

April 2026

Watershed

Draft Little Fork Watershed Total Maximum Daily Load Report 2026

E. coli TMDL for Flint Creek (09030005-588)



m MINNESOTA POLLUTION
CONTROL AGENCY



Authors

Michael J. Kennedy, MPCA

Kevin Stroom, MPCA

Kaity Taylor, MPCA

Jeff Strom, MPCA

Andrea Plevan, MPCA

Contributors/acknowledgements

Sam Soderman, (formerly) Koochiching Soil and Water District

Jolen Simon, Koochiching Soil and Water District

Phil Norwich, N. St. Louis Soil and Water District

Joe Murphy, (formerly) N. St. Louis Soil and Water District

Becca Riess, (formerly) N. St. Louis Soil and Water District

Editing

Jinny Fricke, MPCA (Public Notice 4.20.26)

Cover Photo: Michael J. Kennedy, MPCA

Contents

Contents.....	i
List of tables	ii
List of figures	iii
Abbreviations	iii
Executive summary.....	i
1. Project overview.....	2
1.1 Introduction	2
1.2 Identification of water bodies	4
1.3 Tribal lands.....	5
1.4 Priority ranking	5
2. Applicable water quality standards and numeric water quality targets.....	6
2.1 Beneficial uses	6
2.2 Narrative and numeric standards	7
2.3 Antidegradation policies and procedures.....	7
2.4 Little Fork River Watershed water quality standards – <i>E. coli</i>	8
3. Watershed and water body characterization	8
3.1 Climate trends.....	9
3.2 Subwatersheds	10
3.3 Land cover.....	10
3.4 Flow data	11
3.5 <i>E. coli</i> data.....	11
3.6 Pollutant source summary.....	13
3.6.1 Permitted sources.....	14
3.6.2 Nonpermitted sources.....	14
3.6.3 Source assessment summary	18
4. TMDL development.....	18
4.1 Loading capacity methodology	19
4.2 Margin of safety.....	19
4.3 Wasteload allocation methodology.....	19
4.4 Load allocation methodology	20
4.5 Seasonal variation and critical conditions	20
4.6 Reserve capacity	21
4.7 Baseline year.....	21

4.8	Percent reduction	21
4.9	TMDL summary.....	21
5.	Future growth considerations.....	22
5.1	New or expanding permitted MS4 WLA transfer process	23
5.2	New or expanding wastewater	23
6.	Reasonable assurance	24
6.1	Reduction of permitted sources	24
6.2	Reduction of nonpermitted sources	24
6.2.1	SSTS Program	24
6.2.2	Feedlot Program	26
6.2.3	Minnesota buffer law	26
6.3	Summary of local plans.....	27
6.4	Examples of pollution reduction efforts	27
6.5	Funding	28
6.6	Reasonable assurance conclusion	29
7.	Monitoring	30
8.	Implementation strategy summary	30
8.1	Permitted sources.....	30
8.2	Nonpermitted sources.....	30
8.3	SSTS.....	31
8.4	Cost	31
8.5	Adaptive management	31
9.	Public participation.....	32
10.	Literature cited	32

List of tables

Table 1.	Impaired water body in the LFRW addressed in this TMDL report.....	4
Table 2.	<i>E. coli</i> water quality criteria for class 2 water bodies.....	8
Table 3.	Land cover in the Flint Creek drainage area. Source: 2024 National Land Cover Database (NLCD).	10
Table 4.	Average county SSTS failure and ITPHS rates (2017-2024) for St. Louis County, which covers the Flint Creek Watershed.	16
Table 5.	Wastewater <i>E. coli</i> wasteload allocations.....	20
Table 6.	Flint Creek (09030005-588) <i>E. coli</i> TMDL summary	22
Table 7.	Example BMPs for nonpermitted sources of <i>E. coli</i>	30

List of figures

Figure 1. Location of the Flint Creek <i>E. coli</i> impaired reach and drainage area within the larger Little Fork River HUC-8 Watershed.	3
Figure 2. Flint Creek impaired reach, 09030003-588 outlined in RED, and location of NPDES discharger (ISD 2142 Pre-Kindergarten to Grade 12 N School) and water quality monitoring stations (S003-997, S016-764, and S016-763) referenced in this report.	9
Figure 3. Flint Creek drainage area land cover.	11
Figure 4. Flint Creek (S003-997) <i>E. coli</i> concentrations by month, 2018 and 2019.	12
Figure 5. Flint Creek (S003-997) <i>E. coli</i> concentrations by flow zone, 2018 and 2019.	12
Figure 6. <i>E. coli</i> longitudinal survey results.	13
Figure 7. Flint Creek (09030005-588) <i>E. coli</i> load duration curve and monitored loads.	22
Figure 8. St. Louis County SSTS replacements by year.	26
Figure 9. Spending for watershed implementation projects; data from the MPCA’s Healthier Watersheds website.	29
Figure 10. Adaptive management.	32

Abbreviations

1W1P	One Watershed, One Plan
AU	animal unit
AUID	assessment unit identification
BFBC	Bois Forte Band of Chippewa
BMP	best management practice
BWSR	Board of Water and Soil Resources
DNR	Minnesota Department of Natural Resources
<i>E. coli</i>	<i>Escherichia coli</i>
EPA	U.S. Environmental Protection Agency
HSPF	Hydrologic Simulation Program–Fortran
HUC	Hydrologic Unit Code
ITPHS	imminent threat to public health and safety
IWM	intensive watershed monitoring
LA	load allocation
LDC	load duration curve
LFRW	Little Fork River Watershed
LGU	local government unit
m	meter

mL	milliliter
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
SDS	state disposal system
SID	Stressor Identification
SSTS	subsurface sewage treatment systems
SWCD	soil and water conservation district
TMDL	total maximum daily load
TSS	total suspended solids
WBIF	watershed-based implementation funding
WLA	wasteload allocation
WRAPS	Watershed Restoration and Protection Strategy
WQBEL	water quality-based effluent limit
WWTF	wastewater treatment facility

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 in the State of Minnesota's Cycle 2 Watershed Approach and is a continuation of Cycle 1 TMDL efforts in the Little Fork River Watershed (LFRW) that were approved by the U.S. Environmental Protection Agency (EPA) Region 5. Since the 2008 Cycle 1 TMDLs, the LFRW has been re-visited for intensive watershed monitoring (IWM; 2018-2019) and reassessed (2020) for meeting water quality standards. Information from multiple sources was used to evaluate the ecological health of each water body including:

- All available water quality data over the period of 2010 through 2019
- Published studies (Please see Little Fork Watershed Restoration and Protection Strategy (WRAPS) Report Update 2026, Page 16)
- Cycle 2 Stressor Identification (SID) investigation
- Hydrologic Simulation Program-Fortran (HSPF) model updates
- Stakeholder input

This TMDL study addresses one *Escherichia coli* (*E. coli*) impairment in the LFRW (09030005-588; Flint Creek) that was identified as needing TMDLs on the 2024 State of Minnesota's 303(d) list of impaired waters. This TMDL establishes the maximum amount of *E. coli* this reach can receive daily to meet the *E. coli* water quality standard.

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 the impaired reach. These methods include monitored flow and water quality data, the Little Fork River HSPF model, and the flow duration curve approach. This TMDL report was developed in conjunction with a WRAPS Report Update for the Little Fork River (MPCA 2026). The WRAPS Report Update provides an update of Cycle 2 efforts throughout the watershed and addresses multiple nonpollutant impairments.

A general strategy and cost estimate for implementation to address the impairment are included in this report. Nonpoint source load reductions will be the focus of implementation efforts. Nonpoint source contributions are not regulated and will need to proceed on a voluntary basis.

1. Project overview

1.1 Introduction

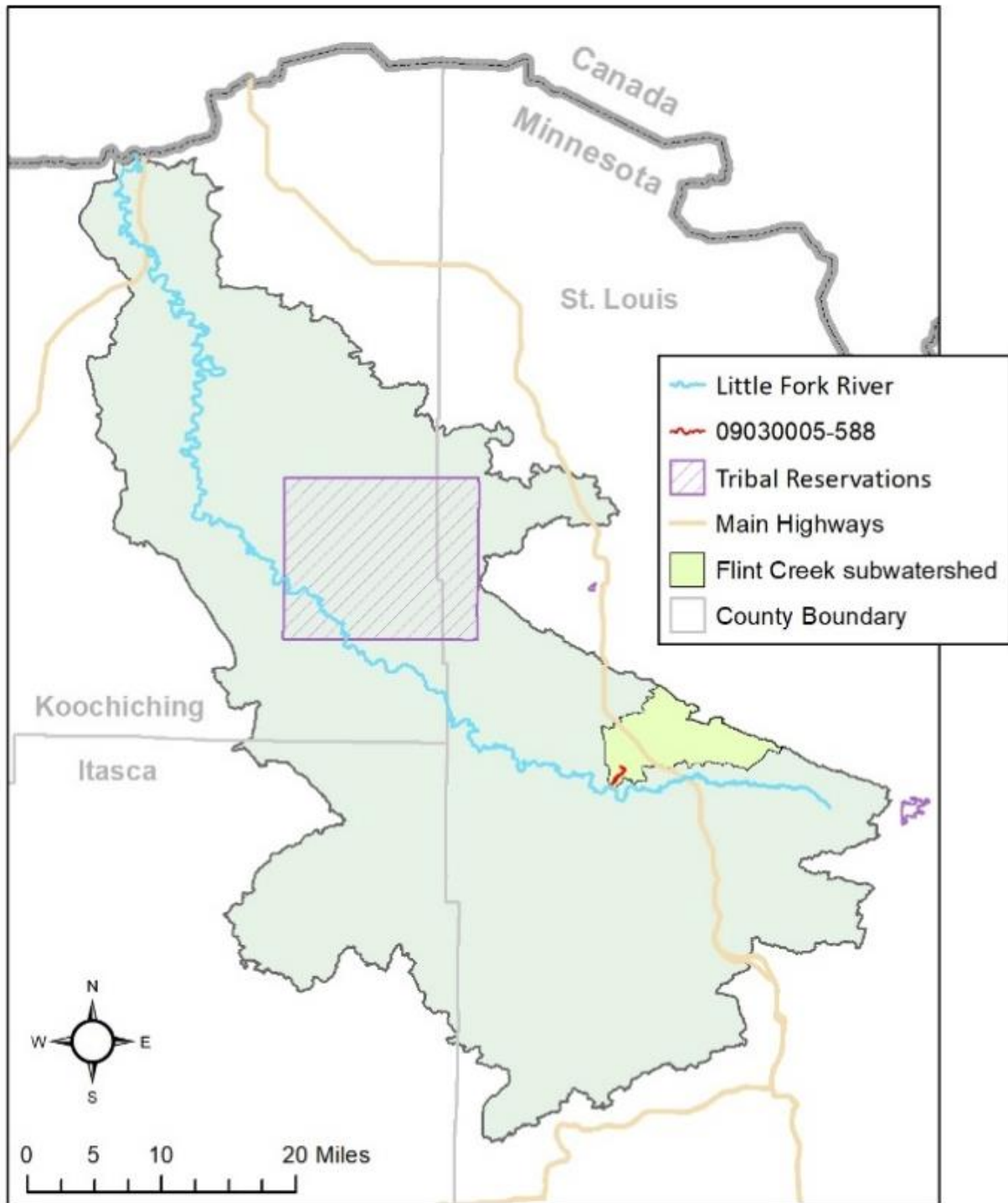
This report contains an *E. coli* TMDL for Flint Creek (09030005-588) in the LFRW. The Flint Creek Subwatershed is located on the traditional homelands of the Anishinaabeg. However, no part of the Flint Creek Subwatershed is located within the boundary of federally recognized tribal land, and the TMDL does not allocate pollutant load to any federally recognized Tribal Nation in this watershed.

