December 2025

Watershed

Redeye River Watershed Restoration and Protection Strategy Report Update 2025

MINNESOTA POLLUTION CONTROL AGENCY

CLEAN WATER LAND & LEGACY AMENDMENT

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Document number: wq-ws4-105a

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Key terms and abbreviations

1W1P	One Watershed, One Plan
AQC	aquatic fish consumption
AQL	aquatic life
AQR	aquatic recreation
BMP	best management practice
CAFO	Concentrated Animal Feeding Operations
CFS	cubic feet per second
DNR	Minnesota Department of Natural Resources
DO	dissolved oxygen
DOP	Dissolved Orthophosphate
E. coli	*Escherichia coli*
EPA	Environmental Protection Agency
FIBI	fish community-based Index of Biological Integrity
FWMC	flow weighted mean concentration
HSPF	Hydrologic Simulation Program–Fortran
IBI	index of biological integrity
IWM	intensive watershed monitoring
IWL	impaired waters list
LA	load allocation
mg/L	milligrams per liter
mL	milliliter
MPN	most probable number
MIBI	macroinvertebrate community-based Index of Biological Integrity
MPCA	Minnesota Pollution Control Agency
MSHA	MPCA Stream Habitat Assessment
NO2+NO3	Nitrate-Nitrogen
NPDES	National Pollutant Discharge Elimination System
SAM	Scenario Application Manager
SID	stressor identification
SSTS	Subsurface Sewage Treatment Systems

10X	Ten times (chemistry samples collected on 10 dates)
TKN	Total Kjeldahl Nitrogen
TN	total nitrogen
TMDL	total maximum daily load
TP	total phosphorus
TSS	total suspended solids
USGS	United States Geological Survey
WID	waterbody identification
WHAF	watershed health assessment framework
WPLMN	Watershed Pollutant Load Monitoring Network
WLA	wasteload allocation
WRAPS	watershed restoration and protection strategy
WTP	Water Treatment Plant
WWTF	Wastewater Treatment Facility

Executive summary

The State of Minnesota has adopted a watershed approach for managing water quality for each of the 80 major watersheds in the state. Every 10 years, each major watershed undergoes surface water monitoring and assessment and has the opportunity for a Watershed Restoration and Protection Strategy (WRAPS) Update Report to be written. The first intensive watershed monitoring (IWM) cycle began in the Redeye River Watershed in 2011, with the initial WRAPS report approved in 2016.

The *Redeye River WRAPS Report Update 2025* (WRAPS Update) is an update of the 2016 WRAPS report. This WRAPS Update summarizes water quality findings from the second round of IWM, stressor identification (SID), and water quality research projects and studies. The goals of this WRAPS Update are to:

1. Highlight differences and trends in watershed conditions over the last 10 years;
2. Share updated surface water quality resources, information, and tools for watershed stakeholders as they plan and implement best management practices (BMPs); and
3. Recommend implementation priorities and targets throughout the watershed.

Overall, water quality conditions have not significantly changed in the Redeye River Watershed since 2011. The following summary highlights these updated findings for lakes, streams, and overall watershed conditions.

Condition of Lakes:

- All the lakes that were sampled in Cycle 1 and Cycle 2 meet water quality standards for aquatic recreation (AQR).
- Water quality data for East Leaf Lake (56-0116-02) is declining and is nearly impaired by nutrients.
- Seven lakes within the watershed were reviewed for aquatic life (AQL) use standards for the first time using the Fish-Based Index of Biological Integrity (FIBI) developed for Minnesota lakes. One lake, Wolf Lake, was not considered assessable due to frequent winterkills. The six remaining lakes (Adley, Donalds, East Leaf, Middle Leaf, West Leaf, and Portage) were all found to be fully supporting AQL.

Condition of Rivers and Streams:

- Fifteen of the 21 stream reaches assessed (71%) meet the standard for AQL in the Redeye River Watershed.
- Three stream reaches that were previously impaired for AQL use were removed from the impaired waters list (IWL) due to a correction in data.
- The eight streams determined to be impaired for *Escherichia coli (E. coli)* in the first watershed assessment are still impaired 10 years later. However, two of these streams show that *E. coli* levels are improving and with this most recent assessment are close to meeting water quality standards.
- There are five new stream reaches impaired for AQL use.

Watershed and Climate Trends:

Long-term water quality and flow trend analysis was completed on the Redeye River (2009 through 2020). Data indicated:

- Nitrate-nitrogen (NO2+NO3) showed a significant increasing trend,
- Total phosphorus (TP) and total suspended solids (TSS) showed no significant trend,
- Average yearly stream flow decreased by approximately 13% (roughly 40cfs) over the 12-year period of record.

The climate summary report for this watershed developed by the Department of Natural Resources (DNR) indicates the following for temperature and precipitation:

- Temperature - the average, minimum and maximum temperatures show a slight increase, most notably in the winter.
- Precipitation - data show a slight increase in precipitation in the fall, spring, and summer but a decrease during the winter.

Watershed modeling revealed areas along the Wing River and Leaf River had higher amounts of sediment, nitrogen, and phosphorus.

