations of water quality standards. For facilities whose discharges are found to have a reasonable potential to cause or contribute to exceedances of applicable water quality standards, WQBELs will be developed. WQBELs may vary slightly from the TMDL WLAs and may include, and may include concentration based effluent limitations.

NPDES/SDS permits for discharges that may cause or have reasonable potential to cause or contribute to an exceedance of a water quality standard are required to contain WQBELs consistent with the assumptions and requirements of the WLAs in this TMDL report.

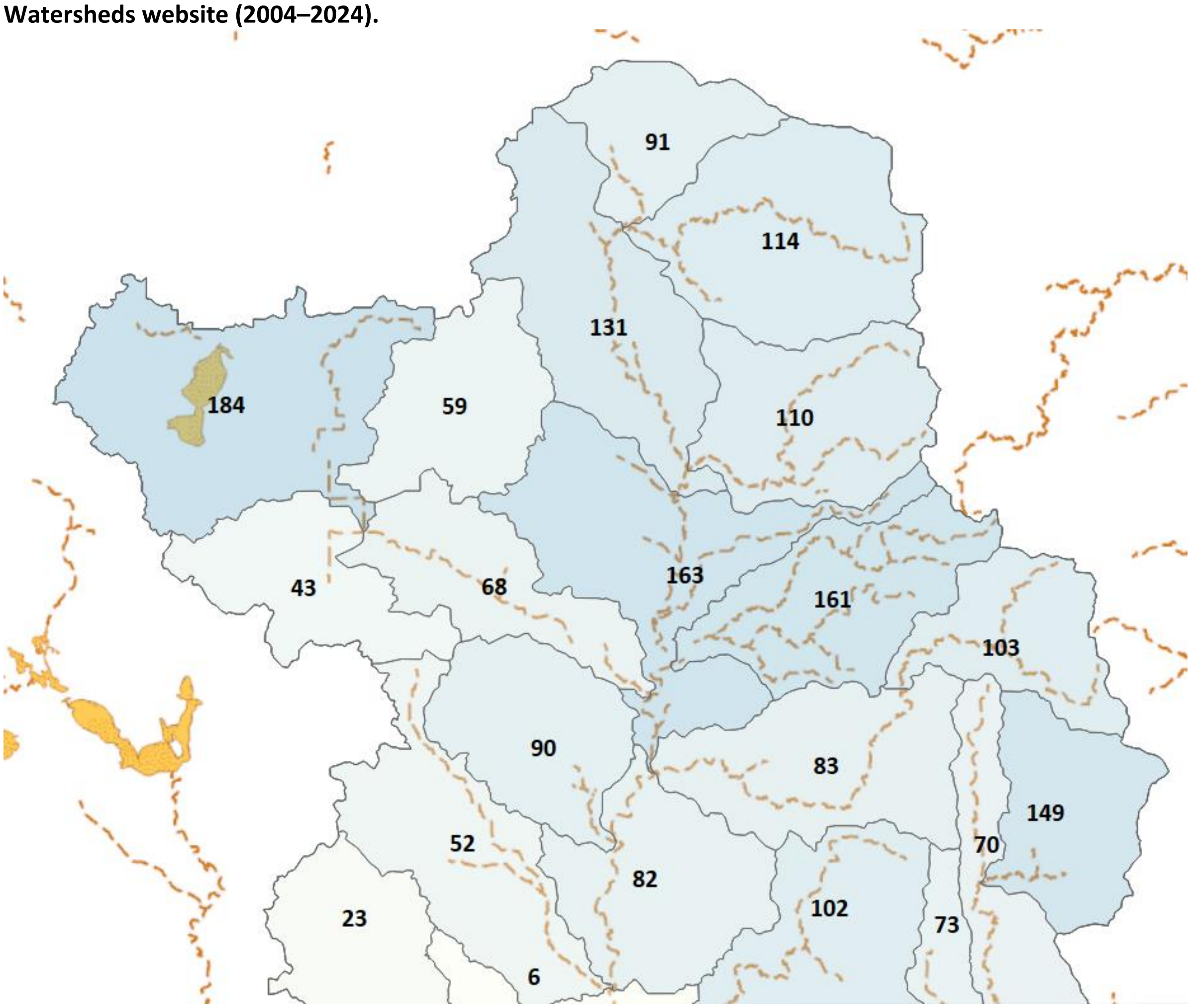
6.1.5 Permitted feedlots

See the discussion of the state's Feedlot Program in Section 6.2.2, which applies to both permitted and nonpermitted feedlots.

6.2 Reduction of nonpermitted sources

Several nonpermitted reduction programs exist to support implementation of nonpoint source reduction BMPs in the Cedar River Watershed. These programs identify BMPs, provide means of focusing BMPs, and support their implementation via state initiatives, ordinances, and/or dedicated funding. Figure 24 shows the number of BMPs that have been implemented per subwatershed, as tracked on the MPCA's Healthier Watersheds website.

Figure 24. Number of BMPs per subwatershed in the Cedar River Watershed; data from the MPCA's Healthier Watersheds website (2004–2024).



Mower Soil and Water Conservation District (SWCD), CRWD, Dodge SWCD, and Fillmore SWCD work with landowners in the watershed to design/install/maintain and provide technical assistance on BMPs like vegetated buffers, cover crops/no-till, grassed waterways, streambank stabilization, wetland restoration, and water storage practices. These practices cut pollution by keeping soil on the land and filtering runoff pollutants, especially sediment, phosphorus and nitrogen before they reach streams, lakes, and ditches. Refer to the WRAPS for more information on reductions of pollutants and reasonable assurance (MPCA, 2026b).

The following examples describe large-scale programs that have proven to be effective and/or will reduce pollutant loads going forward.

6.2.1 SSTS Program

SSTS regulation: SSTSs are regulated through Minn. Stat. §§ 115.55 and 115.56. SSTS specific rule requirements can be found in Minn. R. 7080 through 7083. Regulations include the following:

- Minimum technical standards for design and installation of individual and mid-size SSTS
- A framework for local units of government to administer SSTS programs
- Statewide licensing and certification of SSTS professionals, SSTS product review and registration, and establishment of the SSTS Advisory Committee
- Various ordinances for SSTS installation, maintenance, and inspection

Each county maintains an SSTS ordinance, in accordance with Minn. Stat. and Minn. R., establishing minimum requirements for regulation of SSTS, for the treatment and dispersal of sewage within the applicable jurisdiction of the county, to protect public health and safety, to protect groundwater quality, and to prevent or eliminate the development of public nuisances. Ordinances serve the best interests of the county's residents by protecting health, safety, general welfare, and natural resources. In addition, each county zoning ordinance prescribes the technical standards that on-site septic systems are required to meet for compliance and outlines the requirements for the upgrade of systems found not to be in compliance. This includes systems subject to inspection at transfer of property, upon the addition of living space that includes a bedroom and/or a bathroom, and at discovery of the failure of an existing system.

SSTS assessments: State-sponsored funding programs are available for community-wide septic system assessments. The Public Facilities Authority administers the Small Community Wastewater Treatment Program, which provides grants of up to $60,000 to local government units (LGUs) to conduct preliminary site evaluations and prepare feasibility reports, provide advice on possible SSTS alternatives, and help develop the technical, managerial, and financial capacity to build, operate, and maintain SSTS systems. These studies assess current SSTS compliance status as well as potential future individual and/or community SSTS solutions.

BWSR has provided grant funds in the past to local governments for large-scale SSTS compliance inspection projects. These projects typically involve riparian communities on impaired water bodies.

SSTS upgrades and replacement: All known ITPHS are recorded in a statewide database by the MPCA. Some of the alleged straight pipes are typically found to have been abandoned, fixed, or not to be a straight pipe system. The remaining known, unfixed, straight pipe systems receive a notice of noncompliance with a 10-month deadline to be fixed, are issued Administrative Penalty Orders, or are docketed in court.

Many counties and SWCDs offer low interest loan programs for SSTS upgrades or replacement. The MPCA Clean Water Partnership Loan Program offers low-interest loans to LGUs for implementing nonpoint source BMPs and other activities that target the restoration and protection of water resources such as lakes, streams, or groundwater aquifers; these funds can be used for SSTS upgrades and replacements. The Small Community Wastewater Program offers grant and loan packages of up to $2,000,000 for the construction of publicly owned community SSTS.

Since 2017, the counties within the Mower County, which is where the impairments are in this report have, on average, replaced 75 systems per year (Table 22).

Table 22. SSTS replacements in Mower County (2017–2024).

Year	Number of SSTS replaced
2017	66
2018	56
2019	33
2020	115
2021	100
2022	84
2023	85
2024	63

The MPCA, through the Clean Water Partnership Loan Program, has awarded over $1,550,000 to counties within the Cedar River Watershed to provide low interest loans for SSTS upgrades since 2010. More information on SSTS financial assistance can be found SSTS financial assistance.