Section 303(d) of the 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 daily 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 them. 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 LFRW (Hydrologic Unit Code [HUC]-8 09030005) drains 1,872 square miles (MPCA 2016) before joining the Rainy River and flowing northwest to Lake of the Woods and north through Canada (Figure 1). This remote watershed is characterized by the Northern Lakes and Forest and Northern Minnesota Wetlands ecoregions and located on glacial Lake Agassiz geology. Much of the watershed was intensively logged in the late 1800s and early 1900s, and timber harvest remains one of the primary economic activities in the basin to present day. Surficial geology in the watershed is characterized by Rainy Lobe glacial deposits in the southern extent of the watershed (adjacent to the Mesabi Iron Range), and large areas of Koochiching Lobe glacial deposits (Minnesota Geological Survey 2021). Exposures of Lake Agassiz sediments extend into the watershed from the west, and the northeastern edge of the watershed is characterized by scoured bedrock uplands (Minnesota Geological Survey 2021). A large portion of the watershed is part of the Nett Lake Reservation tribal lands belonging to the Bois Forte Band of Chippewa (BFBC; MPCA 2016). Land cover across the watershed is largely comprised of forests and wetlands. Forests cover a combined 37% of the watershed, with 18% deciduous, 6% evergreen, and 13% mixed forest. Woody wetlands cover 40% of the watershed, and emergent herbaceous wetland covers 6%. Less than 2% of the watershed is considered developed and 2% is under agricultural use, mostly for pasture/hay (1.6%) with a small amount in cultivated crops. As much as 19% of the wetlands delineated by NLCD data set may be peat deposits (Hobbs and Goebel 1982).

This is the second TMDL report for the LFRW. The first TMDL report, written in November 2017 and approved by EPA in 2018, highlighted five stream segments impaired by excess sedimentation (turbidity) and one stream segment in the Rice River tributary (09030005-517, Johnson Creek to Little Fork River), which was impaired for aquatic life. One of those stream segments on the Little Fork River (09030005-502, Headwaters to Rice River) was not included in the 2017 TMDL and was deferred to understand the relationship between total suspended solids (TSS) and volatile suspended solids.

Figure 1. Location of the Flint Creek *E. coli* impaired reach and drainage area within the larger Little Fork River HUC-8 Watershed.



The watershed wide monitoring and assessment in 2018 and 2019 resulted in additional identification of impaired waters in the watershed; please see the [Little Fork River Watershed Assessment and Trends Update Report](#) (MPCA 2021). This TMDL report will focus on the Flint River Subwatershed (HUC-12) recreational impairment for high *E. coli*. Although Flint Creek is also listed as impaired for aquatic life

due to high TSS, no TSS TMDLs will be completed this cycle. TSS are addressed in the updated WRAPS for the Little Fork Watershed as local, state, and Federal partners continue to understand sediment in the Little Fork River system.

This TMDL report is a component of a larger effort to update the WRAPS Report for the Little Fork River Watershed, originally published in 2017 (MPCA 2017). Another component of the effort is the *Little Fork River Watershed Monitoring and Assessment Report* (MPCA 2021). These reports together complete the second round of work by the MPCA in the Little Fork Watershed. In addition, the USGS published:

- [Stream corridor sediment budget for watershed sediment source apportionment for the forested Little Fork River, Minnesota | U.S. Geological Survey](#)
- [Near-channel erosion as a driver of watershed-scale sediment and phosphorus loading in a forested subwatershed of Lake of the Woods \(Baker et al. 2025\)](#)

Local partners in the LFRW include BFBC, Itasca County Soil and Water District (ISWCD), Koochiching County Soil and Water District (KSWCD), and North St. Louis Soil and Water District (NSLSWCD). Research assistance on sediment and phosphorus was given by MPCA, U.S. Geological Survey and Minnesota Department of Natural Resources (DNR).

1.2 Identification of water bodies

This TMDL report addresses one section of Flint Creek (09030005-588), which is located approximately south of Minnesota Hwy 1, northwest of Cook and north of Wein Road. It addresses an aquatic recreation impairment for *E. coli*.

Although TMDLs are not developed in this report for nonpollutant stressors to biological impairments, all stressors—not just those with associated TMDLs—are addressed in the WRAPS report (MPCA 2017, MPCA 2026). The WRAPS report provides an opportunity to call for environmental improvements in situations where TMDLs alone would not. Nonpollutant stressors include factors such as habitat and/or flow alteration. TMDLs are not typically developed for nonpollutant stressors because they are not subject to load quantification.

Table 1 below summarizes the LFRW impairment addressed by a TMDL in this document. For a complete listing of all LFRW impairments, please see [Little Fork River WRAPS Report Update](#) (2026).

Table 1. Impaired water body in the LFRW addressed in this TMDL report.

AUID	Water body name	Water body description	Use class	Listing year	Affected designated use ^a	Listing parameter	TMDL pollutant	Category 4A upon TMDL approval ^b
09030005-588	Flint Creek	Unnamed Creek to Unnamed Creek	2b	2022	AQR	<i>E. coli</i>	<i>E. coli</i>	Yes

a. AQR: aquatic recreation

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 Flint Creek Subwatershed is located on the traditional homelands of the Anishinaabeg. However, no part of the Flint Creek Subwatershed 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.

The BFBC (also referred to as Ojibwe) has lived in northern Minnesota for centuries, but they did not originate there. The people journeyed from the east coast up the Saint Lawrence River, around the Great Lakes and followed rivers and lakes inland.

The BFBC's reservation is divided into three sectors: Nett Lake, Vermilion, and Deer Creek. The largest section is around Nett Lake located in St. Louis and Koochiching counties. 50% of the Nett Lake sector is wetland and is the largest producer of wild rice in the United States. The Nett Lake sector is home to many of the Bois Forte Band members and the Band's primary government offices. Bois Forte, or "strong wood," was the French name given to the Indians living in the densest forests of what is now extreme northern Minnesota.

The community first entered a treaty with the United States in 1854 that set aside an undefined region around Lake Vermilion as a reservation. The regions at Nett Lake and Itasca County – Deer Creek – were officially established in an 1866 treaty, and the Lake Vermilion lands were defined in an 1881 executive order. In 1997, the Bois Forte Reservation Tribal Council assumed full responsibility for the delivery of all government programs and services to its people.

The Bois Forte Band's Natural Resources Program has been a partner in water quality work with MPCA since 2006. As an active participant in water quality restoration and protection with county and state partners, the tribe strives to restore ecological resources on their reservation and surrounding areas.

Bois Forte Tribal lands are not included in this TMDL's pollutant load development calculations, as there are no tribal lands within the Flint Creek reach (09030005-588) drainage area.

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 CWA 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 2024a). 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 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 criteria, 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 – aquatic life and recreation
- 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 aquatic life beneficial use includes a TALU 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 criteria are adopted into rule to protect each beneficial use. TMDLs are developed to protect the most sensitive use of a water body.

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 aquatic life and habitat, drinking water, and associated use classes: Classes 1B; 2A, 2Ae, or 2Ag; 3; 4A and 4B; and 5
- Cool and warm water aquatic life 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 aquatic life 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 aquatic consumption (human health-based standards)
- Class 2: Aquatic life (toxicity-based standards, conventional pollutants, biological indicators)
- Class 2: Aquatic recreation (*E. coli* bacteria, eutrophication)
- Class 2: Aquatic consumption (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 aquatic life and their habitats. Class 2B waters are protected for the propagation and maintenance of a healthy community of cool or warm water aquatic life and their habitats. Both Class 2A and 2B waters are also protected for aquatic recreation 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 CWA, United States Code, title 33, section 1326.

2.4 Little Fork River Watershed water quality standards – *E. coli*

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 applicable designated use. The class 2 standards for *E. coli* apply from April through October. The *E. coli* TMDL in this report is 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 criteria apply.