Watershed Restoration and Protection Goals:

Some of the water quality in the watershed is still healthy; however, there are existing impairments and there are several areas that are vulnerable to impairment and would benefit from implementation efforts to keep them from becoming impaired.

Where impairments exist, restoration activities are recommended as noted below. A culvert inventory and livestock inventory were completed as part of this WRAPS Update to help target both restoration and protection activities.

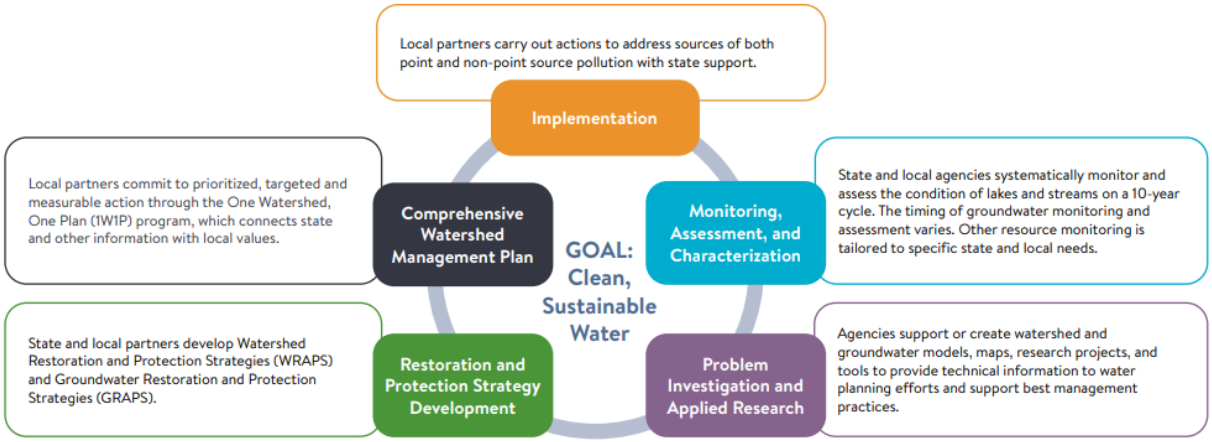
The restoration and protection goals for the Redeye River Watershed are to:

- Protect water quality in East Leaf Lake, the water quality in East Leaf Lake is declining and could be impaired next cycle if strategies to reduce nutrients to the lake are not implemented. Consider near shore practices like septic system compliance, lakeshore buffers, stormwater management, and watershed wide practices like cropland nutrient reductions, increasing forested acreage and conservation easements.
- Restore water quality on streams with existing *E. coli* impairments, especially Bluff and Oak Creeks that are currently in the Clean Water Act Section 319 small watershed program. BMPs such as cattle exclusion, increasing riparian buffers, manure management, prescribed grazing plans, filter strips and soil health practices are recommended.

1. Watershed Approach

Minnesota has adopted a watershed approach to address the state's 80 major watersheds. The Minnesota Watershed Approach incorporates **water quality assessment, watershed analysis, public participation, planning, implementation, and measurement of results** into a 10-year cycle that addresses both restoration and protection.

Along with the Watershed Approach, the Minnesota Pollution Control Agency (MPCA) developed a process to identify and address threats to water quality in each of these major watersheds.



This process is called WRAPS development. The WRAPS reports have two parts: impaired waters have strategies for restoration, and waters that are not impaired have strategies for protection.