6.2.2 Feedlot Program

The MPCA's Feedlot Program addresses both permitted and nonpermitted feedlots. The Feedlot Program implements rules governing the collection, transportation, storage, processing, and disposal of animal manure and other livestock operation wastes. Minn. R. ch. 7020 regulates all feedlots in the state of Minnesota. The focus of the rule is on animal feedlots and manure storage areas that have the greatest potential for environmental impact. All feedlots capable of holding 50 or more AUs, or 10 in shoreland areas, are required to register. A feedlot holding 1,000 or more AUs is required to obtain a permit.

The Feedlot Program is implemented through cooperation between MPCA and delegated county governments in 50 counties in the state. The MPCA works with county representatives to provide training, program oversight, policy and technical support, and formal enforcement support when needed. A county participating in the program has been delegated authority by the MPCA to administer the Feedlot Program. These delegated counties receive state grants to help fund their feedlot programs based on the number of feedlots in the county and the level of inspections they complete. The delegated counties in the project area for this report are Freeborn, Mower and Steele, and Dodge County is nondelegated. The MPCA is tasked with running the Feedlot Program in nondelegated counties.

From 2016 through 2025, 159 feedlot facilities were inspected in the Cedar River Watershed, with 141 of those inspections occurring at non-CAFO facilities and 19 at CAFO facilities. There have been an additional 28 facilities with manure application reviews within the watershed all occurring at non-CAFO facilities.

The Minnesota Department of Agriculture's (MDA's) Agriculture BMP Loan Program provides low interest loans to feedlot operators, farmers, rural landowners, and agriculture supply businesses. The purpose is to encourage agricultural BMPs that prevent or reduce runoff from feedlots, farm fields, and other pollution problems identified by the county in local water plans.

6.2.3 Minnesota buffer law

Minnesota's buffer law (Minn. Stat. § 103F.48) requires perennial vegetative buffers of up to 50 feet along lakes, rivers, and streams and buffers of 16.5 feet along ditches. These buffers help filter out phosphorus, nitrogen, and sediment. Alternative practices are allowed in place of a perennial buffer in some cases. Amendments enacted in 2017 clarify the application of the buffer requirement to public waters, provide additional statutory authority for alternative practices, address concerns over the potential spread of invasive species through buffer establishment, establish a riparian protection aid program to fund local government buffer law enforcement and implementation, and allowed landowners to be granted a compliance waiver until July 1, 2018, when they filed a compliance plan with the appropriate SWCD.

The Board of Water and Soil Resources (BWSR) provides oversight of the buffer program, which is primarily administered at the local level. Compliance with the buffer law ranges from 94% to 100% for counties in the Cedar River Watershed as of February 2024.

6.2.4 Minnesota Agricultural Water Quality Certification Program

The Minnesota Agricultural Water Quality Certification Program (MAWQCP) is a voluntary opportunity for farmers and agricultural landowners to take the lead in implementing conservation practices that protect our water. Those who implement and maintain approved farm management practices will be certified and, in turn, obtain regulatory certainty for a period of 10 years.

Through this program, certified producers receive:

- Regulatory certainty: certified producers are deemed to be in compliance with any new water quality rules or laws during the period of certification
- Recognition: certified producers may use their status to promote their business as protective of water quality
- Priority for technical assistance: producers seeking certification can obtain specially designated technical and financial assistance to implement practices that promote water quality

Through this program, the public receives assurance that certified producers are using conservation practices to protect Minnesota's lakes, rivers, and streams. Since the start of the program in 2014, the program has achieved the following (estimates as of January 5, 2026, and June 4, 2026):

- Enrolled over 1,289,000 acres
- Included 1,833 producers
- Added more than 7,800 new conservation practices
- Kept over 59,000 tons of sediment out of Minnesota rivers
- Saved 166,000 tons of soil and 76,000 lbs of phosphorus on farms
- Cut greenhouse gas emissions by more than 48,000 tons annually

Approximately 23,000 acres in the Cedar River Watershed are certified under the MAWQCP (through December 2024).

6.2.5 Clean Water Act Section 319 Small Watershed Focus Program

The federal CWA Section 319 grant program provides funding to states to address nonpoint source water pollution in watersheds. The MPCA has adopted a Section 319 Small Watersheds Focus Program to focus on geographically smaller and longer term watershed projects. The intent of the program is to make measurable progress for targeted water bodies in the Section 319 focus watersheds, ultimately restoring impaired waters and preventing degradation of unimpaired waters. Successful restorations in the Cedar River Watershed through this program will support the required pollutant reductions. Dobbins Creek (-504) has been a priority in the region for 25 years and recently developed a Section 319 Plan in 2020. The efforts outlined in the plan include reductions in TSS and *E. coli* through agricultural BMPs, addressing hydrological alterations, upgrading and maintaining SSTS, and MMPs. Over 10,000 acres will be incorporated into the planned upgrades and maintenance. Dobbins Creek was also granted effectiveness monitoring funding (Section 319), companion to the implementation grants. This funding will allow MPCA, DNR, Mower County SWCD and partners to monitor changes in flow and water quality over the duration of the implementation period (MPCA, 2020b). Effectiveness monitoring sites were installed in 2026; flow and water quality data will be archived and summarized at regular intervals going forward.

6.2.6 Minnesota Nutrient Reduction Strategy

The *Minnesota Nutrient Reduction Strategy* (MPCA, 2014, 2026a) guides activities that support nitrogen and phosphorus reductions in Minnesota water bodies and water bodies downstream of the state (e.g., Lake Winnipeg/Red River of the North, Lake Superior, and the Gulf at the mouth of the Mississippi River). The NRS was first developed by an interagency working group with help from public input in 2014. In 2020, the *5-year Progress Report on Minnesota's Nutrient Reduction Strategy* (MPCA, 2020a) was released, providing an update on progress made in nutrient reduction goals outlined in the original 2014 strategy. The NRS was updated beginning in late 2022 to incorporate changing land use, climate, and nutrient loading conditions since 2014, as well as including expanded water quality monitoring data. The NRS update (MPCA, 2026a) was completed in January 2026 and documented progress in decreasing nitrogen loads in both the Mississippi and Red Rivers and major improvements in phosphorus loads in the Mississippi River (Table 23 and Table 24).

Table 23. Summary of total phosphorus (TP) load change results and remaining reduction needs to achieve goals in the Mississippi River and Red River basins at the state lines (MPCA, 2026b).
Loads are in metric tons (MT) per year.

Monitoring site	Baseline load at state line (all MN tributaries combined) MT/yr	Best estimate of current load (MN parts only) MT/yr	Load upon reaching final goal (all MN tributaries combined) MT/yr	Best estimate of load change since baseline (% of baseline)	Best estimate of remaining load reduction needed (% of baseline)	Load reduction still needed (all MN tributaries combined) MT/yr
Mississippi River Basin (all MN contributing areas)	4,627 [a]	3,146 [b]	2,544 [a]	-32%	13%	602
Lake Winnipeg drainage (Red River Basin only)	950 [c]	1,015 [d]	477 [e]	Load increased 7%	57%	538

See footnotes to Table 24.

Table 24. Summary of total nitrogen (TN) load change results and remaining reduction needs to achieve goals in the Mississippi River and Red River basins at the state lines (MPCA, 2026b).

Monitoring site	Baseline load at state line (all MN tributaries combined) MT/yr	Best estimate of current load (MN parts only) MT/yr	Load upon reaching final goal (all MN tributaries combined) MT/yr	Best estimate of load change since baseline (% of baseline)	Best estimate of remaining load reduction needed (% of baseline)	Load reduction still needed (all MN tributaries combined) MT/yr
Mississippi River Basin (all MN contributing areas)	91,069 [a]	85,605 [b]	50,088 [a]	-6%	39%	35,517
Lake Winnipeg drainage (Red River Basin only)	8,007 [c]	7,286 [d]	3,800 [e]	-9%	42%	3,486

[a] From the 2014 NRS, Table 3-7
[b] Subtracting 6% of the baseline 4,267 MT/yr
[c] Updated from 2014 NRS: Minnesota contribution (39.9%) of the 1996–2000 average load of 20,067 MT/yr
[d] Based on Minnesota contribution (39.9%) of 2023 WRTDS FN-load (18,007 MT/yr; about 10% decrease from baseline).
[e] Updated from 2014 NRS: Minnesota contribution (39.9%) of the updated goals (9,525 MT/yr) set by Manitoba for Red River at the international border in Emerson.

The NRS Update also included an updated *Watershed Nutrient Loads to Accomplish Minnesota's Nutrient Reduction Strategy Goals* guidance that integrates the state's NRS into local watershed work by developing load reduction planning goals on a Hydrologic Unit Code (HUC)-8 watershed basis.