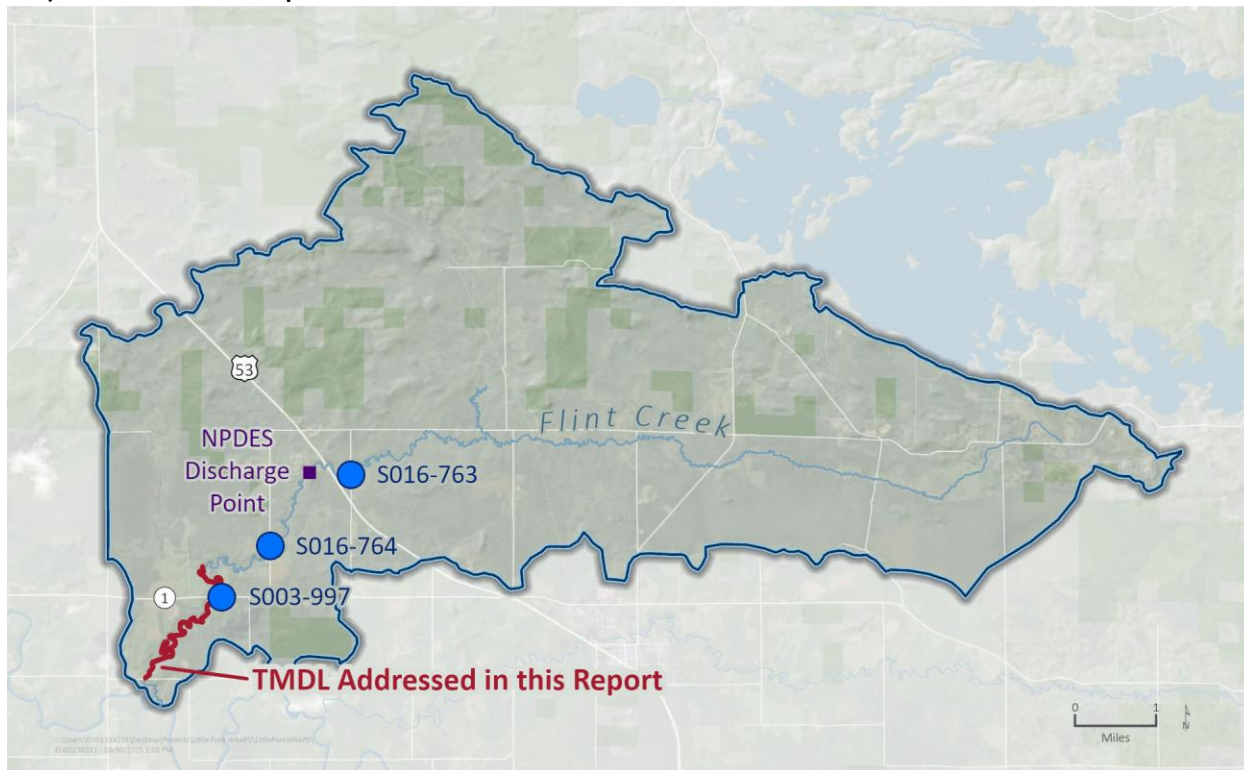
Table 2. *E. coli* water quality criteria for class 2 water bodies.

Parameter	Water Quality Standard	Numeric Criteria
<i>E. coli</i>	Not to exceed 126 org 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 org/100 mL (monthly geometric mean) $\leq 1,260$ org/100 mL (individual sample)

3. Watershed and water body characterization

This TMDL study addresses the Flint Creek *E. coli* impairment in the LFRW in Northern Minnesota’s St. Louis County. The subwatershed is located in the Northern Minnesota Wetlands ecoregion. Flint Creek’s headwaters start near the watershed divide between the Little Fork River and Vermilion River major watersheds and it flows southwesterly to the main stem of the Little Fork River, approximately 48 miles (Figure 2). The impaired steam reach is 14.5% of the stream network; however, assessment monitoring has not occurred along the entire stream length. Recreational uses of Flint Creek include canoe and kayak paddling, waterfowl hunting, and fishing.

Figure 2. Flint Creek impaired reach, 09030003-588 outlined in RED, and location of NPDES discharger (ISD 2142 Pre-Kindergarten to Grade 12 N School) and water quality monitoring stations (S003-997, S016-764, and S016-763) referenced in this report.



3.1 Climate trends

Statewide data collected by the DNR, MPCA, and local partners show that climate trends have already impacted streams and lakes throughout the state and region. According to MPCA’s [Climate Change and Minnesota's Surface Waters Viewer](#), lake surface water temperatures have warmed during all seasons throughout Northern Minnesota. During the summer growing season (June through September), lakes in northern Minnesota are, on average, warmer now than they were 50 years ago. Additionally, warmer winters have resulted in about 10 or more fewer days of ice coverage on average for lakes throughout the northern region since the mid-1970s.

Minnesota stream temperatures have remained relatively stable during the winter and summer months but have warmed consistently during the Spring (March–June) and Fall (September–November) since the late 1960s. Compared to historical records, most rivers in Minnesota have had 2 to 3 times more high flow years than expected over the past 10 and 20 years. Climate driven changes in the biological conditions of streams of the Little Fork River Watershed will take decades to become apparent, underscoring the need for long-term monitoring.

Changes in climate are happening, and local citizens and governmental organizations need to address these changes by incorporating climate resiliency planning for infrastructure repair and replacement. As county, city, and townships replace culverts, bridges, stormwater treatments and other important infrastructure it is important to accommodate new trends in temperature and precipitation into the

effort. Homeowners also should be aware of these changes and build them into future landscape planning as well.

3.2 Subwatersheds

The Flint Creek Subwatershed boundary (Figure 2) was developed using multiple data sources, starting with watershed delineations from the LFRW HSPF model. The model watershed boundaries are based on DNR Level 7 watershed boundaries. Where additional watershed breaks were needed to define the impairment watershed, DNR Level 9 watershed boundaries were used.

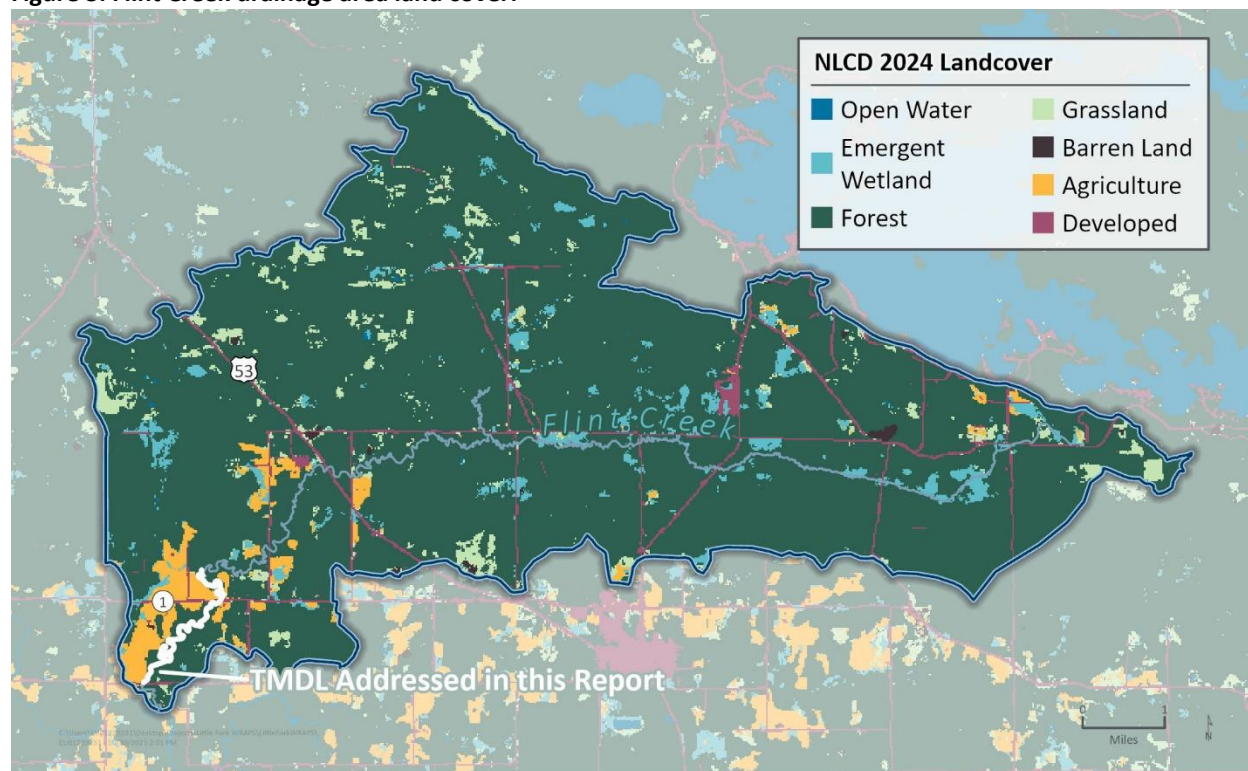
3.3 Land cover

Land cover in the Flint Creek Subwatershed is characterized by wetlands and forested landscape interspersed by small farms and rural homesteads (Table 3 and Figure 3). The area is located on the old Glacial Lake Agassiz lake bed. Development pressure is negligible, with occasional lands being parceled out for timber production or recreational homes. Small livestock and crop operations exist in the watershed (2.7%); however, the majority of the landscape is forest and wetlands.

Table 3. Land cover in the Flint Creek drainage area. Source: 2024 [National Land Cover Database \(NLCD\)](#).

Primary land cover group	Individual land cover category	Acres	Percent
Forest (89.8%)	Woody Wetlands	13,298	43.2%
	Deciduous Forest	6,945	22.6%
	Mixed Forest	5,717	18.6%
	Shrub Scrub	1,004	3.2%
	Evergreen Forest	668	2.2%
Emergent wetlands (3.4%)	Emergent Herbaceous Wetlands	1,059	3.4%
Developed (3.3%)	Developed Open Space	489	1.6%
	Developed Low Intensity	484	1.6%
	Developed Medium Intensity	20	0.1%
	Developed High Intensity	4	<0.1%
Agriculture (2.7%)	Pasture/Hay	819	2.7%
	Cultivated Crops	14	<0.1%
Grassland (0.4%)	Grassland Herbaceous	123	0.4%
Barren Land (0.3%)	Barren Land	88	0.3%
Open Water (0.1%)	Open Water	25	0.1%
TOTAL		30,757	100%

Figure 3. Flint Creek drainage area land cover.



3.4 Flow data

Due to limited and inconsistent flow records for Flint Creek, simulated flows from the 2025 updated HSPF model were used to represent average daily flows for Flint Creek during the model simulation period (1996 through 2022). HSPF simulated flows are available at the confluence of Flint Creek and the Little Fork River. The model was first developed in 2011, and the model reports (RESPEC 2011, 2012, 2015, 2016, 2021; MPCA 2025) describe the framework and the data that were used to develop and update the model. HSPF is a comprehensive model of watershed hydrology and water quality that allows the integrated simulation of point sources, land and soil contaminant runoff processes, and in-stream hydraulic and sediment-chemical interactions. The results provide hourly runoff flow rates, sediment concentrations, and nutrient concentrations, along with other water quality constituents, at the outlet of any modeled subwatershed. Within each subwatershed, the upland areas are separated into multiple land cover categories.