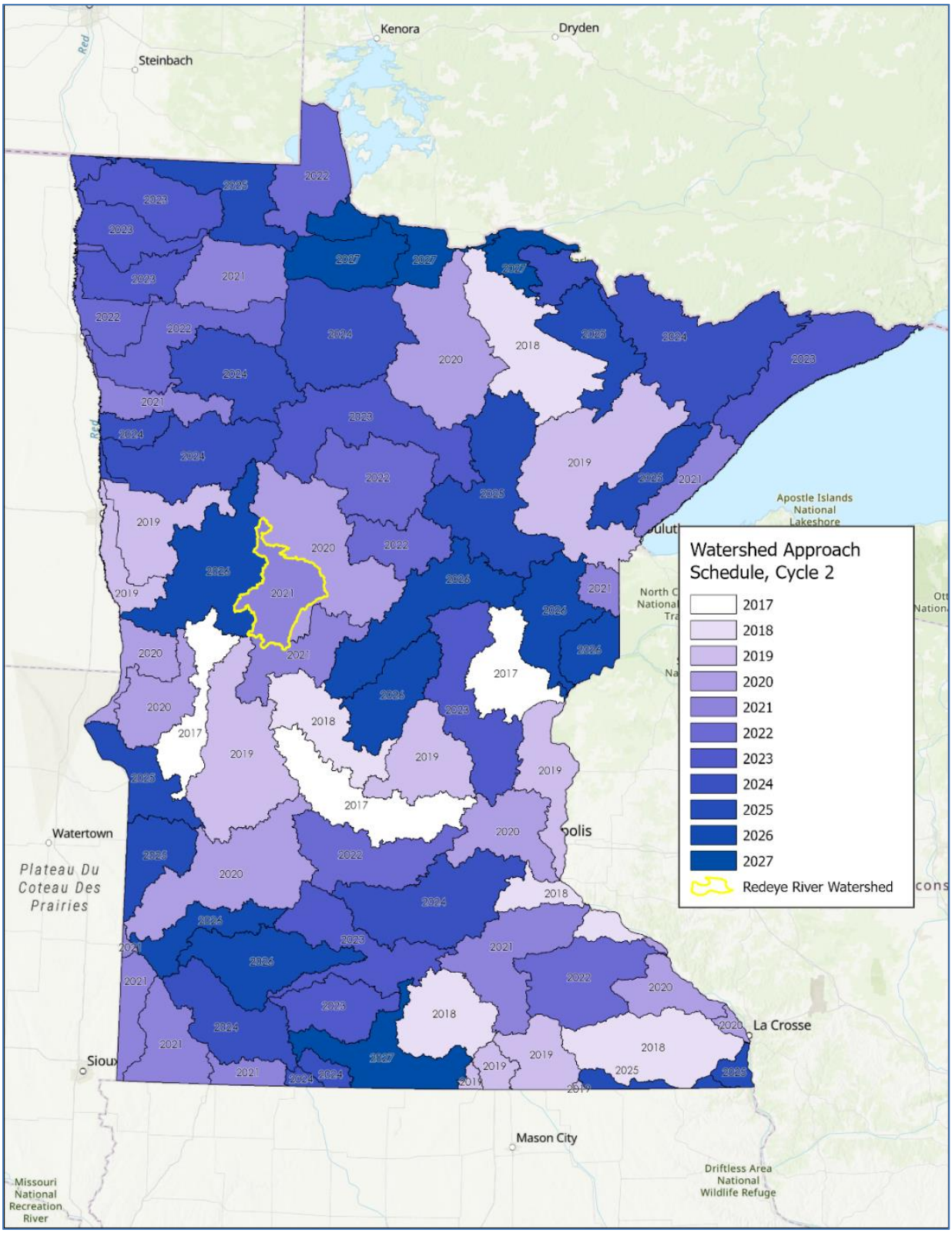
Waters not meeting state standards are listed as impaired, and total maximum daily load (TMDL) studies may be developed for them. The TMDLs are incorporated into the WRAPS reports. In addition, the Watershed Approach process facilitates a more cost-effective and comprehensive characterization of multiple water bodies and overall watershed health, including both protection and restoration efforts. A key aspect of this effort is to develop and use watershed-scale models and other tools to identify strategies for addressing point and nonpoint source pollution that will cumulatively achieve water quality targets. For nonpoint source pollution, the WRAPS report informs local planning efforts, but ultimately the local partners decide what work will be included in their local plans. The WRAPS report also serves as a building block for addressing the U.S. Environmental Protection Agency's (EPA) Nine Minimum Elements of watershed plans, to help qualify applicants for eligibility for Clean Water Act Section 319 implementation funds.

Watershed Approach assessment work started in the Redeye River Watershed in 2011 and was revisited in 2022 (Figure 1). Some of the information presented in this report was produced in earlier Watershed Approach work, prior to the development of the WRAPS report. However, this WRAPS Update presents additional data and analyses, and works to summarize results into a comprehensive story of the watershed's surface water quality. Related Cycle 1 reports are listed below and can be found at: Redeye River | Minnesota Pollution Control Agency (state.mn.us).

- *Redeye River Watershed Assessment and Trends Update Cycle 2*
- *Redeye River Watershed Stressor Identification (SID) Report*

- *Redeye River Watershed Restoration and Protection Strategies*
- *Redeye River Watershed Pollutant Reduction Project (TMDL) Study for Bacteria*