Fundamental elements of the NRS Update include:

- Defining nutrient reductions needed to meet both out-of-state and in-state water quality goals
- Measuring progress compared to established major watershed baselines
- Building on current strategies, programs, and success
- Maintaining a record of the most current science on nutrient reducing practices
- Prioritizing problems and solutions

- Supporting local planning and implementation
- Improving tracking and accountability

Included within the strategy are alternatives and tools for consideration by drainage authorities and local water resource managers, information on available approaches for reducing phosphorus and nitrogen loading and tracking efforts within a watershed, and additional research priorities. The NRS is focused on gradual progress and provides meaningful and achievable nutrient load reduction milestones that allow for better understanding of adaptive progress toward final goals.

The 2014 strategy originally set a reduction goal of 45% for both phosphorus and nitrogen in waters leaving the state via the Mississippi River (relative to average 1980–1996 conditions). The 2025 NRS maintains the Mississippi River goals and adds additional goals for Lake Winnipeg, Lake Superior, and groundwater (Table 25).

Table 25. TP and TN river load goals and timelines in original 2014 NRS and the updated 2025 NRS, along with groundwater nitrate goals (MPCA, 2026b).

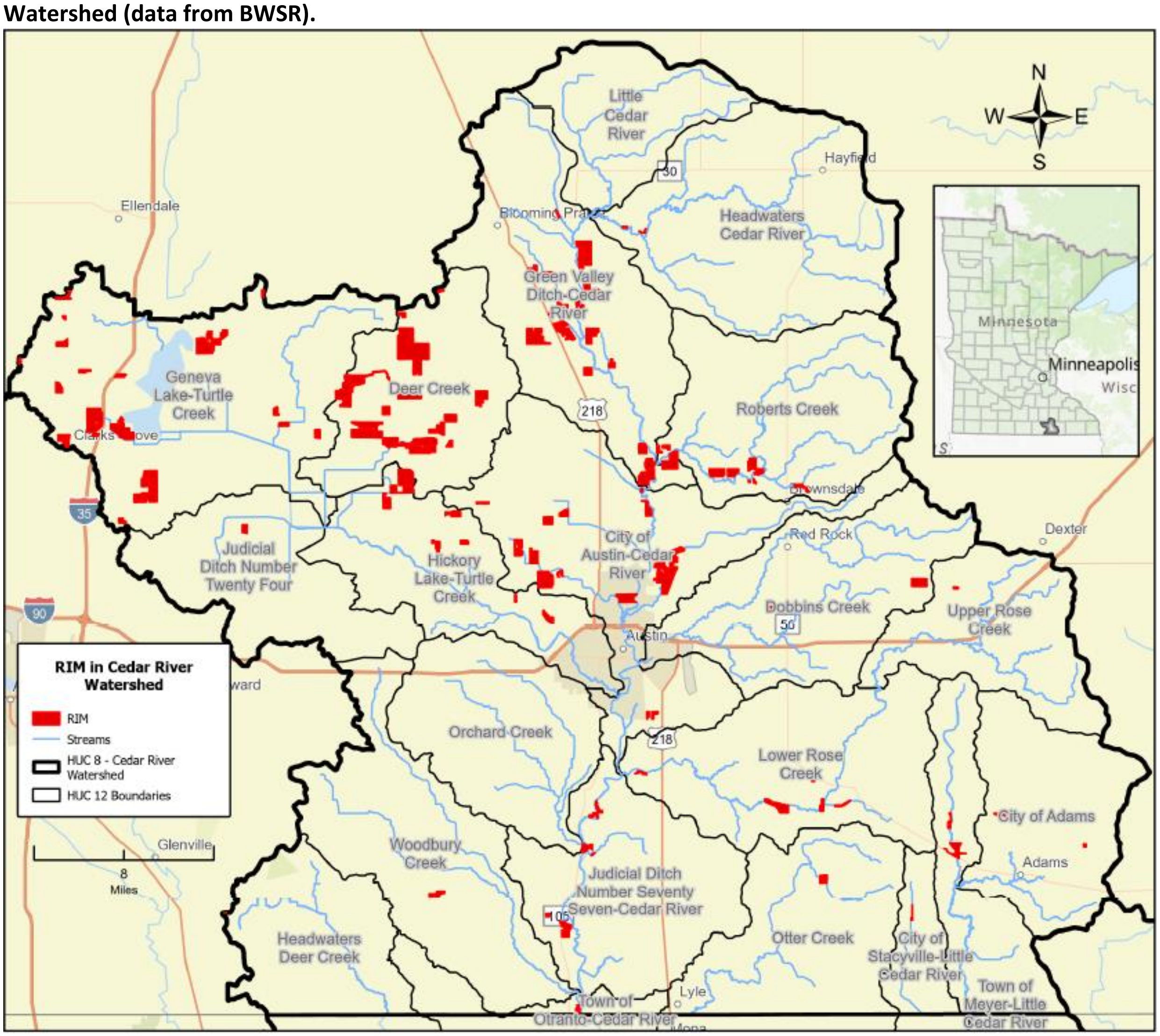
Water body	Nutrient	Original 2014 NRS goals	Updated 2025 NRS goals
Lake Superior MN tributaries	TP	Maintain protection goals; no net increase from 1979 conditions	No increase above 245 MT/yr average (combined MN tributaries)
	TN	Maintain protection	No increase above 2,670 MT/yr average (combined MN tributaries)
Lake Winnipeg (Red River at Canada border)	TP	Achieve reductions identified through international efforts with Manitoba (interim milestone: 10% by 2025)	Reduce to 1,400 MT/yr average load (all states). ~50% reduction from late 1990s (1996–2000)
	TN	Achieve reductions identified through international efforts with Manitoba (interim milestone: 13% by 2025)	Reduce to 18,687 MT/yr average load (all states). ~53% reduction from late 1990s (1996–2000)
Mississippi River	TP	Achieve 45% TP reduction by 2040 (from 1980–1996 baseline)	Same as original
	TN	Achieve 45% TN reduction by 2040 (from 1980–1996 baseline)	Same as original
Groundwater	Nitrate	Meet 1989 Groundwater Protection Act goals	Meet 1989 Groundwater Protect Act goals, and reduce groundwater nitrate baseflow into major rivers to enable achieving TN load reduction goals at state lines

The strategy also emphasizes the need to achieve local nutrient reduction needs within HUC-8 watersheds to protect drinking water, AQL, and lakes and rivers from eutrophication. The 2025 NRS analyzed if meeting in-state water quality standards would achieve Minnesota’s downstream water quality goals as well. It found that in the Mississippi Watershed, meeting in-state goals for drinking water, protecting AQL, and lake and river eutrophication would likewise result in the Mississippi River nitrogen and phosphorus reduction goals.

6.2.7 Conservation easements

Conservation easements are a critical component of the state's efforts to improve water quality by reducing soil erosion, reducing phosphorus and nitrogen loading, and improving wildlife habitat and flood attenuation on private lands. Easements protect the state's water and soil resources by permanently restoring wetlands, adjacent native grassland wildlife habitat complexes, and permanent riparian buffers. In cooperation with county SWCDs, state and federal programs compensate landowners for granting conservation easements and establishing native vegetation habitat on economically marginal, flood prone, environmentally sensitive, or highly erodible lands. These easements vary in length of time from 10 years to permanent/perpetual easements. Conservation easement types in Minnesota include Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Reinvest in Minnesota (RIM), and the Wetland Reserve Program (WRP) or Permanent Wetland Preserve (PWP). As of August 2025, in the counties that are located in the Cedar River Watershed, there were 37,199 acres of short-term conservation easements such as CRP and 18,273 acres of long term or permanent easements (CREP, RIM, WRP).

Figure 25. RIM Reserve state-funded conservation easements in the counties that are located in the Cedar River Watershed (data from BWSR).



6.3 Summary of local plans

Minnesota has a long history of water management by local government, which included developing water management plans along county boundaries since the 1980s. Following on late 20th century county water planning, the 21st century BWSR-led One Watershed, One Plan (1W1P) program is rooted in work initiated by the Local Government Water Roundtable (Association of Minnesota Counties, Minnesota Association of Watershed Districts, and Minnesota Association of SWCDs). The Roundtable recommended that local governments organize to develop focused implementation plans based on watershed boundaries. That recommendation was followed by the legislation (Minn. Stat. § 103B.801) that established the 1W1P program, which provides policy, guidance, and support for developing comprehensive watershed management plans:

- Align local water planning purposes and procedures on watershed boundaries to create a systematic, watershed-wide, science-based approach to watershed management.
- Acknowledge and build off of existing local government structure, water plan services, and local capacity.
- Incorporate and make use of data and information, including WRAPS.
- Solicit input and engage experts from agencies, residents, and stakeholder groups; focus on implementation of prioritized and targeted actions capable of achieving measurable progress.
- Serve as a substitute for a comprehensive plan, local water management plan, or watershed management plan developed or amended, approved, and adopted.