3.5 *E. coli* data

Most of the available *E. coli* data for Flint Creek are from 2018 and 2019 at water quality station S003-997 (Figure 2). A total of 19 *E. coli* samples were collected during this period from June through August. *E. coli* concentrations ranged from 33 to 2,420 org/100 mL. The monthly geometric mean standard was exceeded in three of the four months that were monitored, and the individual sample standard was exceeded at least one time in both July and August (Figure 4). The highest monthly geometric mean concentration was in August (714 org/100 mL) and 60% of the samples collected in August exceeded the individual sample standard.

Figure 5 shows the relationship between *E. coli* and flow in the impaired reach. The low flow zone demonstrated the highest geomean concentration (621 org/100 mL) and the highest incidence of individual sample standard exceedances (57%). Exceedances of the individual sample standard occurred during mid and low flow conditions.

Figure 4. Flint Creek (S003-997) *E. coli* concentrations by month, 2018 and 2019.

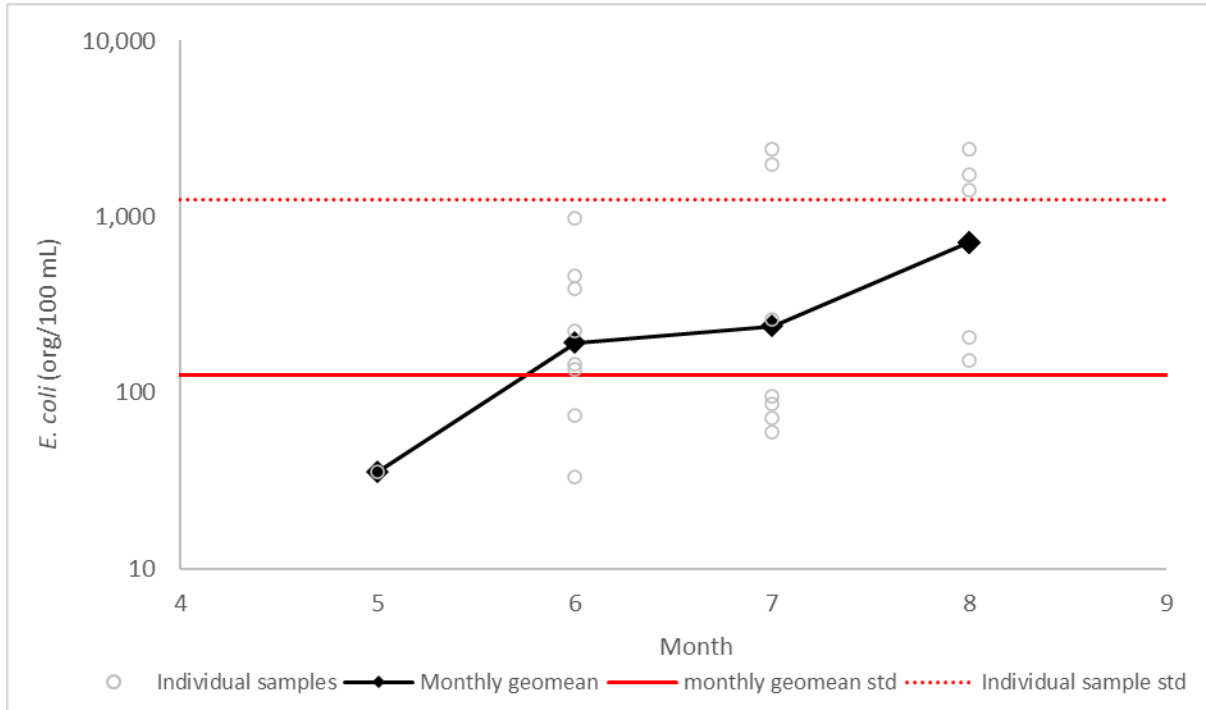
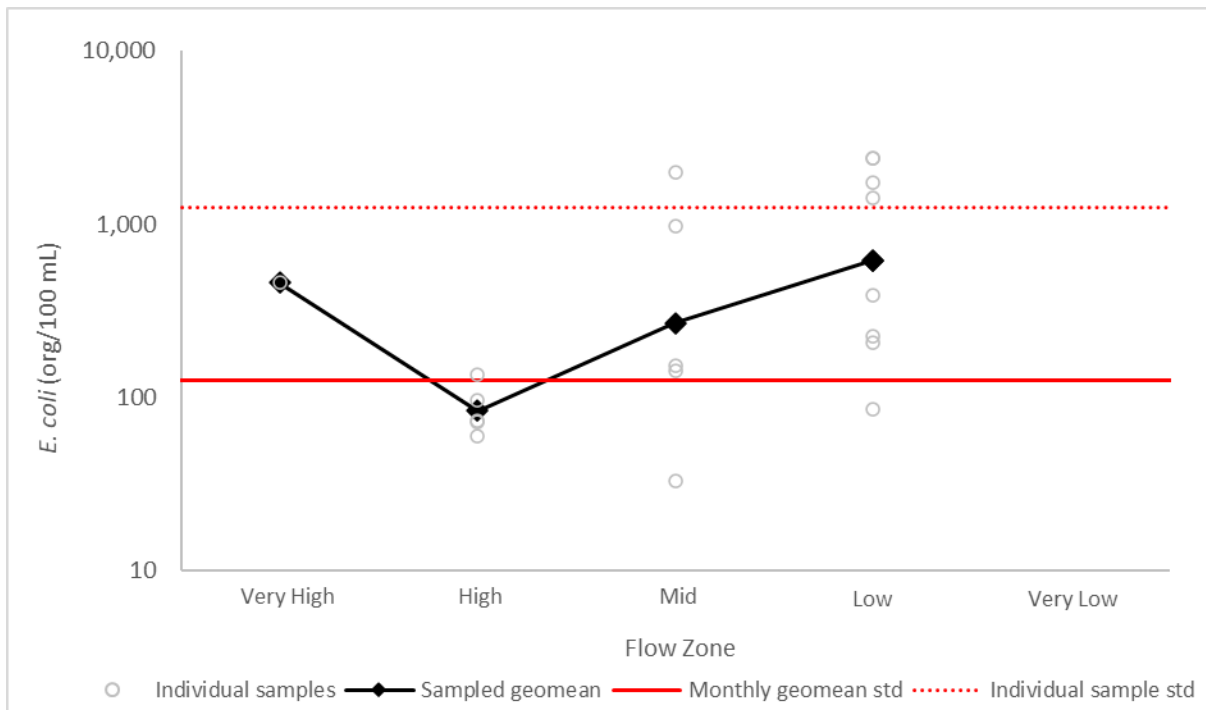
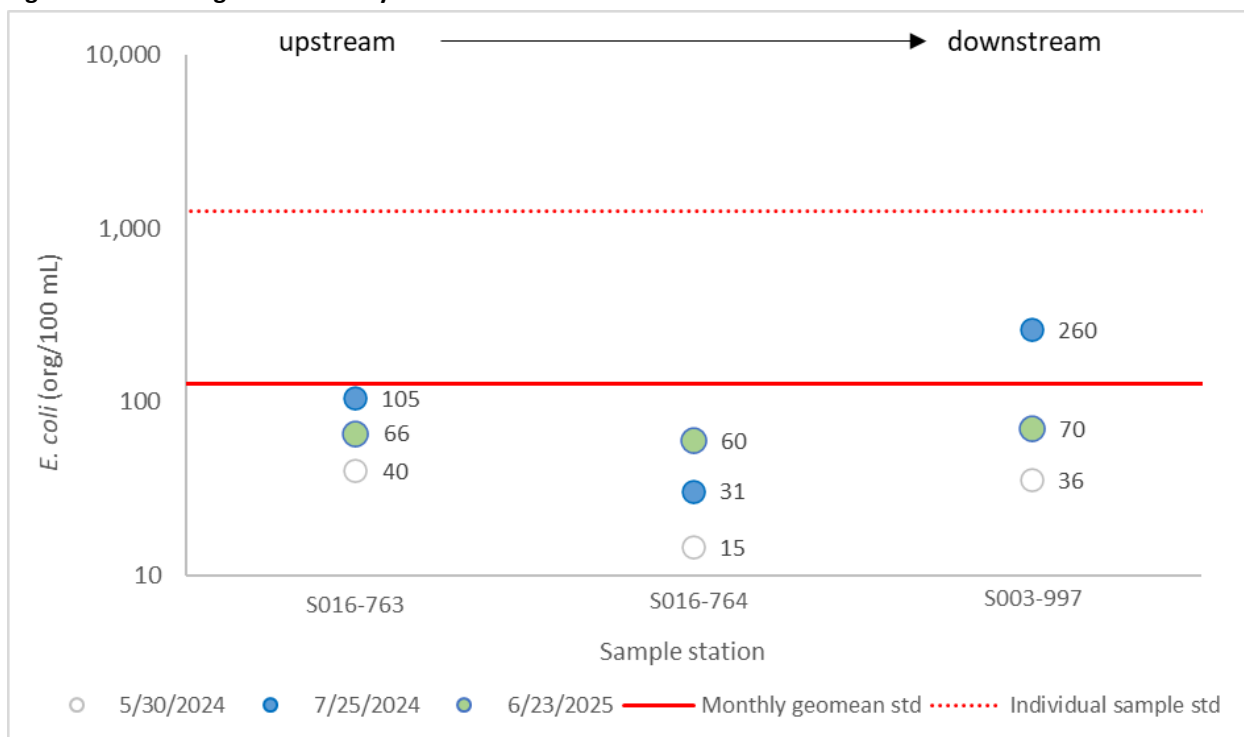


Figure 5. Flint Creek (S003-997) *E. coli* concentrations by flow zone, 2018 and 2019.