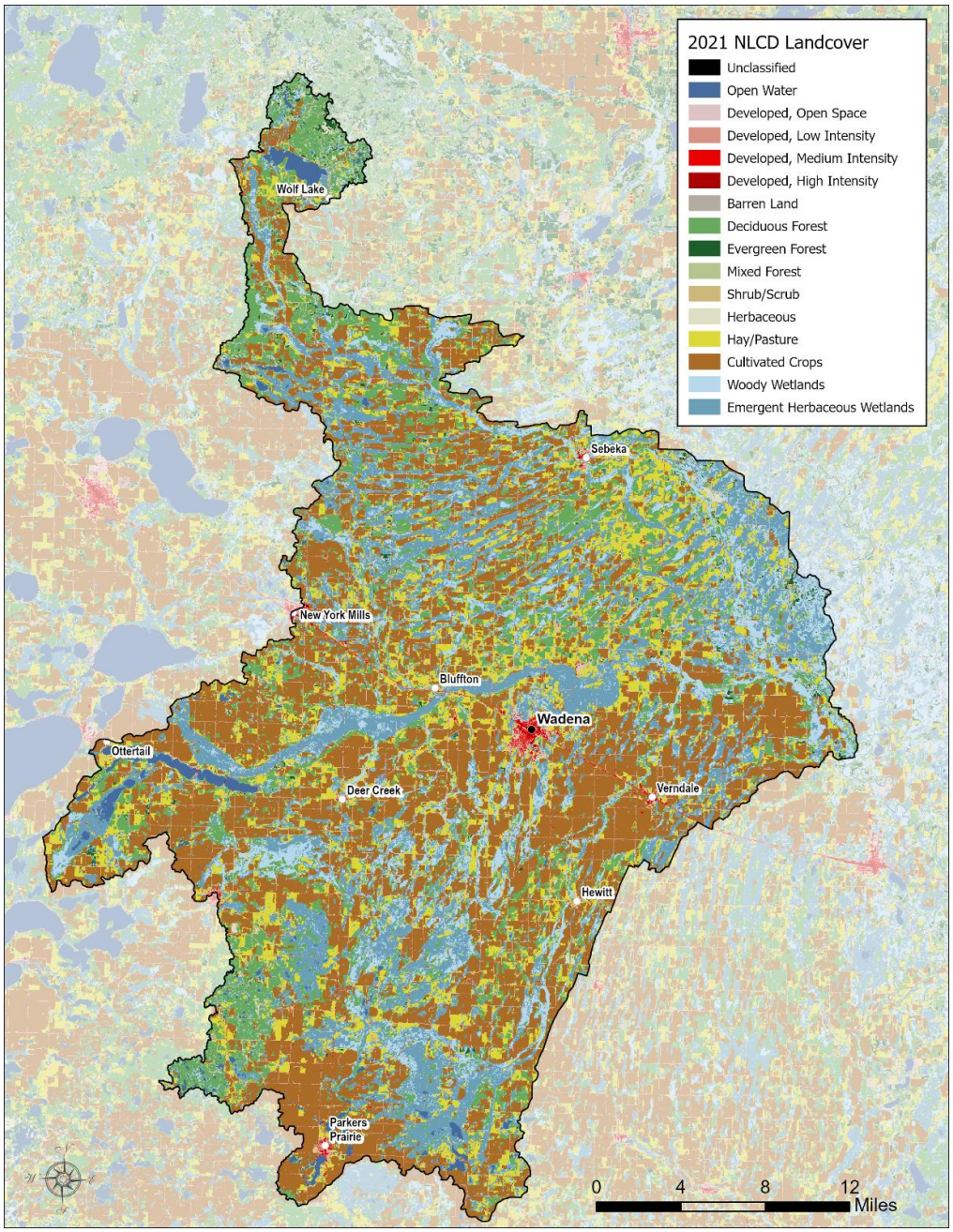
Figure 1. Watershed Approach Schedule Cycle 2.



2. Watershed description

The Redeye River Watershed (07010107) lies within the northwestern to north-central portion of the Upper Mississippi River Basin in central Minnesota. The watershed has 28 stream assessment units (AUIDs) and 73 lakes greater than 10 acres. The recreational value of lakes and streams are assets to the health and wealth of local economies throughout the watershed. Major rivers within the watershed are the Redeye, Leaf, and Wing. Major lakes in the watershed include Wolf, Gourd, and the chain of West, Middle, and East Leaf Lakes. The Redeye River provides habitat for aquatic life, riparian corridors for wildlife, and recreational opportunities such as fishing, swimming, and canoeing for local communities.

Figure 2. Redeye River Watershed land use.



As of 2021, the land cover in the Redeye Watershed shows:

- 49% agriculture (crop and rangeland)
- 30% forests
- 15% wetlands
- 2% water
- 4% is developed for housing, business and industrial complexes, county roads, and city streets