In December of 2019, a 1W1P comprehensive water management plan was published by the Cedar-Wapsipinicon Watershed Partnership. Developing the plan involved input from community members, state agencies, counties, and SWCDs. From these efforts, the 1W1P highlights the following goals related to impaired waters:

- Implement structural and nonstructural projects and practices to reduce phosphorus, nitrogen, and sediment loading within the watershed
- Increase average runoff retention by expanding watershed storage capacity by 0.25 inches
- Reduce nitrogen loading to groundwater through the implementation of field-level BMPs and reduced fertilizer application rates
- Reduce *E. coli* loading through management of SSTS, un-sewered discharges, and feedlots

There will be a focus on education, outreach, restoration projects, septic upgrades, shoreline protection BMPs, land protection and agricultural/feedlot BMPs to achieve these goals. More specifically, counties will focus on educating the public regarding nutrient and MMPs, proper SSTS maintenance and functioning, and low-cost sediment reduction efforts. The plan also identifies a need for more consistent monitoring of impaired reaches.

6.4 Examples of pollution reduction efforts

According to the CRWD's 2024 Annual Report (CRWD, 2024), pollution reduction and restoration efforts are reaching record-breaking highs. In 2024, the Cedar River Watershed had 307 acres converted from cropland to permanent wetlands/prairie—the most ever converted in one year. In the Cedar River Watershed, there have also been efforts to reduce peak flows throughout the streams in the watershed to reduce TSS pollution. Upland storage berms built into Dobbins Creek and Unnamed Creek (-524, -563) in 2016 lowered floodwaters by an entire foot in the region during a large rain event in June 2024. Mower County's SWCD successfully used the cost-sharing program to implement a variety of agricultural BMPs outlined in Table 26.

Table 26. Cost sharing agricultural BMPs in Mower County.

Agricultural BMPs	Converted land
Cover crops	6,004 acres
No till/strip till	1,865 acres
Reduced till	2,083 acres
Grassed waterways	5.7 miles
Water/sediment control basins	1,410 feet

Efforts to reduce pollution in this watershed resulted in delistings from the impaired waters list in Minnesota in 2022. Woodbury Creek (-615) and Roberts Creek (-504) were listed as impaired for having impaired benthic macroinvertebrates in 2020 and 2012 respectively. Both were removed from the impaired waters list in 2022 after efforts to reduce pollution improved AQL conditions in the streams.

6.5 Funding

Funding sources to implement TMDLs can come from local, state, federal, and/or private sources. Examples of some of the major funding sources include BWSR's Clean Water Fund Watershed-based Implementation Funding (WBIF), Clean Water Fund Competitive Grants (e.g., Projects and Practices), and conservation funds from Natural Resources Conservation Service (NRCS) (e.g., Environmental Quality Incentives Program and Conservation Stewardship Program).

WBIF is a noncompetitive process to fund water quality improvement and protection projects for lakes, rivers/streams, and groundwater. This funding allows collaborating local governments to pursue timely solutions based on a watershed's highest priority needs. The approach depends on the completion of a comprehensive watershed management plan developed under the 1W1P program to provide assurance that actions are prioritized, targeted, and measurable. The Cedar River Watershed 1W1P group is anticipated to receive over $980,000 in 2026, having received almost $1,200,000 in FY20-23.

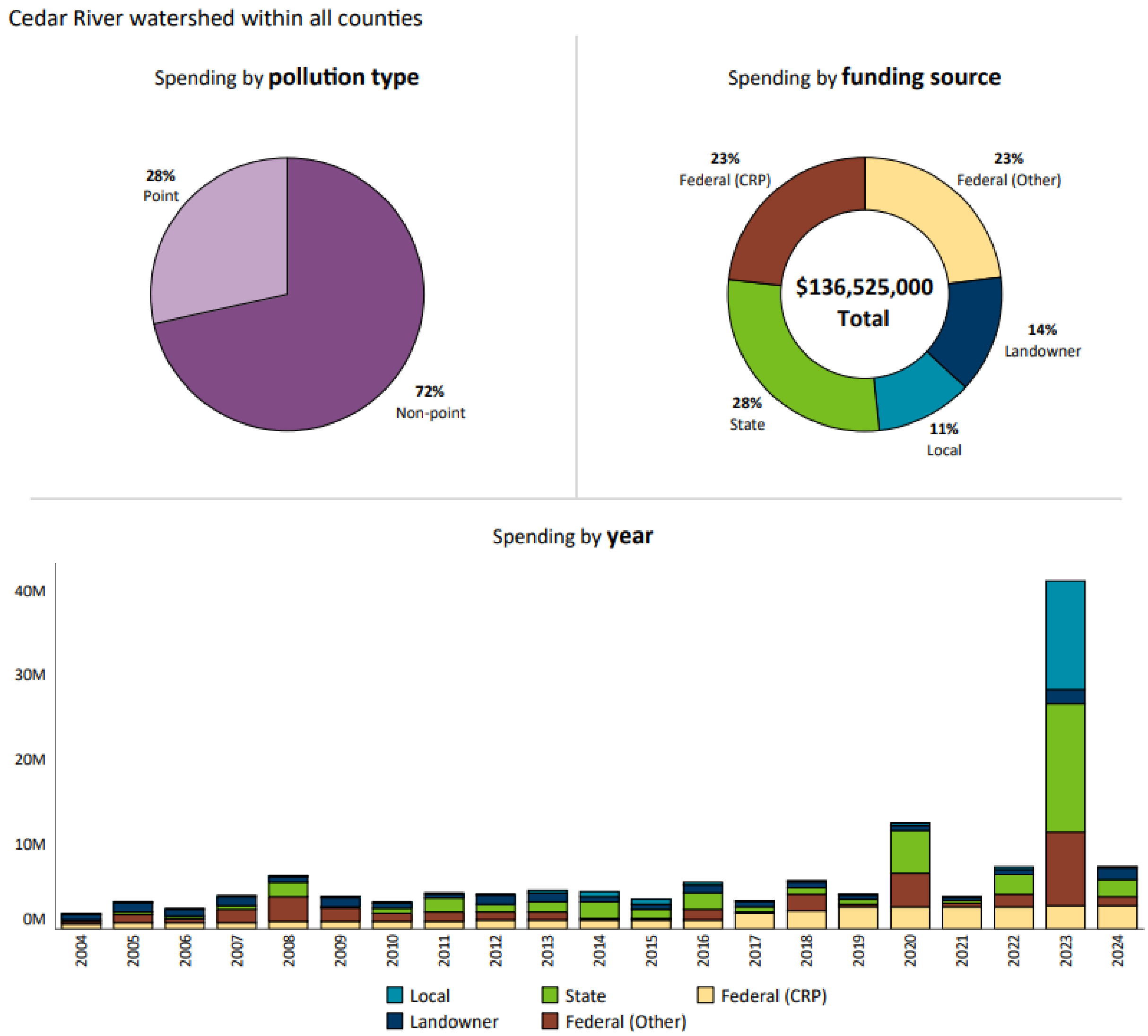
BWSR has been moving more of its available funding away from competitive grants and toward WBIF to accelerate water management outcomes, enhance accountability, and improve consistency and efficiency across the state. This approach allows more clean water projects identified through planning to be implemented without having to compete for funds, helping local governments spend limited resources where they are most needed.

WBIF assurance measures summarize and systematically evaluate how WBIF dollars are being used to achieve clean water goals identified in comprehensive watershed plans. The measures will be used by BWSR to provide additional context about watershed plan implementation challenges and opportunities. The following assurance measures are supplemental to existing reporting and on-going grant monitoring efforts:

- Understand contributions of prioritized, targeted, and measurable work in achieving clean water goals.
- Review progress of programs, projects, and practices implemented in identified priority areas.
- Complete Clean Water Fund grant work on schedule and on budget.
- Leverage funds beyond the state grant.

More than $136,500,000 has been spent cumulatively on watershed implementation projects in the Cedar River Watershed from 2004 through 2024 (Figure 26) based on data found on the MPCA's Healthier Watersheds website.

Figure 26. Spending for watershed implementation projects; data from the MPCA's Healthier Watersheds website.



6.6 Other partners and organizations

The Hormel Foundation has been a major philanthropic funder of the CRWD, especially for CRWD's Capital Improvement Plan (CIP) that builds upland stormwater-storage berms and ravine/erosion fixes to cut sediment loading and reduce flood peaks. The Foundation has been an ongoing supporter to build ~25 projects on the Cedar River and Dobbins Creek aimed at slowing runoff and reducing sediment reaching Austin and East Side Lake.

6.7 Reasonable assurance conclusion

In summary, significant time and resources have been devoted to identifying the best strategies and BMPs, providing means of focusing them in the Cedar River Watershed, and supporting their implementation via state, local, and federal initiatives and dedicated funding. The Cedar River WRAPS and TMDL process engaged partners to arrive at reasonable scenarios of BMP combinations that attain pollutant reduction goals. Minnesota is a leader in watershed planning and implementation, as well as monitoring and tracking progress toward water quality goals and pollutant load reductions.