In addition to the IWM *E. coli* data collected in 2018 and 2019 at station S003-997, three longitudinal *E. coli* surveys were conducted on 5/30/2024, 7/25/2024, and 6/23/2025. The purpose of these surveys was to evaluate potential bacteria loading hotspots and how *E. coli* concentrations change from upstream to downstream along the main the mainstem of Flint Creek during different months and flow conditions. Figure 2 shows the location of the longitudinal survey monitoring stations in relation to the impaired reach. The 5/30/2024 and 6/23/2024 surveys were conducted during higher flow conditions while the 7/25/2025 survey was conducted during low flow conditions. As shown in Figure 6, the highest observed *E. coli* concentration during the three surveys was at station S003-997 on 7/25/2024. This sample result (260 org/100 mL) was more than eight times higher than the concentration measured at the adjacent upstream station (31 org/100 mL at S016-764) suggesting there are likely low-flow source(s) of bacteria between these stations, such as livestock with access to the stream or SSTS.

Figure 6. *E. coli* longitudinal survey results.



3.6 Pollutant source summary

Sources of pollutants in the Flint Creek Subwatershed 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 “nonpermitted” 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.

3.6.1 Permitted sources

Permitted wastewater can be a source of *E. coli* to surface water. 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 through releases of untreated wastewater.

Wastewater dischargers that operate under NPDES permits are required to disinfect wastewater to reduce fecal coliform concentrations to 200 org/100 mL or less as a monthly geometric mean. This limit is protective to the 126 org/100 mL *E. coli* class 2 water standards. Like *E. coli*, fecal coliform is an indicator of fecal contamination. The primary function of the fecal bacteria effluent limit is to assure that the effluent is being adequately treated and disinfected to assure a complete or near complete kill of fecal bacteria prior to discharge (MPCA 2007). Dischargers to class 2 waters are required to disinfect from April 1 through October 31, and dischargers to class 7 waters are required to disinfect from May 1 through October 31. There are no permitted combined sewer overflows in the impaired watersheds.

The only permitted source of *E. coli* in the Flint Creek Subwatershed is one institutional wastewater treatment facility (WWTF). There are no permitted *E. coli* sources of stormwater and no NPDES/SDS permitted animal feedlots. The Independent School District (ISD) 2142 Pre-Kindergarten to Grade 12 N School operates a small WWTF located approximately three miles northeast of the impairment and is authorized by MPCA-issued NPDES permit number MN0069850 (Figure 2). The WWTF discharges to the adjacent upstream reach (Flint Creek WID 09030005-612) and is required to meet a 200 organism/100 mL fecal coliform effluent limit from April 1 through October 31.

Monthly geometric means of effluent monitoring data (source: [MPCA Wastewater Data Browser](#)) are used to determine compliance with the 200 org/100 mL fecal coliform permit limit. ISD 2142 Pre-Kindergarten to Grade 12 N School WWTF has exceeded the fecal coliform limit twice over the last 10 years. The facility reported a geometric mean of 440 org/100 mL for the month of September 2017 and a geometric mean of 374 org/100 mL for the month of September 2024. These two effluent limit exceedances represent only 3% of the 58 months with reported effluent fecal coliform data since April 2016. The MPCA has determined that this WWTF is not a significant contributor of *E. coli* to Flint Creek.

3.6.2 Nonpermitted sources

Nonpermitted sources of *E. coli* in the Flint Creek Watershed include watershed runoff, nonpermitted feedlots and wastewater, natural background sources, and naturalized *E. coli*.

3.6.2.1 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 are carried with the runoff water and delivered to surface water bodies. The sources of pollutants in watershed runoff may include soils, fertilizer, vegetation, and livestock, pet, and wildlife waste. A portion of the pollutants in watershed runoff can be considered natural background sources, which are inputs that would be expected under natural, undisturbed conditions.

The primary possible source of *E. coli* that is transported to surface water bodies through watershed runoff in the Flint Creek Subwatershed is livestock manure from small cattle operations. This source is discussed under non-NPDES/SDS permitted animal feeding operations and manure management.

Watershed runoff from developed areas transport *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. *E. coli* contributions are likely small from these sources.

3.6.2.2 Non-NPDES/SDS permitted animal feedlots and manure application

Manure that is generated on feedlots is usually stockpiled on site or on crop fields, or stored in pits, tanks, or earthen basins on site until field conditions and the crop rotation allow for applying the manure as fertilizer. Manure can be delivered to surface waters from failure of manure containment, runoff from the feedlot itself, or runoff from nearby 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 overland runoff associated with large precipitation events. Injecting or incorporating manure is a preferred best management practice (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.

There are 6 registered feedlots in the Little Fork watershed ranging in size from 219 to 60 animal units. These operations are permitted and inspected to ensure compliance with current permits.

3.6.2.3 Pasture

Livestock operations that are only pastures do not need to be registered with the MPCA. The definition of pastures in [Minn. R. ch. 7020.0300, subp. 1](#), states that pastures are areas where grass or other growing plants are used for grazing, and where the concentration of animals is such that a vegetation cover is maintained during the growing season, except in the immediate vicinity of temporary supplemental feeding or watering devices. Based on review of air photos there are at least 2 to 3 small (i.e., likely less than 50 animal units [AU]), pastured livestock operations in the Flint Creek Subwatershed and there is approximately 800 acres of pasture/hay land in the Flint Creek Subwatershed (Table 3). In many areas, the pastureland crosses the impaired reach and adjacent upstream tributaries (Figure 3). Direct contact with livestock and the streams could be a significant source of *E. coli* to the impaired reach and may have contributed to the high *E. coli* measurement at S003-997 during the July 25, 2024, longitudinal survey (Figure 6).

3.6.2.4 Nonpermitted wastewater

Individual subsurface sewage treatment systems

Adequate wastewater treatment is vital to protecting the health, safety, and environment in Minnesota. More than 650,000 Minnesota homes and businesses use subsurface sewage treatment systems (SSTs). SSTs 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 septic](#) 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.

The exact number and status of SSTSs in the Flint Creek Subwatershed is unknown. However, each year, every county in the state reports 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 rates for St. Louis County is 22% failure to protect groundwater and 2% ITPHS (Table 4).

Table 4. Average county SSTS failure and ITPHS rates (2017-2024) for St. Louis County, which covers the Flint Creek Watershed.

County Name	Failing	ITPHS
St. Louis	22%	2%

Rates are provided by counties to MPCA and are estimates only; the data do 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. The county is aware of undocumented straight pipes in the county and are working to document and remediate this potential source of *E. coli*.

Small community wastewater treatment areas of concern

To ensure that effective sewage treatment occurs across the state, the MPCA regularly conducts surveys of local governmental units to identify areas that may be 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 no communities in the impaired reach watershed identified as areas of concern with respect to wastewater treatment.

3.6.2.5 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, that 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 wildlife. However, for the impaired reach, 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. These source assessments indicate that natural background inputs are generally low compared to livestock manure, noncompliant SSTs, and other anthropogenic sources.

Based on the MPCAs water body assessment process and the TMDL source assessments, there is no evidence at this time to suggest that natural background sources are major drivers of the impairment and/or affect the water body’s ability to meet state water quality standards.

3.6.2.6 Naturalized *E. coli*

The adaptation and evolution of naturalized *E. coli* that allow 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 et al. 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.

There is diverse and recent evidence for *E. coli* persistence in environments across Minnesota (Ishii et al. 2010, Ishii et al. 2006, Chandrasekaran et al. 2015, Burns & McDonnell Engineering Company, Inc. 2017), though differentiating between naturalized and recent *E. coli* populations requires more testing (Tymensen et al. 2015).

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 body's ability to meet state water quality standards.

3.6.3 Source assessment summary

Monitoring data for Flint Creek show elevated *E. coli* concentrations are most common during mid and low flow conditions (Figure 5), suggesting low-flow sources may be a bigger driver of the *E. coli* impairment compared to runoff-driven sources. The primary sources of elevated *E. coli* to Flint Creek include:

- Livestock direct access to riparian areas within and upstream of the impaired reach
- Inadequately treated wastewater – the estimated rate of ITPHS septic systems in St. Louis County is 2% (Table 4). Information on specific locations of ITPHS are not known. Although these rates are low, ITPHS could be a source of *E. coli* if they are located near the impaired reach and/or directly discharge to surface waters upstream of the impaired reach.

Based on review of DMR data, effluent from ISD 2142 Pre-Kindergarten to Grade 12 N School WWTF (MN0069850) is not a major source of bacteria to the impaired reach (see Section 3.6.1). Waste from wildlife may be a source of *E. coli* to the impaired stream but is generally considered to be low compared to other sources. Wildlife could represent a more substantial part of overall *E. coli* loading in isolated areas of high wildlife density and under low flow conditions.

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. A reserve capacity (RC) was not assigned in this TMDL because the existing domestic population in the Flint Creek drainage area is not currently served by permitted WWTFs nor does it have sufficient population density to justify the use of RC. This section describes the approach used to derive the TMDLs and allocations.

4.1 Loading capacity methodology

The loading capacity for the Flint Creek *E. coli* TMDL was developed using a load duration curve (LDC) approach. LDCs relate mean daily flow to the percent 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. Daily average flows from all months (even those outside of the time period that the standard is in effect) were used to develop the LDC for the Flint Creek *E. coli* impaired reaches in this TMDL (see Section 3.4). The LDC is divided into five 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%). Thus, 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). 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 table 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 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 in the Flint Creek *E. coli* TMDL 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, and uncertainty in modeling outputs. This MOS is considered to be sufficient given the calibration results of the HSPF model. Simulated flows from the HSPF model were used to develop the LDCs for the *E. coli* impairment (the HSPF model does not simulate *E. coli* loads). The HSPF model was updated and recalibrated in 2025 and calibration results indicate that the HSPF model is a valid representation of hydrologic conditions in the watershed (MPCA 2025).

4.3 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.

The only WLA assigned in this TMDL is for ISD 2142 Pre-Kindergarten to Grade 12 N School (MN0069850). There are no NPDES-permitted municipal stormwater discharges (i.e., municipal separate storm sewer system [MS4s]) in the impairment watersheds. WLAs for regulated construction stormwater (MNR100001) are not developed in Minnesota because *E. coli* is not a typical pollutant from construction sites. 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.

E. coli WLAs were assigned to the permitted wastewater facility based on the *E. coli* geometric mean standard (126 org/100 mL) multiplied by the facility’s design flow. ISD 2142 Pre-Kindergarten to Grade 12 N School has a continuous discharge to Flint Creek, so the average wet weather discharge volume was used to calculate the WLA.