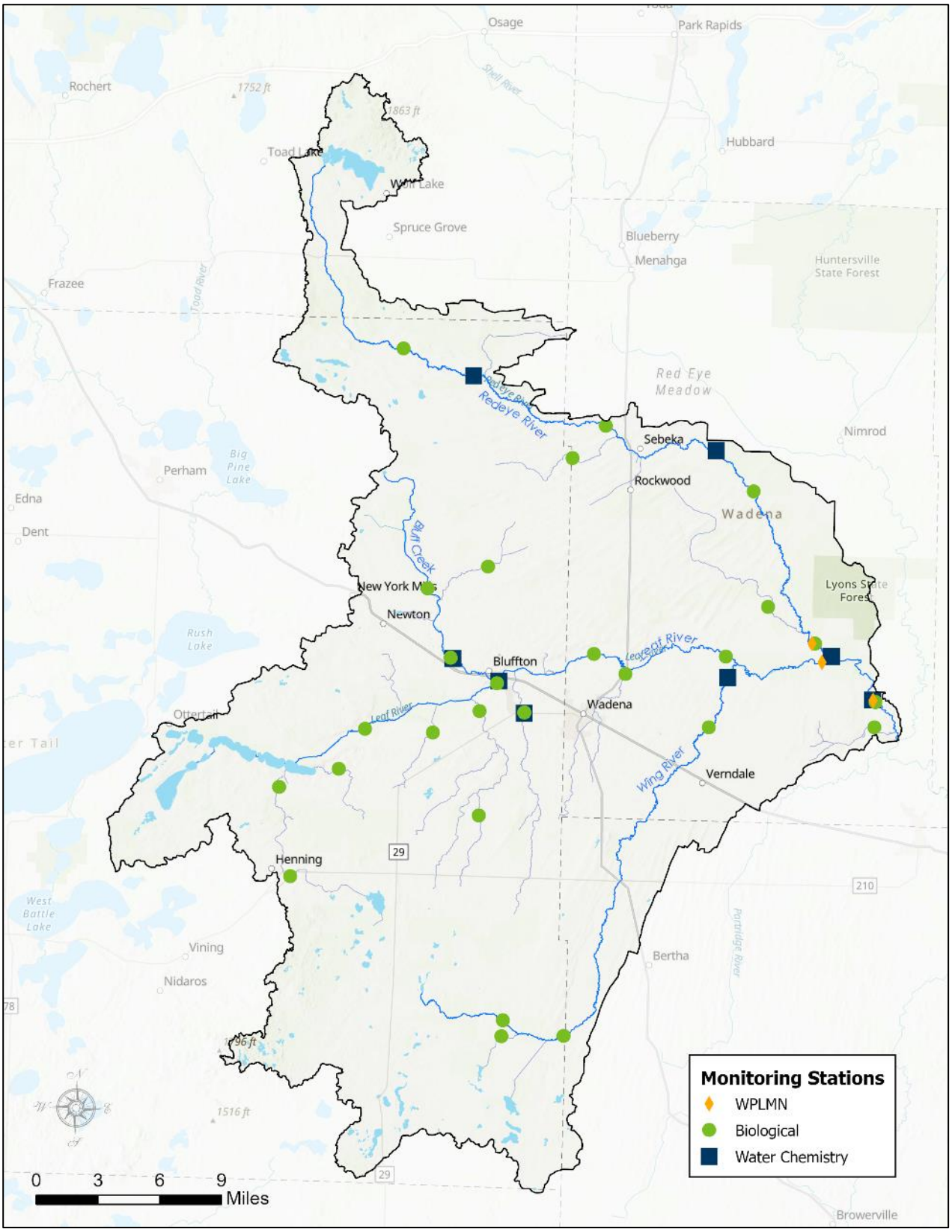
3. Assessing water quality

3.1 Lakes and streams

The MPCA and partners conducted biological and chemical surveys on lakes, rivers, and streams in 2011-2012 and again in 2022-2023 to assess if the water bodies met water quality standards for AQL, AQR, and fish consumption (AQC). The biological and chemistry data collected from streams and rivers was also used to determine if any change in condition had occurred between the two time periods. The overall goal of these assessments is to ultimately determine which waters are healthy and in need of protection or are polluted and require restoration. Figure 3 shows the watershed monitoring locations.

Water monitoring is essential to determining whether lakes and streams meet water quality standards designed to ensure that waters are fishable and swimmable. While local partners and state agencies monitor water quality on an ongoing basis, the MPCA conducts intensive monitoring of major lakes and streams in each of the state's 80 watersheds every 10 years to detect any changes in water quality. This intensive monitoring looks at fish and macroinvertebrate communities as well as water chemistry to gauge water quality. The partners use the data to see which waters are healthy and need protection and which waters are impaired and need restoration.

Figure 3. Redeye River Watershed Cycle 2 Monitoring Locations.



Waters are considered impaired if they fail to meet water quality standards as defined by the EPA and MPCA. More information on how waters are assessed can be found here:

- Guidance Manual for Assessing the Quality of Minnesota Surface Waters for Determination of Impairment: 305(b) Report and 303(d) List - 2022 (state.mn.us).
- *Redeye River Watershed Assessment and Trends Update* provides additional information on lake and stream monitoring and the Tableau Viewer.
- Water Quality Assessment Results Data Viewer | Tableau Public provides an interactive way to view the data.

Section 4 below provides a summary of waterbody health assessment information.

3.2 Stressor identification

When streams and lakes are found to have impaired fish and macroinvertebrates communities, the causes of these biological impairments are studied and identified in a process called SID. The SID process identifies the parameters that negatively impact the biological communities, referred to as "stressors". Stressors are identified using the EPA Caddis process. In short, stressors are identified based on the characteristics of the aquatic community in tandem with water quality information and other observations. This WRAPS report summarizes the streams SID results in Section 4.2.2 below. The full SID report is available at *Red Eye River Stressor Identification Report 2025*.