7. Monitoring

These monitoring activities provide an overview of what is expected to occur at many scales in the Cedar River Watershed, subject to availability of monitoring resources. The AQR and AQL designated uses will be the ultimate measures of water quality. Improving the state of these designated uses depends on many factors, and improvements may not be detected over the next 5 to 10 years or much longer. Consequently, a monitoring plan is needed to track shorter and longer term changes in water quality and land management. Monitoring is important for several reasons:

- Evaluating water bodies to determine if they are meeting water quality standards and tracking trends,
- Assessing potential sources of pollutants,
- Determining the effectiveness of implementation activities in the watershed,
- Delisting of waters that are no longer impaired; and
- Implementing an adaptive management approach to help determine when a change in management is needed.

There are many monitoring efforts in place to address the different types of monitoring. Several key monitoring programs will provide the information to track trends in water quality and evaluate compliance with TMDLs:

- Monitoring and assessment at the HUC-8 scale associated with Minnesota's watershed approach. This monitoring effort is conducted by the MPCA approximately every 10 years for each HUC-8. An outcome of this monitoring effort is the identification of waters that are impaired (i.e., do not meet standards and need restoration) and waters in need of protection to prevent impairment. Over time, condition monitoring can also identify trends in water quality. This helps determine whether water quality conditions are improving or declining, if waters can be delisted, and how management actions are improving the state's waters overall.
- The MPCA's Watershed Pollutant Load Monitoring Network (WPLMN) measures and compares data on pollutant loads from Minnesota's rivers and streams and tracks water quality trends. WPLMN data are used to assist with assessing impaired waters, watershed modeling, determining pollutant source contributions, developing watershed and water quality reports, and measuring the effectiveness of water quality restoration efforts. Data are collected along major river main stems, at major watershed (i.e., HUC-8) outlets to major rivers, and in several subwatersheds. In the Cedar River Watershed, WPLMN subwatershed sites are located near the city of Austin near Cedar River (E48020001) and at Turtle Creek (E48027001).
- Implementation tracking is conducted by both BWSR (i.e., eLINK) and the U.S. Department of Agriculture (USDA). Both agencies track the locations of BMP installations. Tillage transects and crop residue data are collected periodically and reported through the Minnesota Tillage Transect Survey Data Center. BMP tracking information is readily available through the MPCA's Healthier Watersheds webpage.

- Discharges from permitted municipal wastewater sources are reported through discharge monitoring records; these records are used to evaluate compliance with NPDES/SDS permits. Summaries of discharge monitoring records are available through the MPCA's Wastewater Data Browser.
- The MDA conducts MDA's pesticide water quality monitoring in groundwater and surface water with a variety of cooperators to analyze water for up to approximately 180 different pesticide compounds. The purpose is to determine the presence and concentration of pesticides and present long-term trend analysis. Data collection includes pesticides in addition to more conventional water quality parameters. MDA monitoring reports are available on their website: MDA Water Monitoring Reports and Resources.
- Effectiveness monitoring in the Dobbins Creek Watershed is designed to evaluate water quality and biological responses to targeted BMP implementation at a small-watershed scale. Monitoring efforts focus on priority tributaries with known impairments and documented implementation activity, including the North and South Branch of Dobbins Creek. Pollutants of concern include TSS, TP, nitrogen species, and *E. coli*. Implemented BMPs include stream restoration, upland storage and water retention practices, riparian buffers, nutrient and manure management, exclusion fencing, and septic system upgrades. Monitoring is structured as a multi-year effort (minimum three years, up to 16 years; dependent on continued EPA CWA Section 319 funding), with 'anchor' sites established to support long-term evaluation of water quality and biological conditions and to inform adaptive management decisions. Monitoring activities include:
    - Discrete and continuous water quality monitoring
    - Streamflow measurement
    - Biological community assessments
    - Geomorphic and habitat evaluations

  Discrete water quality samples are collected approximately 15 to 20 times per year at 6 stream sites, targeting a range of hydrologic conditions during the open-water season. Continuous turbidity, temperature, and discharge data are collected at select sites where feasible. Biological monitoring of fish and macroinvertebrate communities is conducted every two to three years at core stations, with additional sampling triggered by observed changes in community condition. Data are evaluated annually to assess changes in flow-weighted mean concentrations, seasonal and annual loads, frequency of standard exceedances, and biological indices, supporting assessment of BMP effectiveness and progress toward applicable water quality standards.

8. Implementation strategy summary

8.1 Permitted sources

8.1.1 Wastewater

Municipal and industrial wastewater treatment facilities are regulated through NPDES permits. These permits include effluent sediment and *E. coli* limits set to meet water quality standards, along with monitoring and reporting requirements to ensure effluent limits are met.

The existing TSS permit limits for both municipal facilities (MN0022934 (SD 001), MNG585214 (SD 001)) are consistent with the WLA at 45 mg/L. This is lower than the standard of 65 mg/L.

8.1.2 Municipal separate storm sewer systems

The City of Austin MS4 has been assigned both *E. coli* and TSS WLAs in this TMDL. However, they have no existing conveyance within the impairment subwatersheds, and therefore the TMDLs do not require any reductions.

The MS4 General Permit has instituted performance based requirements for MS4s with *E. coli* or fecal coliform WLAs requiring reductions. If future permit requirements remain the same, MS4s are expected to inventory potential *E. coli* or fecal coliform sources and prioritize reduction activities that address the identified sources. The City of Austin MS4 has previously assigned *E. coli* and fecal coliform WLAs and is required to continue following the bacteria permit requirements in future MS4 general permits. [Guidance for meeting bacteria TMDL MS4 permit requirements - Minnesota Stormwater Manual (state.mn.us)]

Prior to implementation, permitted MS4s are encouraged to compare their sewersheds (e.g., catchments, pipesheds, etc.) with the drainage areas for each impaired water body to ensure appropriate BMP crediting. If a permitted MS4 sewershed is different from what is defined as the drainage area in this report, the sewershed should be considered part of the MS4 contribution to the impaired water if sufficient evidence of the appropriate sewershed area is provided to the MPCA. With Agency approval, any wasteload-reducing BMP implemented since the TMDL baseline year within the sewershed of an impaired water will be creditable towards an MS4's load reduction for purposes of annual reporting and demonstrating progress towards meeting the WLA(s).

8.1.3 Construction stormwater

The WLA for stormwater discharges from sites where there is construction activity reflects the number of construction sites greater than one acre expected to be active in the watershed at any one time, and the BMPs and other stormwater control measures that should be implemented at the sites to limit the discharge of pollutants of concern. The BMPs and other stormwater control measures that should be implemented at construction sites are defined in Minnesota's NPDES/SDS General Stormwater Permit for Construction Activity (MNR100001). If a construction site owner/operator obtains coverage under the NPDES/SDS General Stormwater Permit and properly selects, installs, and maintains all BMPs required under the permit, including those related to impaired waters discharges and any applicable additional requirements found in Section 23 of the Construction Stormwater General Permit, the stormwater discharges would be expected to be consistent with the WLA in this TMDL. Construction activity must also meet all local government construction stormwater requirements.

8.1.4 Industrial stormwater

The WLA for stormwater discharges from sites where there is industrial activity reflects the number of sites in the watershed for which NPDES/SDS industrial stormwater permit coverage is required, and the BMPs and other stormwater control measures that should be implemented at the sites to limit the discharge of pollutants of concern. Minnesota's NPDES/SDS Industrial Stormwater Multi-Sector General Permit (MNR050000) and NPDES/SDS Nonmetallic Mining and Associated Activities General Permit (MNG490000) establish benchmark concentrations for pollutants in industrial stormwater discharges. If a facility owner/operator obtains stormwater coverage under the appropriate NPDES/SDS Permit and properly selects, installs, and maintains BMPs sufficient to meet the benchmark values in the permit, the stormwater discharges would be expected to be consistent with the WLA in this TMDL report. Industrial activity must also meet all local government stormwater requirements.

8.1.5 Feedlots

The NPDES and SDS feedlot permits include design, construction, operation, and maintenance standards that all CAFOs must follow. WLAs are not assigned to CAFOs in this TMDL report, including CAFOs with NPDES or SDS permits, and CAFOs not requiring permits; this is equivalent to a WLA of zero. If the CAFOs are properly permitted and operate under the applicable NPDES or SDS permit, then the CAFOs are expected to be consistent with this TMDL. MPCA inspections of large CAFOs focus on high risk facilities located within or near environmental justice areas, waters impaired by *E. coli* or excess nutrients, drinking water supply and vulnerable groundwater areas, and other sensitive water features, and on facilities that haven't been inspected in the most recent five years. CAFOs that are found to be noncompliant are required to return to compliance in accordance with applicable NPDES or SDS conditions and Minn. R. ch. 7020.

8.2 Nonpermitted sources

Implementation of the Cedar River Watershed TMDL will require numerous BMPs that address non-NPDES-permitted sources of *E. coli* and TSS. This section provides an overview of the BMPs that may be used for implementation and largely aligns with the goals stated in the 1W1P (Barr Engineering, 2019a). The Dobbins Creek Clean Water Act Section 319 Nine Key Element Plan (MPCA, 2020b) details priority spots in the Dobbins Creek and surrounding catchments to reduce TSS and *E. coli* loading in the Cedar River Watershed. The BMPs will target ITHPS and manure management to control sources of *E. coli*, erosion control and changes to agricultural practices for TSS, and producing an educated cultural shift in the community to prioritize these efforts (MPCA, 2020b).