The fecal coliform permit limit for ISD 2142 Pre-Kindergarten to Grade 12 N School is 200 org/100 mL as a calendar month geometric mean. The purpose of fecal bacterial effluent limits in wastewater permits is to ensure that wastewater facilities provide effective disinfection during the applicable time periods, and fecal coliform effluent limits will continue in NPDES permits for Minnesota WWTF (MPCA 2007). It is assumed that if a facility meets the fecal coliform limit of 200 org/100 mL it also meets the *E. coli* WLA and therefore existing effluent limits are consistent with *E. coli* WLA assumptions in this TMDL. ISD 2142 Pre-Kindergarten to Grade 12 N School’s *E. coli* WLA is presented in Table 5.

Table 5. Wastewater *E. coli* wasteload allocations.

Facility name	Permit number	WLA flow (mgd) ¹	Flow type	Pollutant	<i>E. coli</i> WLA (billion organisms per day)	Existing permit consistent with WLA assumptions
ISD 2142 Pre-Kindergarten to Grade 12 N School	MN0069850	0.00565	continuous	<i>E. coli</i>	0.027	Y

¹ Flow used to calculate the WLA is the facility’s average wet weather design flow

4.4 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 3.6). 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.

4.5 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 aquatic recreation apply from April through October. These time periods are when aquatic

recreation is more likely to occur in Minnesota waters and when high *E. coli* concentrations generally occur.

4.6 Reserve capacity

A RC was not assigned in this TMDL. RC 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.

4.7 Baseline year

The monitoring data used to calculate the percent reductions are from 2018 and 2019. The baseline year for implementation is 2018 (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.

4.8 Percent reduction

The estimated percent reduction provides 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 reduction should not be construed to mean that each of the separate sources listed in the TMDL table (Table 6) 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. 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.

4.9 TMDL summary

The Flint Creek *E. coli* LDC and TMDL allocations are presented in Figure 7 and Table 6, respectively. All *E. coli* loads in Table 6 are reported in billions of org/day and were rounded to two significant digits and values greater than 99 were rounded to whole numbers. The estimated percent reductions needed to meet the *E. coli* TMDL is approximately 82%. The *E. coli* LDC shows elevated *E. coli* loads have been observed during all flow conditions but most commonly during mid and low flow conditions. This suggests low-flow sources of *E. coli* should be further investigated and targeted for BMPs and TMDL implementation (see Section 3.6.3).

Figure 7. Flint Creek (09030005-588) *E. coli* load duration curve and monitored loads.

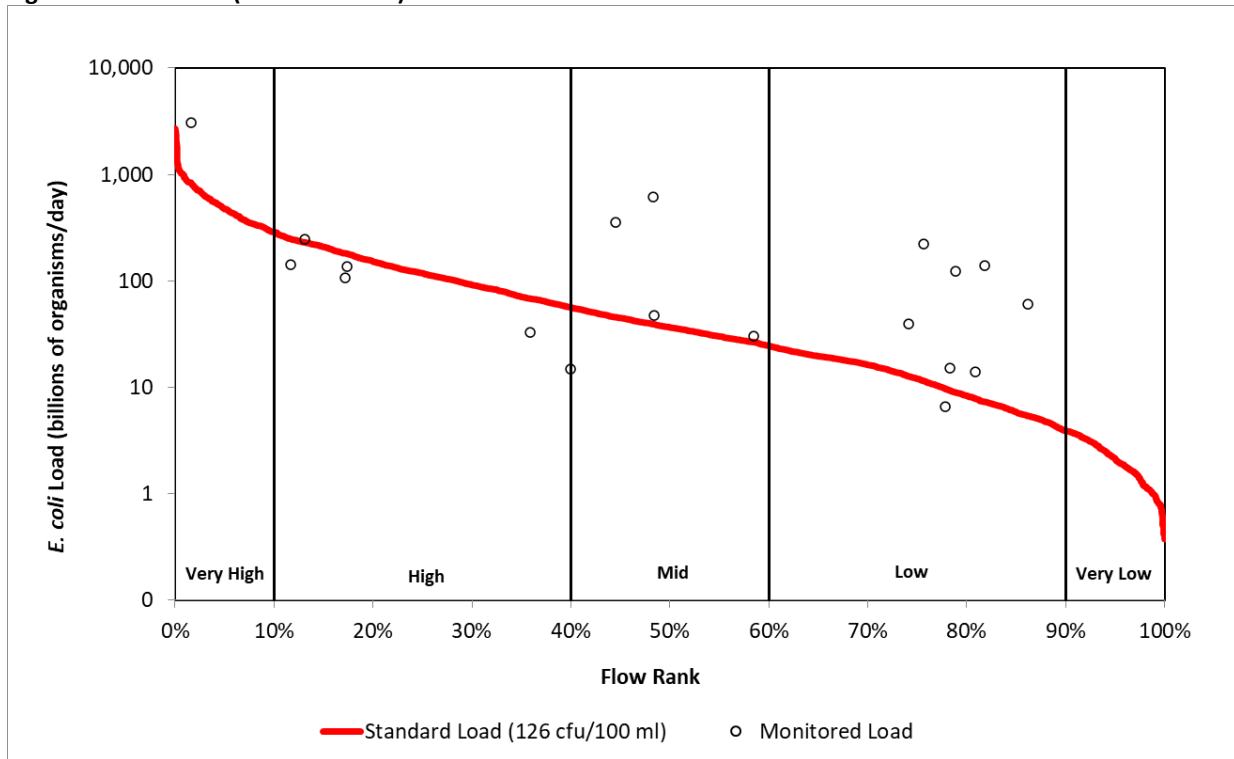


Table 6. Flint Creek (09030005-588) *E. coli* TMDL summary

- Listing year: 2022
- Baseline year: 2018 (end of year)
- Numeric standard used to calculate TMDL: 126 org/100 mL
- TMDL and allocations apply Apr-Oct

TMDL parameter		TMDL <i>E. coli</i> load (billions org./day) by flow zone				
		Very high	High	Mid	Low	Very low
WLA	ISD 2142 Pre-Kindergarten to Grade 12 N School (MN0069850)	0.027	0.027	0.027	0.027	0.027
LA	Total LA	426	106	33	11	1.9
	MOS	47	12	3.7	1.2	0.21
	TMDL	473	118	37	12	2.1
Maximum monthly geometric mean (org/100 mL)		714				
Estimated percent reduction		82%				

5. Future growth considerations

The Flint Creek (09030005-588) *E. coli* impairment is west/northwest of the community of Cook, which has a population of 520 people. The stream segment impaired is approximately 3.4 miles in length and is the last stream segment of four before Flint Creek enters the Little Fork main stem. Cook is one of the largest concentrations of people in the Little Fork Watershed and is located close to the headwaters. However, Cook has an aging population and has a median age of 58. The population in Cook decreased

from 459 in 2022 to 427 in 2023, a nearly 7% decline. The county that Cook is located in, St. Louis, is also an aging population and is also in decline. Given the local and regional context of a declining and aging population, it is unlikely that the city of Cook will experience any significant population growth in the foreseeable future.

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 Urbanized Area 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 point source is identified and is covered under an NPDES 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, a simple land area basis. 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, 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 2012). 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

The only permitted source assigned a WLA in this TMDL ISD 2142 Pre-Kindergarten to Grade 12 N School (MN0069850). As discussed in Section 4.3, this facility already contains effluent limits that require disinfection from April through October. Existing permit conditions are consistent with the assumptions and requirements of the TMDL WLA. Further reductions in *E. coli* loading from this facility are not needed to ensure attainment of the water quality standard.

Any NPDES/SDS permitted facility discharging wastewater that has a reasonable potential to cause or contribute to the water quality impairments addressed by these TMDLs include, or will include upon permit reissuance, water quality-based effluent limits that are consistent with the assumptions and requirements of these TMDL WLAs. Discharge monitoring is conducted by permittees and routinely submitted to the MPCA for review.

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. 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 will be evaluated for the potential to cause or contribute to violations of water quality standards. WQBELs will be developed for facilities whose discharges are found to have a reasonable potential to cause or contribute to exceedances of applicable water quality standards. The WQBELs will be calculated based on low flow conditions, may vary slightly from the TMDL WLAs, and may include concentration based effluent limitations.

6.2 Reduction of nonpermitted sources

Several nonpermitted reduction programs exist to support implementation of nonpoint source reduction BMPs in the LFRW. These programs identify BMPs, provide means of focusing BMPs, and support their implementation via state initiatives, ordinances, and/or dedicated funding. It shows the number of BMPs that have been implemented per subwatershed, as tracked on the [MPCA’s Healthier Watersheds website](#). The most common kinds of BMPs in the LFRW include re-planting of old agricultural fields into trees and shrubs, septic improvements, pasture management, and streambank/shoreline stabilization/restoration.

6.2.1 SSTS Program

SSTS regulation: Minn. Stat. §§ 115.55 and 115.56 provide SSTS regulations, and 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