3.3 Computer modeling

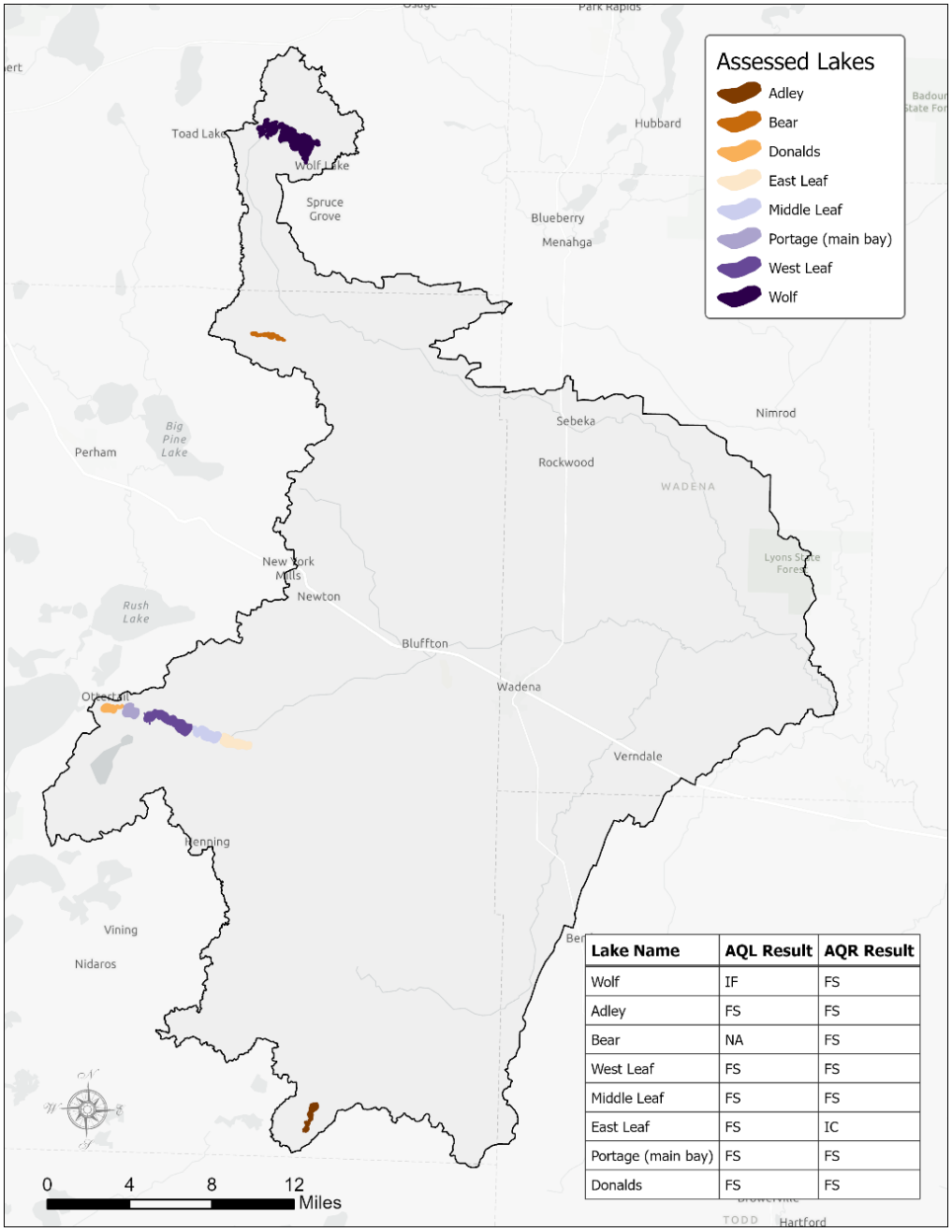
Monitoring for pollutants and stressors using the Watershed Approach is generally extensive, but not every stream or lake can be monitored due to financial and logistical constraints. In these areas where less monitoring is done, computer modeling can extrapolate the known conditions of the watershed to areas with less monitoring data. Computer models, such as Hydrological Simulation Program – Fortran (HSPF [USGS 2014c]), represent complex natural phenomena with numeric estimates and equations of natural features and processes. The HSPF model incorporates data including stream pollutant monitoring, land use, weather, soil type, etc. to estimate flow, sediment, and nutrient conditions in the watershed. The HSPF model output provides a reasonable estimate of pollutant concentrations across watersheds. The output can be used for source assessment, TMDL calculations, and prioritizing and targeting conservation efforts. Modeled pollutant concentration yields are presented in Section 5.1.

4. Watershed condition

4.1 Water quality conditions – Lakes

All of the lakes that had enough data to assess meet water quality standards for AQR and AQL. There were no new AQR lake impairments identified in the watershed during the first or second cycle of monitoring. However, water quality is declining in East Leaf Lake and it is nearly impaired by nutrients. Table 1 compares the chlorophyll-*a*, TP, and Secchi disc values from Cycle 1 and Cycle 2 for the assessed lakes in the watershed. Some of the parameters are improving while others are declining.

Figure 4. Redeye River Watershed water quality condition of lakes.



Lake Name	AQL Result	AQR Result
Wolf	IF	FS
Adley	FS	FS
Bear	NA	FS
West Leaf	FS	FS
Middle Leaf	FS	FS
East Leaf	FS	IC
Portage (main bay)	FS	FS
Donalds	FS	FS

Seven lakes within the watershed were reviewed for AQL use standards for the first time using the FIBI developed for Minnesota lakes. One lake, Wolf Lake, was not considered assessable due to frequent winterkills. The six remaining lakes (Adley, Donalds, East Leaf, Middle Leaf, West Leaf, and Portage) were all found to be fully supporting AQL.

Table 1. Aquatic recreation data for lakes assessed in the Redeye River Watershed.