Table 27 summarizes example BMPs that can be implemented to achieve goals of the TMDLs. Actual implementation may vary. Descriptions of the BMP examples can be found in *Agricultural BMP Handbook for Minnesota* (Lenhart, 2017), the *Minnesota Stormwater Manual* (Minnesota Stormwater Steering Committee, 2008), and the University of Minnesota Extension's *Onsite Sewage Treatment Program* website, *Sediment Reduction Strategy for the Minnesota River Basin and South Metro* (MPCA, 2015), and *Minnesota Soil Health Coalition* (Minnesota Soil Health Coalition, 2020). The Cedar River WRAPS Update Report (MPCA, 2026b) developed concurrently with this report contains a more comprehensive list of implementation strategies.

Table 27. Example BMPs for nonpermitted sources.

Strategy	BMP examples	Targeted pollutant(s)
Agriculture runoff control and manure management	Filter strips and field borders	*E. coli,* TSS
Feedlot runoff control	Feedlot reduction and treatment	*E. coli*
Pasture management	Livestock access control	*E. coli,* TSS
Septic system improvements	Maintain and replace septic systems	*E. coli*
Buffers and filters	Riparian buffers and field boarders	*E. coli,* TSS
Education/outreach	Promote BMPs	*E. coli,* TSS
Reduce sediment erosion	Water and sediment basins	TSS
	Conservation cover easements	TSS

8.2.1 SSTS

SSTS assessments, maintenance, and upgrades and replacements address pollutant loading from noncompliant systems (see Section 6.2.1: SSTS program). The reductions in loading resulting from upgrading or replacing failing systems in the watershed depend on the level of failure present in the watershed. The most cost-effective approach to manage loads from SSTSs is regular maintenance. The EPA recommends that septic tanks be pumped every three to five years depending on the tank size and number of residents in the household (EPA, 2002). Annual inspections, in addition to regular maintenance, ensure that systems function properly. Compliance with state and county code is essential to reducing *E. coli* loading from SSTSs.

Education is another crucial component of reducing pollutant loading from SSTSs. Education can occur through public meetings, routine SSTS service provider home visits, mass mailings, and radio and television advertisements. An inspection program can also help with public education because inspectors can educate owners about proper operation and maintenance during inspections.

8.2.2 Manure management

According to the Dobbins Creek Section 319 Nine Key Element Plan, over the next 10 years, 10 manure and land application plans will be reviewed and implemented to help reduce *E. coli* loads. This source of *E. coli* is especially important during wet periods in the Cedar River Watershed. Approximately 10,000 acres will need to be converted using BMPs to meet these reduction goals related to manure management (MPCA, 2020b).

8.2.3 Altered hydrology

The CRWD has 25 identified high priority areas that contribute 50% of TSS loads to the watershed and are considered higher load and higher erodible areas. Phase 1 of these efforts have been completed, and Phase 2 is currently underway. Efforts that address altered hydrology in the area include grassed waterways, rock riffles, streambank revitalization, berms/impoundments, and ravine stabilization (Barr Engineering, 2019a; MPCA, 2020b).

8.2.4 Agricultural BMPs

Practices that reduce TSS loading from the landscape include managing crop residue, planting cover crops, implementing crop rotations, optimizing nutrient applications, controlled drainage, wetland restorations, water retention BMPs, ditch maintenance, two-stage ditches, stream restoration, and buffers, as well as other approaches that enhance soil structure the result in an increase in soil structure (Minnesota Soil Health Coalition, 2020; MPCA, 2020b). These goals include an emphasis in educating communities in high priority areas to voluntarily implement strategies to improve water quality.

8.3 Water quality trading

Water quality trading can help achieve compliance with WLAs or water quality based effluent limits. Water quality trading can also offset increased pollutant loads in accordance with antidegradation regulations. Water quality trading reduces pollutants (e.g., TP or TSS) in rivers and lakes by allowing a point source discharger to enter into agreements under which the point source “offsets” its pollutant load by obtaining reductions in a pollutant load discharged by another point source or a nonpoint source or sources in the same watershed. The MPCA must establish specific conditions governing trading in the point source discharger’s NPDES/SDS permit or in a general permit that covers the point source discharger. The MPCA implements water quality trading through permits. See MPCA’s *Water Quality Trading Guidance* (MPCA, 2022e) for more information.

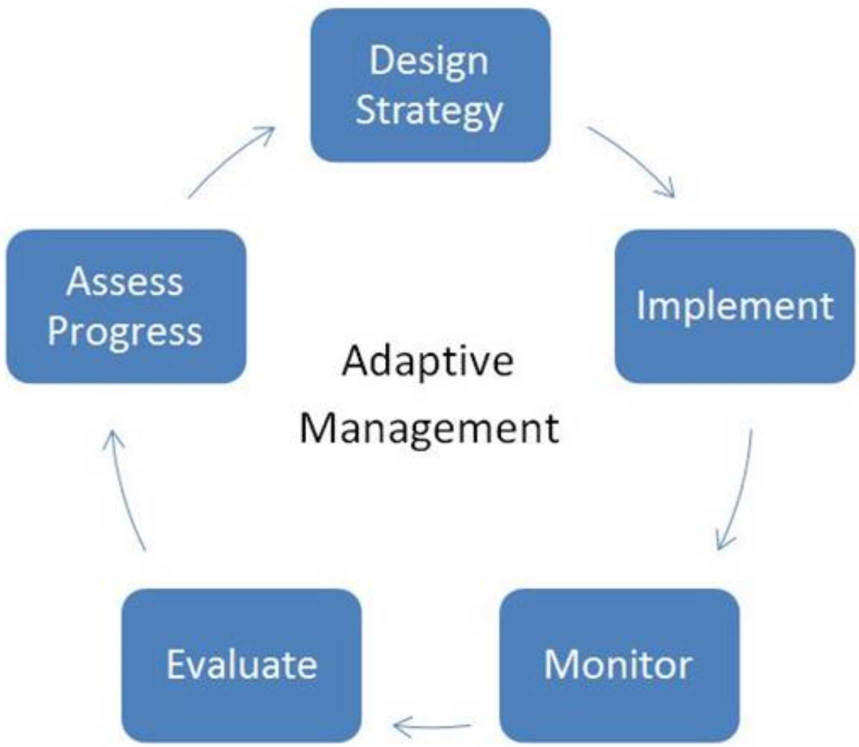
8.4 Cost

The Cedar River Watershed 1W1P has a goal to reduce TSS and *E. coli* in impaired streams and rivers. The estimated cost will be around $4.5 million. This estimate acknowledges the average cost per acre implementing suggested BMPs is $179.70 outlined in the 1W1P. It is assumed that Dobbins Creek (-524) will need 3,930 acres treated and Roberts Creek (-504) 6,230 acres treated to address their impairments. The 1W1P does not define the number of acres needed to address the impairment in Unnamed Creek (-563), but it is a similar size, land use, and impairment as Dobbins Creek, so it is appropriate to use the same number of treated acres as Dobbins Creek. This results in 14,090 acres treated with BMPs to address the impairments. The 1W1P also seeks to upgrade and maintain 100 SSTS systems over 10 years, at $20,000 per SSTS resulting in an additional $2 million dollars needed to address in the impairments (Barr Engineering, 2019a).

8.5 Adaptive management

The implementation strategies and the more detailed WRAPS Update prepared concurrently with this TMDL report are based on the principle of adaptive management (Figure 27). Continued monitoring and course corrections responding to monitoring results are the most appropriate strategy for attaining the water quality goals established in this TMDL report. Management activities will be changed or refined as appropriate over time to efficiently meet the TMDL and lay the groundwork for delisting the impaired water bodies.

Figure 27. Adaptive management.



9. Public participation

An opportunity for public comment on the draft TMDL report was provided via public notice in the State Register from June 22, 2026, through July 22, 2026. There were xx comment letters received and responded to as a result of the public comment period.

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Appendix A

This appendix lists all of the impairments in the Cedar River Watershed along with the TMDL status of each impairment (Table 28). Planned recategorizations are provided for listings that have been further assessed and for which recategorization will be considered. Recategorizations will not be final until they are approved by EPA as part of Minnesota's list of impaired water bodies; therefore, this table represents a snapshot in time, and the EPA category or planned recategorization may change.

Table 28. Impaired water bodies in the Cedar River Watershed.