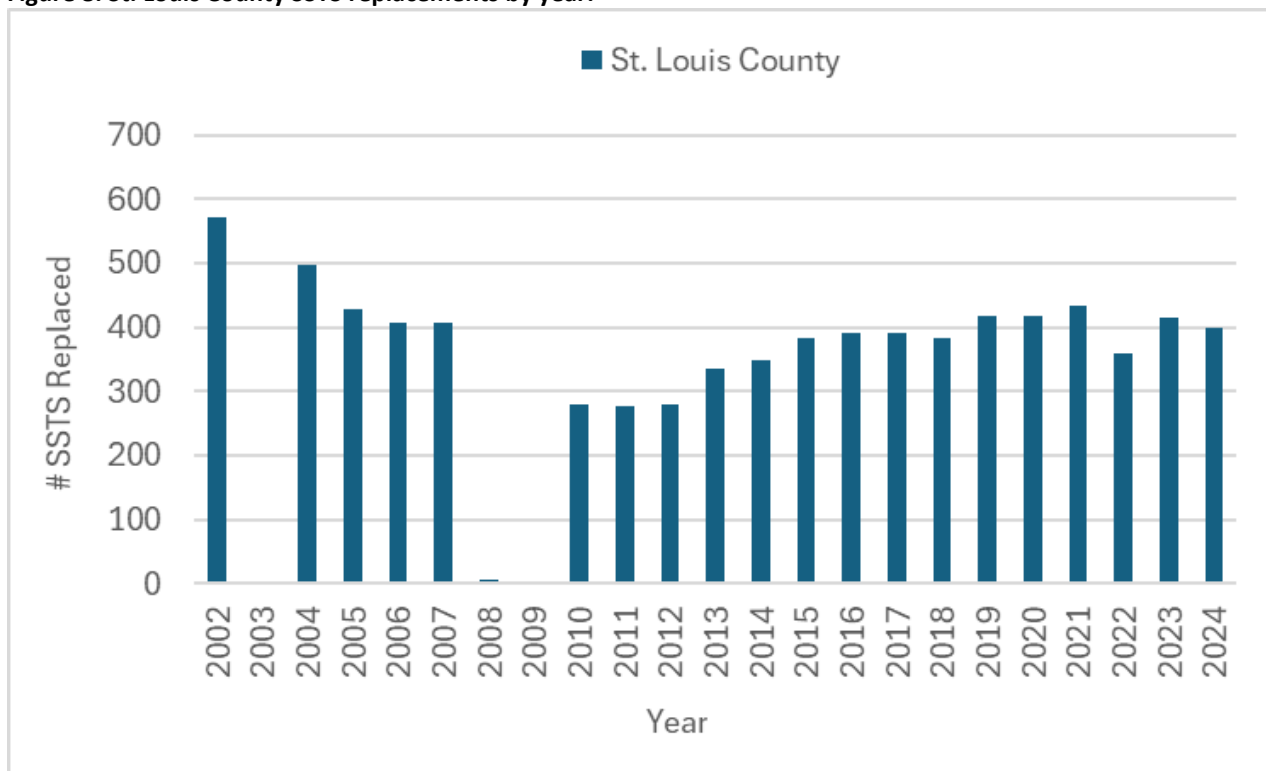
Each county maintains an SSTS ordinance, in accordance with Minn. Stat. and Minn. R., establishing minimum requirements for regulation of SSTS, for the treatment and dispersal of sewage within the applicable jurisdiction of the county, to protect public health and safety, to protect groundwater quality, 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 upgrades and replacement: ITPHSs are identified and corrected by the applicable local government unit (LGU). 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 program offers low-interest loans to local units of government 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 2002, St. Louis County has, on average, replaced 373 systems per year (Figure 8).

Figure 8. St. Louis County SSTS replacements by year.



6.2.2 Feedlot Program

The MPCAs Feedlot Program addresses both permitted and nonpermitted feedlots. The Feedlot Program implements Minn. R. ch. 7020 for all feedlots in the state, governing the collection, transportation, storage, processing, and disposal of animal manure and other livestock operation wastes. The focus of the rule is on animal feedlots and manure storage areas that have the greatest potential for environmental impact, in this case specifically surface and ground waters. 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. Although there are no registered feedlots in the Flint Creek Watersheds, the Feedlot Program provides reasonable assurance with respect to potential future registered feedlots.

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 is 100% for counties in the Little Fork Watershed as of March 2026

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. The 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 to:

- 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 from 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, citizens, 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.

The 1W1P program began in the Little Fork Watershed in Spring of 2025 and is slated for adoption in Spring 2026. The plan has a restoration focus on the widespread sediment issues in the watershed and protection issues in the Sturgeon River Subwatershed. Several activities are planned in both contexts, and one restoration activity is focused on agricultural BMPs in the upper watershed specifically targeting perennial plantings along exposed waterways, which will also be a BMP for cattle access to streams for watering purposes. The Flint Creek Subwatershed is in the area where these BMPs are suggested.

6.4 Examples of pollution reduction efforts

The LFRW Comprehensive Management Plan has identified the Flint Creek Subwatershed as a low priority area for watershed implementation, as the main focus in this watershed is sediment impairments in the main stem. However, the counties have identified manure and livestock management as one of the main drivers of the nutrient issues within the watershed. Efforts for funding will be focused on increasing manure management practices and BMPs such as feeding areas located away from water conveyances, nutrient management plans, buffers, and reducing access to creeks and streams in pastures. The plan calls for more study into the sources of *E. coli* and plans to identify landowners on septic and manure management activities that could reduce pollutant loading to the stream.

6.5 Funding

Funding for TMDL implementation is available through a diverse array of local, state, federal, and private channels, ranging from the Natural Resources Conservation Service's (NRCS) conservation programs—such as the Environmental Quality Incentives Program—to state-level Clean Water Fund competitive grants. A significant portion of this support is channeled through the Board of Water and Soil Resources (BWSR) via Watershed-Based Implementation Funding and the more recent Water Storage and Climate Resilience program. This newer legislative initiative specifically targets the implementation of landscape-level water storage practices designed to mitigate the impacts of shifting precipitation patterns and intensified land drainage, effectively slowing runoff to reduce peak stream flows and downstream flooding.

The WBIF program 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 plan for the LRRW will be completed in 2026.

In recent years, 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, and helps local governments spend limited resources where they are most needed.

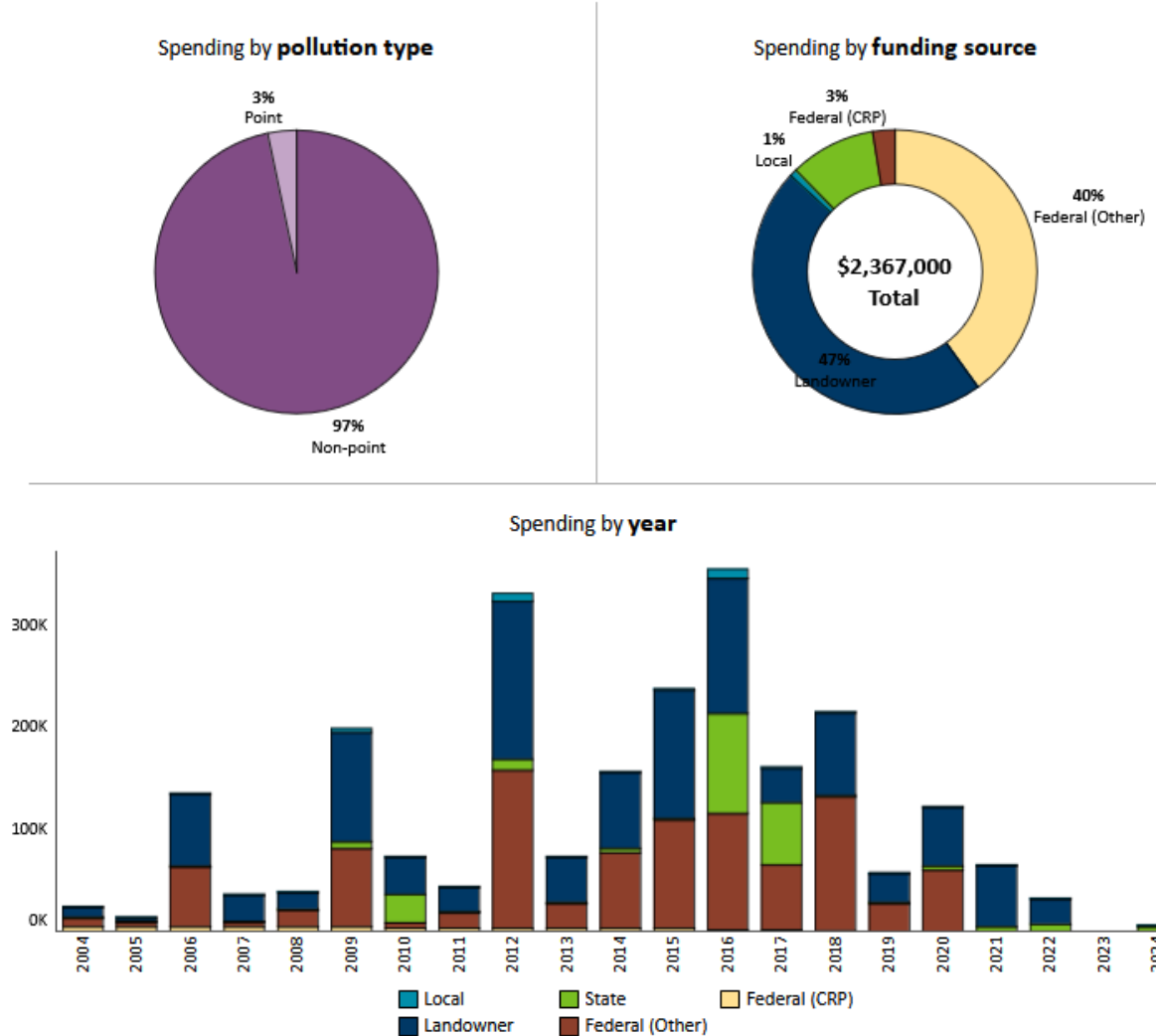
WBIF assurance measures summarize and systematically evaluate how WBIF dollars are being used to achieve clean water goals identified in comprehensive watershed plans. The measures will be used by BWSR to provide additional context about watershed plan implementation challenges and opportunities. The 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 \$2,000,000 has been spent cumulatively on watershed implementation projects in the Little Fork Watershed from 2004 through 2025 (Figure 9).

Figure 9. Spending for watershed implementation projects; data from the MPCA’s Healthier Watersheds website.

Little Fork River watershed within all counties



6.6 Reasonable assurance conclusion

In summary, time and resources have been and will be devoted to identifying and implementing BMPs via state, local, and federal initiatives and dedicated funding. The Little Fork 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 as well as monitoring and tracking progress toward water quality goals and pollutant load reductions.

7. Monitoring

Monitoring has been done for this impairment at various flow regimes. Very high and high flow conditions have generally met state *E. coli* standards, but mid and low flow regimes have higher incidences of elevated *E. coli*. Additional monitoring at very low flows may be necessary to further identify *E. coli* sources and priority areas. In addition, longitudinal sampling surveys should be done in various flow conditions to further develop plans for standard attainment through BMP work. These monitoring recommendations are not required but rather could be used to supplement information from MPCA’s monitoring programs.

8. Implementation strategy summary

8.1 Permitted sources

As discussed in chapters 3 and 4, ISD 2142 Pre-Kindergarten to Grade 12 N School (MN0069850) has existing permit limits that are consistent with the WLA in this TMDL (Table 5). At permit reissuance, WQBELs and/or additional monitoring requirements are considered by permitting staff. Based on review of data available on the MPCA’s Wastewater Data Browser, ISD 2142 Pre-Kindergarten to Grade 12 N School is currently meeting the *E. coli* WLA requirements set forth in this TMDL.