		Cycle 2 Assessment	Chla mean value (ug/L)		TP mean value (mg/L)		Secchi mean value (meters)	
Lake ID (WID)	**Waterbody Name**	**AQR**	**Cycle 1**	**Cycle 2**	**Cycle 1**	**Cycle 2**	**Cycle 1**	**Cycle 2**
03-0101-00	Wolf	FS	6	8.8	22.5	26.5	2.04	1.4
56-0031-00	Adley	FS	24	19.1	45.5	35.6	1.82	2.3
56-0069-00	Bear	FS	11	9.1	25.8	31.6	2.41	2.8
56-0114-00	West Leaf	FS	9	7.8	19.4	35.2	2.72	2.4
56-0116-01	Middle Leaf	FS	8	6.5	19.5	18.4	2.96	2.8
56-0116-02*	East Leaf	IC*	23	21.2	37.1	37.1	1.99	2.1
56-0140-01	Portage	FS	3	2.8	10.1	10.4	4.07	4.9
56-0200-00	Donalds	FS	4	3.2	17.1	15	3.39	4.4

*Inconclusive (IC) and vulnerable to impairment

Table 2. Aquatic life data for lakes assessed the Redeye River Watershed.

Lake ID (WID)	Waterbody Name	Assmt. AQL	FIBI Scores	Score the Shore	Comments
03-0101-00	Wolf	IF	Not assessed due to fish winter kill		
56-0031-00	Adley	FS	50 (2023) 37 (2021) 47 (2007) *	67 - Moderate (2017)	Watershed Area: Lake Surface = 14:1 Watershed Disturbance = 77%
56-0069-00	Bear	NA	Not assessed		
56-0114-00	West Leaf	FS	63 (2022) 57 (2018) 54 (2007) *	79 - Moderate (2017)	Watershed Area: Lake Surface = 30:1 Watershed Disturbance = 53%
56-0116-01	Middle Leaf	FS	66 (2023) 40 (2022) 61 (2018)	76 - Moderate (2017)	Watershed Area: Lake Surface = 181:1 Watershed Disturbance = 53%
56-0116-02	East Leaf	FS**	48 (2022) 45 (2018)	86 - High (2017)	Watershed Area: Lake Surface = 173:1 Watershed Disturbance = 53%
56-0140-01	Portage	FS	55 (2023) 60 (2022)	75 - Moderate (2023)	Watershed Area: Lake Surface = 11:1 Watershed Disturbance = 51%
56-0200-00	Donalds	FS	45 (2021) 43 (2010) *	64 - Moderate (2021)	Watershed Area: Lake Surface = 6:1 Watershed Disturbance = 58%

* Used for supporting data

**Vulnerable to impairment

4.2 Water quality conditions – Streams

4.2.1 New stream impairments

There were seven new stream impairments on five different streams. Table 3 and Table 4 provide details about the new stream impairments and Table 5 discusses the previous stream impairments from Cycle 1.