Water body name	Water body description	WID (HUC-8-)	Use class [a]	Year added to list	Affected designated use [b]	Listing parameter	Stressors to bioassessment impairments	Planned recategor-ization [d]	EPA category in next impaired waters list [c]	TMDL Approval Year	TMDL developed in this report
Roberts Creek	Unnamed cr to Cedar R	07080201-504	2Bg	2022	AQL	TSS	NA	NA	5	NA	Yes
Unnamed creek	Headwaters to Roberts Cr	07080201-505	2Bg	2022	AQL	Benthic macroinvertebrates bioassessments	Nitrate, flow alteration, habitat	NA	5	NA	No
Dobbins Creek	Headwaters to T103 R17W S31, west line	07080201-524	2Bg	2022	AQL	Fish bioassessments Benthic macroinvertebrates bioassessments	Nitrate, TSS, habitat, fish passage, flow alteration	NA	5	NA	No
Dobbins Creek	Headwaters to T103 R17W S31, west line	07080201-524	2Bg	2022	AQL	TSS	NA	NA	5	NA	Yes
Dobbins Creek	Headwaters to T103 R17W S31, west line	07080201-524	2Bg	2022	AQR	Escherichia coli (*E. coli*)	NA	NA	5	NA	Yes
Unnamed creek	Unnamed cr to Unnamed cr	07080201-562	2Bg	2022	AQR	Escherichia coli (*E. coli*)	NA	NA	5	NA	Yes
Unnamed creek	Unnamed cr to Dobbins Cr	07080201-563	2Bg	2022	AQR	Escherichia coli (*E. coli*)	NA	NA	5	NA	Yes

Water body name	Water body description	WID (HUC-8-)	Use class [a]	Year added to list	Affected designated use [b]	Listing parameter	Stressors to bioassessment impairments	Planned recategor-ization [d]	EPA category in next impaired waters list [c]	TMDL Approval Year	TMDL developed in this report
Unnamed creek	Headwaters to Dobbins Cr	07080201-605	2Bg	2022	AQR	Escherichia coli (*E. coli*)	NA	NA	5	NA	Yes
Unnamed creek	Unnamed cr to Unnamed cr	07080201-606	2Bg	2022	AQR	Escherichia coli (*E. coli*)	NA	NA	5	NA	Yes
Unnamed creek	Unnamed cr to Unnamed cr	07080201-607	2Bg	2022	AQR	Escherichia coli (*E. coli*)	NA	NA	5	NA	Yes
Unnamed creek	Unnamed cr to Unnamed cr	07080201-608	2Bg	2022	AQR	Escherichia coli (*E. coli*)	NA	NA	5	NA	Yes
Unnamed creek	Unnamed cr to Unnamed cr	07080201-609	2Bg	2022	AQR	Escherichia coli (*E. coli*)	NA	NA	5	NA	Yes
Unnamed creek	Headwaters to Unnamed cr	07080201-610	2Bg	2022	AQR	Escherichia coli (*E. coli*)	NA	NA	5	NA	Yes
Orchard Creek	T102 R18W S29, north line to T102 R18W S32, south line	07080201-613	2Bg	2022	AQR	Escherichia coli (*E. coli*)	NA	4a	5	NA	No: will use downstream -539 fecal coliform TMDL to address this impairment

Water body name	Water body description	WID (HUC-8-)	Use class [a]	Year added to list	Affected designated use [b]	Listing parameter	Stressors to bioassessment impairments	Planned recategor-ization [d]	EPA category in next impaired waters list [c]	TMDL Approval Year	TMDL developed in this report
Judicial Ditch 5	-92.983 43.724 to Cedar R	07080201-623	2Bg	2022	AQR	Escherichia coli (*E. coli*)	NA	4a	5	NA	No: will use downstream -502 fecal coliform TMDL to address this impairment
Unnamed creek	Headwaters to Dobbins Cr	07080201-624	2Bg	2022	AQL	TSS	NA	NA	5	NA	Yes
Unnamed creek	T102 R18W S29. west line to Orchard Cr	07080201-628	2Bg	2022	AQL	Benthic macroinvertebrates bioassessments	NA	NA	5	NA	No
Otter Creek	Headwaters to MN/IA border	07080201-517	2Bg	2020	AQL	Benthic macroinvertebrates bioassessments	NA	NA	5	NA	No
Mud Creek	Headwaters to Turtle Cr (JD 24)	07080201-528	2Bg	2020	AQL	Benthic macroinvertebrates bioassessments	Nitrate, habitat, flow alteration	NA	5	NA	No
Turtle Creek	T103 R20W S2, north line to T103 R18W S31, south line	07080201-538	2Bg	2020	AQL	TSS	NA	4a	5	NA	No: will use downstream -540 TSS TMDL to address this impairment
Unnamed creek	JD 24 to Turtle Cr	07080201-572	2Bg	2020	AQL	Benthic macroinvertebrates bioassessments	Nitrate, habitat, flow alteration	NA	5	NA	No

Water body name	Water body description	WID (HUC-8-)	Use class [a]	Year added to list	Affected designated use [b]	Listing parameter	Stressors to bioassessment impairments	Planned recategor-ization [d]	EPA category in next impaired waters list [c]	TMDL Approval Year	TMDL developed in this report
Unnamed creek	Unnamed cr to Otter Cr	07080201-574	2Bg	2020	AQL	Benthic macroinvertebrates bioassessments	NA	NA	5	NA	No
County Ditch 8	Unnamed cr to Unnamed ditch	07080201-584	2Bg	2020	AQL	Fish bioassessments Benthic macroinvertebrates bioassessments	Nitrate, habitat, flow alteration	NA	5	NA	No
Judicial Ditch 24	Unnamed ditch to JD 24	07080201-587	2Bg	2020	AQL	Benthic macroinvertebrates bioassessments	Nitrate, habitat, flow alteration	NA	5	NA	No
Mud Lake Creek/County Ditch 75	Unnamed cr to Woodbury Cr	07080201-590	2Bg	2020	AQL	Benthic macroinvertebrates bioassessments	NA	NA	5	NA	No
Unnamed creek	Unnamed cr to MN/IA border	07080201-596	2Bg	2020	AQL	Benthic macroinvertebrates bioassessments	NA	NA	5	NA	No
Orchard Creek	T102 R18W S29, north line to T102 R18W S32, south line	07080201-613	2Bg	2020	AQL	Benthic macroinvertebrates bioassessments	NA	NA	5	NA	No
Unnamed creek	-92.931 43.837 to Cedar R	07080201-617	2Bg	2020	AQL	Fish bioassessments Benthic macroinvertebrates bioassessments	NA	NA	5	NA	No

Water body name	Water body description	WID (HUC-8-)	Use class [a]	Year added to list	Affected designated use [b]	Listing parameter	Stressors to bioassessment impairments	Planned recategor-ization [d]	EPA category in next impaired waters list [c]	TMDL Approval Year	TMDL developed in this report
Unnamed creek	-93.014 43.605 to Orchard Cr	07080201-621	2Bg	2020	AQL	Benthic macroinvertebrates bioassessments	NA	NA	5	NA	No
Judicial Ditch 5	-92.983 43.724 to Cedar R	07080201-623	2Bg	2020	AQL	Benthic macroinvertebrates bioassessments	NA	NA	5	NA	No
Cedar River	Rose Cr to Woodbury Cr	07080201-501	2Bg	2012	AQL	Fish bioassessments Benthic macroinvertebrates bioassessments	Eutrophication, flow alteration, nitrate, physical habitat, TSS	NA	5	NA	No
Roberts Creek	Headwaters to Unnamed cr	07080201-506	2Bg	2012	AQL	Fish bioassessments Benthic macroinvertebrates bioassessments	Flow alteration, nitrate, physical habitat	NA	5	NA	No
Cedar River	Turtle Cr to Rose Cr	07080201-515	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Dissolved oxygen, eutrophication, flow alteration, nitrate, physical habitat	NA	5	NA	No
Cedar River	Woodbury Cr to MN/IA border	07080201-516	2Bg	2012	AQL	Turbidity	TSS	NA	4a	2019	No

Water body name	Water body description	WID (HUC-8-)	Use class [a]	Year added to list	Affected designated use [b]	Listing parameter	Stressors to bioassessment impairments	Planned recategor-ization [d]	EPA category in next impaired waters list [c]	TMDL Approval Year	TMDL developed in this report
Unnamed creek	Unnamed cr to Little Cedar R	07080201-519	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Flow alteration, nitrate, physical habitat	NA	5	NA	No
Unnamed creek	Unnamed cr to Unnamed cr	07080201-520	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Flow alteration, nitrate, physical habitat	NA	5	NA	No
Schwerin Creek	Headwaters to Rose Cr	07080201-523	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Flow alteration, nitrate, physical habitat	NA	5	NA	No
Little Cedar River (Cedar River, Middle Fork)	Unnamed cr to Cedar R	07080201-530	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Dissolved oxygen, flow alteration, nitrates, physical habitat	NA	5	NA	No
Unnamed creek	Unnamed cr to T103 R17W S10, west line	07080201-534	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments Fish bioassessments	Flow alteration, nitrates, physical habitat	NA	5	NA	No
Turtle Creek	T102 R18W S4, north line to Cedar R	07080201-540	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Dissolved oxygen, eutrophication, flow alteration,	NA	5	NA	No