8.2 Nonpermitted sources

Implementation of the Flint Creek *E. coli* TMDL will require numerous BMPs that address non-NPDES-permitted sources of *E. coli*. Likely sources of *E. coli* to target for implementation are livestock and ITPHS.

Table 7 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 et al. 2017), the [Minnesota Stormwater Manual](#), and the University of Minnesota Extension’s [Onsite Sewage Treatment Program](#) website. The Little Fork River WRAPS Update Report (MPCA 2026) developed concurrently with this report contains a more comprehensive list of implementation strategies.

Table 7. Example BMPs for nonpermitted sources of *E. coli*

Strategy	BMP examples
Pasture management	Livestock access control
Pasture land runoff control and management	Filter strips, field borders, rotational grazing
Septic system improvements	Maintain and replace septic systems
	Identify and remove straight pipes
Buffers and filters	Riparian buffers and field borders
Education/outreach	Promote BMPs

8.3 SSTS

SSTS assessments, maintenance, 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 SSTS 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 SSTS.

Education is another crucial component of reducing pollutant loading from SSTS. 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.

8.4 Cost

The 1W1P for the Little Fork Watershed has this impairment in its workplan for the coming two years. The estimated cost of reducing this *E. coli* impairment is \$1.8 million. This estimate allows for 10 to 15 septic systems to be upgraded and brought into compliance (\$305,500), installation of 10 to 15 feedlot/manure management BMPs (\$1.5), and holding 10 to 30 outreach events (\$15,000) educating the public on how to reduce their contributions to the impairments. This range reflects the level of uncertainty in the source assessment and addresses the likely sources identified in Section 3.6.

8.5 Adaptive management

The implementation strategies and the more detailed WRAPS report, which was prepared concurrently with this TMDL report, are based on the principle of adaptive management (Figure 10). 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 de-listing impaired water bodies.

Figure 10. Adaptive management



9. Public participation

An opportunity for public comment on the draft TMDL report was provided via a public notice in the State Register from April 27, 2026, through May 27, 2026. There were xx comment letters received and responded to as a result of the public comment period. For further information on public participation for this TMDL report, please see the WRAPS report (MPCA 2026).

10. Literature cited

Baker, A.C.; Fitzpatrick, F.A.; Soderman, S.S.; Kennedy, M.J.; Sterner, S.P.; Anderson, J.P.; Gran, K.B.; Anderson, K.S.; Stroom, K.; Norvitch, P.; Blount, J.D.; Gutzmann, M.E.. 2025. Near-channel erosion as a driver of watershed-scale sediment and phosphorus loading in a forested sub-watershed of Lake of the Woods. Available at <https://www.sciencedirect.com/science/article/pii/S0380133025001388>

Burns & McDonnell Engineering Company, Inc. 2017. Minnehaha Creek Bacterial Source Identification Study Draft Report. Prepared for City of Minneapolis, Department of Public Works. Project No. 92897. May 26, 2017.

Chandrasekaran, R., M. J. Hamilton, P. Wang, C. Staley, S. Matteson, A. Birr, and M. J. Sadowsky. 2015. Geographic Isolation of *Escherichia coli* Genotypes in Sediments and Water of the Seven Mile Creek — A Constructed Riverine Watershed. *Science of the Total Environment* 538:78–85. <https://doi.org/10.1016/j.scitotenv.2015.08.013>

EPA (U.S. Environmental Protection Agency). 2002. Onsite Wastewater Treatment Systems Manual. EPA/625/R-00/008. EPA Office of Water and Office of Research and Development. February 2002. https://www.epa.gov/sites/default/files/2015-06/documents/2004_07_07_septics_septic_2002_osdm_all.pdf

- EPA (U.S. Environmental Protection Agency). 2022. 2022–2023 Vision for the Clean Water Act Section 303(d) Program. September 2022. https://www.epa.gov/system/files/documents/2022-09/CWA%20Section%20303d%20Vision_September%202022.pdf
- Fitzpatrick, F.A.; Sterner, S.P.; Baker, A.C.; Soderman, S.S.; Gran, K.B.; Kasun, A.P.; Kennedy, M.J.; Norvitch, P.; Anderson, J.P.; Gutzmann, M.E..2024. Stream Corridor Sediment Budget for Watershed Sediment Source Apportionment for the Forested Little Fork River, Minnesota. Available at <https://www.sedhyd.org/2023Program/1/71.pdf>
- Hobbs, H.C.; Goebel, J.E.. 1982. S-01 Geologic map of Minnesota, Quaternary geology. Minnesota Geological Survey. Retrieved from the University of Minnesota Digital Conservancy, <http://hdl.handle.net/11299/60085>.
- Ishii, S., W.B. Ksoll, R.E. Hicks, and M. Sadowsky. 2006. Presence and Growth of Naturalized *Escherichia Coli* in Temperate Soils from Lake Superior Watersheds. Applied and Environmental Microbiology 72: 612–21. doi:10.1128/AEM.72.1.612–621.2006
- Ishii, S., T. Yan, H. Vu, D. L. Hansen, R. E. Hicks, and M. J. Sadowsky. 2010. Factors Controlling Long-Term Survival and Growth of Naturalized *Escherichia coli* Populations in Temperate Field Soils. Microbes and Environments 25(1):8–14. doi: 10.1264/jsme2.me09172
- Jang, J., H.-G. Hur, M. J. Sadowsky, M. N. Byappanahalli, T. Yan, and S. Ishii. 2017. Environmental *Escherichia Coli*: Ecology and Public Health Implications—a Review. Journal of Applied Microbiology 123(3): 570–81. <https://doi.org/10.1111/jam.13468>
- Lenhart, C., B. Gordon, J. Peterson, W. Eshenaur, L. Gifford, B. Wilson, J. Stamper, L. Krider, and N. Utt. 2017. *Agricultural BMP Handbook for Minnesota, 2nd Edition*. St. Paul, MN: Minnesota Department of Agriculture. <https://wrl.mnpals.net/islandora/object/WRLrepository%3A2955>
- Minnesota Geological Survey, 2021, Surficial geology, Accessed July 8th, 2022, at <https://mngs-umn.opendata.arcgis.com/datasets/UMN::surficial-geology-1/about>.
- MPCA (Minnesota Pollution Control Agency). 2007. Statement of Need and Reasonableness, Book III of III: In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; The Proposed Addition of a New Rule, Minnesota Rules Chapter 7053, Relating to Point and Nonpoint Source Treatment Requirements; and The Repeal of Minn. R. Chapters 7056 and 7065. July 2007.
- MPCA (Minnesota Pollution Control Agency). 2012. Zumbro Watershed Total Maximum Daily Loads for Turbidity Impairments. Document number wq-iw9-13e. <https://www.pca.state.mn.us/sites/default/files/wq-iw9-13e.pdf>
- MPCA (Minnesota Pollution Control Agency). 2014. The Minnesota Nutrient Reduction Strategy. St. Paul, MN. Document number wq-s1-80. <https://www.pca.state.mn.us/sites/default/files/wq-s1-80.pdf>
- Minnesota Pollution Control Agency (MPCA), 2016. Little Fork River Watershed Sediment Reduction Project (Total Maximum Daily Load), Accessed September 25, 2019, at <https://www.pca.state.mn.us/sites/default/files/wq-iw10-05e.pdf>

- Minnesota Pollution Control Agency (MPCA), 2017. Little Fork River Watershed Restoration and Protection Strategy Report. Available at <https://www.pca.state.mn.us/sites/default/files/wq-ws4-21a.pdf>
- MPCA (Minnesota Pollution Control Agency). 2020. 5-year Progress Report on Minnesota's Nutrient Reduction Strategy. Document number wq-s1-84a. August 2020. Available at <https://www.pca.state.mn.us/water/five-year-progress-report>
- MPCA (Minnesota Pollution Control Agency). 2021. Little Fork River Watershed Assessment and Trends Update. Available at <https://www.pca.state.mn.us/sites/default/files/wq-ws3-09030005c.pdf>.
- MPCA (Minnesota Pollution Control Agency). 2024a. Minnesota's Total Maximum Daily Load Studies Prioritization Framework 2022–2032. March 2024. Document number wq-iw1-82. <https://www.pca.state.mn.us/sites/default/files/wq-iw1-82.pdf>
- MPCA (Minnesota Pollution Control Agency). 2024b. Minnesota's TMDL Commitments. March 2024. Document number wq-iw1-83. <https://www.pca.state.mn.us/sites/default/files/wq-iw1-83.pdf>
- MPCA (Minnesota Pollution Control Agency). 2025. Little Fork River (09030005) Watershed Model 2022 Model Calibration. Report available upon request
- MPCA (Minnesota Pollution Control Agency). 2026. PLACEHOLDER FOR WRAPS REPORT REFERENCE**
- RESPEC. 2011. Pervious (PERLND) and Impervious Land (IMPLND) Category Development. Technical memorandum to Minnesota Pollution Control Agency.
- RESPEC. 2012. Hydrology Calibration of Big Fork River and Little Fork River HSPF Watershed Models. Technical memorandum to Minnesota Pollution Control Agency.
- RESPEC. 2015. Model Extension and Recalibration for the Big Fork and Little Fork Watersheds Model Applications. Technical memorandum to Minnesota Pollution Control Agency.
- RESPEC. 2016. Model Land-Class Update and Recalibration for the Lake of the Woods, Rainy River, and Associated Drainage Areas in Both the United States and Corresponding Canadian Watersheds. Technical memorandum to Minnesota Pollution Control Agency.
- RESPEC. 2021. Lower Rainy Hydrological Simulation Program-FORTRAN Time-Series Extension. Technical memorandum to Minnesota Pollution Control Agency.
- Tymensen, L. D., Pyrdok, F., Coles, D., Koning, W., McAllister, T. A., Jokinen, C. C., Dowd, S. E., Neumann, N. F. 2015. Comparative accessory gene fingerprinting of surface water *Escherichia coli* reveals genetically diverse naturalized population. *Journal of Applied Microbiology*. 119(1):263–277. <https://doi.org/10.1111/jam.12814>