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							nitrates, physical habitat, TSS				
Unnamed creek	Unnamed cr to Turtle Cr	07080201-547	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Flow alteration	NA	5	NA	No
Little Cedar River, Middle Fork	Westfield-Ripley Ditch to Unnamed cr	07080201-549	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Flow alteration, physical habitat	NA	5	NA	No
Unnamed creek (Woodson Creek)	T102 R18W S14, north line to Cedar R	07080201-554	1B, 2Ag	2012	AQL	Fish bioassessments Benthic macroinvertebrates bioassessments	Flow alteration, physical habitat	NA	5	NA	No
Unnamed creek	Unnamed cr to Cedar R	07080201-577	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Flow alteration, nitrates, physical habitat	NA	5	NA	No
Unnamed creek (Cedar River, West Fork)	Unnamed cr to Cedar R	07080201-591	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Flow alteration	NA	5	NA	No
Cedar River	Wolf Cr to Lower Austin Dam	07080201-512	2Bg	2006	AQC	PCBs in fish tissue	NA	NA	5	NA	No

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Cedar River	Roberts Cr to Upper Austin Dam	07080201-502	2Bg	2002	AQC	PCBs in fish tissue	NA	NA	5	NA	No
Cedar River	Headwaters to Roberts Cr	07080201-503	2Bg	2002	AQC	PCBs in fish tissue	NA	NA	5	NA	No
Cedar River	Upper Austin Dam to Wolf Cr	07080201-511	2Bg	2002	AQC	PCBs in fish tissue	NA	NA	5	NA	No
Cedar River	Headwaters to Roberts Cr	07080201-503	2Bg	2022	AQL	TSS	NA	NA	4a	2019	No
Cedar River	Headwaters to Roberts Cr	07080201-503	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Dissolved oxygen, eutrophication, flow alteration	NA	4a	2019	No
Cedar River	Dobbins Cr to Turtle Cr	07080201-514	2Bg	2012	AQR	Escherichia coli (*E. coli*)	NA	NA	4a	2019	No
Cedar River	Turtle Cr to Rose Cr	07080201-515	2Bg	2012	AQL	Turbidity	TSS	NA	4a	2019	No
Cedar River	Woodbury Cr to MN/IA border	07080201-516	2Bg	2012	AQR	Escherichia coli (*E. coli*)	NA	NA	4a	2019	No
Little Cedar River	Headwaters to MN/IA border	07080201-518	2Bg	2012	AQR	Escherichia coli (*E. coli*)	NA	NA	4a	2019	No
Rose Creek	Headwaters to Cedar R	07080201-522	2Bg	2012	AQL	Turbidity	TSS	NA	4a	2019	No

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Unnamed creek	Unnamed cr to Cedar R	07080201-533	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Eutrophication, flow alteration, nitrates, physical habitat, TSS	NA	4a	2019	No
Dobbins Creek	T103 R18W S36, east line to East Side Lk	07080201-535	2Bg	2012	AQL	Turbidity	TSS	NA	4a	2019	No
Unnamed creek	Unnamed cr to Rose Cr	07080201-583	2Bg	2012	AQL	Benthic macroinvertebrates bioassessments	Eutrophication, flow alteration, nitrates, physical habitat	NA	4a	2019	No
Geneva	Lake or Reservoir	24-0015-00	2B	2012	AQR	Nutrients	NA	NA	4a	2019	No
Cedar River	Headwaters to Roberts Cr	07080201-503	2Bg	2006	AQR	Fecal coliform	*E. coli*	NA	4a	2019	No
Roberts Creek	Unnamed cr to Cedar R	07080201-504	2Bg	2006	AQR	Fecal coliform	*E. coli*	NA	4a	2019	No
Wolf Creek	Headwaters to Cedar R	07080201-510	2Bg	2006	AQR	Fecal coliform	*E. coli*	NA	4a	2019	No
Otter Creek	Headwaters to MN/IA border	07080201-517	2Bg	2006	AQR	Fecal coliform	*E. coli*	NA	4a	2019	No
Rose Creek	Headwaters to Cedar R	07080201-522	2Bg	2006	AQR	Fecal coliform	*E. coli*	NA	4a	2019	No

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Unnamed creek	Unnamed cr to Cedar R	07080201-533	2Bg	2006	AQR	Fecal coliform	*E. coli*	NA	4a	2019	No
Dobbins Creek	T103 R18W S36, east line to East Side Lk	07080201-535	2Bg	2006	AQR	Fecal coliform	*E. coli*	NA	4a	2019	No
Dobbins Creek	East Side Lk to Cedar R	07080201-537	2Bg	2006	AQL	Turbidity	TSS	NA	4a	2019	No
Dobbins Creek	East Side Lk to Cedar R	07080201-537	2Bg	2006	AQR	Fecal coliform	*E. coli*	NA	4a	2019	No
Orchard Creek	T101 R18W S5, north line to Cedar R	07080201-539	2Bg	2006	AQR	Fecal coliform	*E. coli*	NA	4a	2019	No
Turtle Creek	T102 R18W S4, north line to Cedar R	07080201-540	2Bg	2006	AQL	Turbidity	TSS	NA	4a	2019	No
Turtle Creek	T102 R18W S4, north line to Cedar R	07080201-540	2Bg	2006	AQR	Fecal coliform	*E. coli*	NA	4a	2019	No
Woodbury Creek	Headwaters to 145th St	07080201-614	2Bg	2006	AQR	Fecal coliform	*E. coli*	NA	4a	2019	No
Woodbury Creek	145th St to Cedar R	07080201-615	2Bg	2006	AQR	Fecal coliform	*E. coli*	NA	4a	2019	No

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Cedar River	Rose Cr to Woodbury Cr	07080201-501	2Bg	2002	AQL	Turbidity	TSS	NA	4a	2019	No
Cedar River	Roberts Cr to Upper Austin Dam	07080201-502	2Bg	2002	AQL	Turbidity	TSS	NA	4a	2019	No
Cedar River	Rose Cr to Woodbury Cr	07080201-501	2Bg	1998	AQC	Mercury in fish tissue	Mercury	NA	4a	2007	No
Cedar River	Roberts Cr to Upper Austin Dam	07080201-502	2Bg	1998	AQC	Mercury in fish tissue	Mercury	NA	4a	2007	No
Cedar River	Headwaters to Roberts Cr	07080201-503	2Bg	1998	AQC	Mercury in fish tissue	Mercury	NA	4a	2007	No
Cedar River	Upper Austin Dam to Wolf Cr	07080201-511	2Bg	1998	AQC	Mercury in fish tissue	Mercury	NA	4a	2007	No
Cedar River	Wolf Cr to Lower Austin Dam	07080201-512	2Bg	1998	AQC	Mercury in fish tissue	Mercury	NA	4a	2007	No
Cedar River	Lower Austin Dam to Dobbins Cr	07080201-513	2Bg	1998	AQC	Mercury in fish tissue	Mercury	NA	4a	2007	No
Cedar River	Dobbins Cr to Turtle Cr	07080201-514	2Bg	1998	AQC	Mercury in fish tissue	Mercury	NA	4a	2007	No
Cedar River	Turtle Cr to Rose Cr	07080201-515	2Bg	1998	AQC	Mercury in fish tissue	Mercury	NA	4a	2007	No

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Cedar River	Woodbury Cr to MN/IA border	07080201-516	2Bg	1998	AQC	Mercury in fish tissue	Mercury	NA	4a	2007	No
East Side	Lake or Reservoir	50-0002-00	2B	1998	AQC	Mercury in fish tissue	Mercury	NA	4a	2008	No
Cedar River	Rose Cr to Woodbury Cr	07080201-501	2Bg	1994	AQR	Fecal coliform	*E. coli*	NA	4a	2006	No
Cedar River	Roberts Cr to Upper Austin Dam	07080201-502	2Bg	1994	AQR	Fecal coliform	*E. coli*	NA	4a	2006	No

a. 1B: domestic consumption; 2Ag: aquatic life and recreation—general cold water habitat; 2Bg: aquatic life and recreation—general warm water habitat; 7: limited resource value water.
b. AQR: aquatic recreation, AQL: aquatic life, AQC: aquatic consumption
c. 4A: Impaired and a TMDL study has been approved by USEPA. All TMDLs needed to result in attainment of applicable water quality standards for this impairment have been approved or established by EPA. For biological impairments, there are no remaining conclusive stressors for which TMDLs are needed.
4C: Impaired but a TMDL study is not required because the impairment is not caused by a pollutant.
4D: Impaired but a TMDL study is not required because the impairment is due to natural conditions with insignificant anthropogenic influence.
5: Impaired and a TMDL study has not been approved by EPA.
d. Provided for listings that have been further assessed and are proposed for recategorization. Recategorizations will not be final until they are approved by EPA as part of Minnesota's list of impaired water bodies.