Figure 5. Redeye River Watershed impaired streams

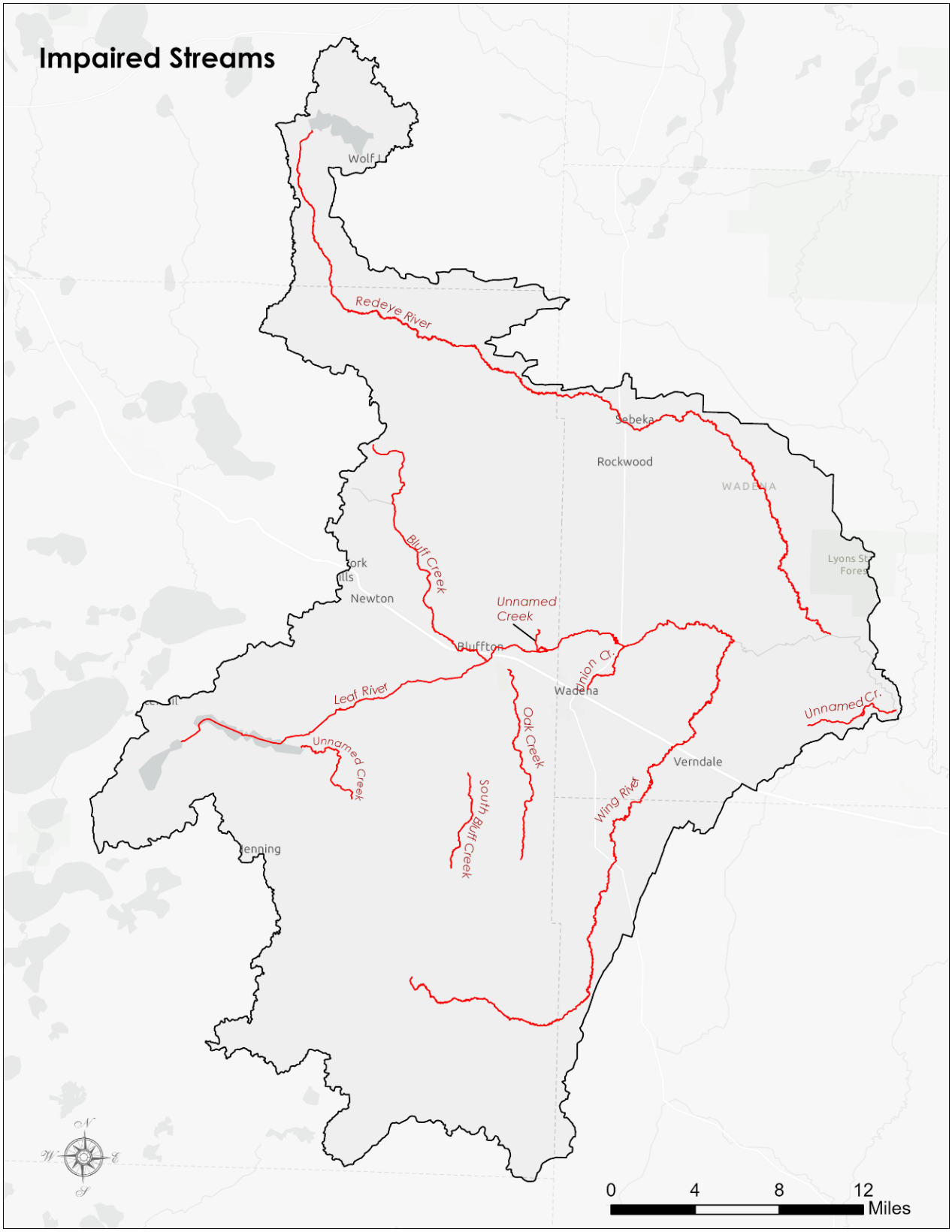


Table 3. New stream impairments

Stream Name and Reach	Impairment Description	Comments
Leaf River 07010107-506 *Added to the IWL in 2020*	FIBI –There was one visit to the biological station 11UM063 for this 17.39 mile general use stream. Lab water chemistry shows a reduction in nitrogen and TSS over the last 10 years. The FIBI scores three points above the threshold but within the confidence interval.	This reach is a good candidate for additional fish sampling for a potential delisting.
Union Creek 07010107-508	FIBI - One fish sample from 13UM178 was collected on 6/22/2022 that falls just below the general use threshold but within the lower confidence interval in the Northern Coldwater Fish Class. MIBI– This section of Union Creek was sampled at the same biological monitoring station (13UM178) during the summer of 2022. The resulting MIBI score is below the coldwater general use lower confidence interval.	This 4.8 mi reach is also impaired by *E. coli* and receives runoff from the city of Wadena as well as inputs from the Wadena Wastewater Treatment Facility (WWTF).
Union Creek 07010107-509	MIBI - This section of Union Creek was sampled at two locations (13UM176 and 00UM095) during the summer of 2023. The resulting MIBI scores are below the coldwater general use threshold.	This is the upstream reach that flows from agricultural fields through the City of Wadena.
Hay Creek 07010107-526	FIBI – This site had three fish samples at two stations (15EM015, 11UM041). FIBI scores (34.18, and 11.37) at 15EM015 from a 2015 visit falls below the threshold, but within the lower confidence limit. A 2021 visit to the same station falls well below the threshold. 11UM041 had one visit, and FIBI score falls below threshold, but within confidence limit. MIBI - This six mile section of Hay Creek was sampled at two biological monitoring stations (11UM041, 15EM015) during the summer of 2015 through 2022. The sample at 11UM041 (24.28) in 2022 produced a MIBI score that was below threshold but above the lower confidence interval, the sample at 15EM015 (41.93) in 2015 produced a MIBI score that was above threshold but below the upper confidence interval, and the sample at 15EM015 (37.04) in 2020 produced a MIBI score that was above threshold but below the upper confidence interval.	This reach is also impaired by *E. coli*.
County Ditch 13 07010107-549	FIBI – There were two visits to one station (11UM079). FIBI score (26.09) in 2022 is well above modified Use Threshold (15), however, the 2023 sample falls well below the threshold.	This reach flows for 2.91 miles and is fully channelized.

4.2.2 Stressors causing stream biological impairments

Four streams were further investigated to determine the stressors causing biological impairment. A summary of the main stressors for each reach are provided in the table below. Please review the entire *Red Eye River Watershed Stressor Identification Report Update 2025* for additional information.

Table 4. Summary of stressors for biological impaired streams

Stream Reach	Stressors to Biology
Leaf River 07010107-506 Impaired FIBI *Added to the IWL in 2020*	Hydrology - Poor sinuosity, poor channel development, and fine sediment were noted within the MPCA Stream Habitat Assessment (MSHA) assessment. These are the result of channel over widening and the creation of a new channel through large wetlands. Habitat – Stream substrate dominated by sand and silt due to channelization. Dissolved Oxygen (DO) – Naturally low DO due to wetland influence and wild rice die off.
Union Creek 07010107-508 Impaired FIBI and MIBI 07010107-509 Impaired for MIBI	Nutrients and DO - Elevated TP and unstable DO levels indicate stressors to the aquatic life. Altered hydrology and habitat - Altered hydrology and geomorphology have also impacted the aquatic life within Union Creek, by removing habitat, increasing the amount of nutrients drained from the landscape, and altering the historic flow condition.
Hay Creek 07010107-526 impaired FIBI and MIBI	DO - The unstable DO levels within the chemistry dataset indicate that DO is a stressor to the aquatic life. The low DO conditions appear to be connected to wetland and land use conditions along the channel. Hydrology and Flow - Land use and substrate have also impacted the aquatic life within Hay Creek, by smothering habitat, increasing the amount of nutrients drained from the landscape, and altering the historic flow conditions due to the increased amount of center pivot irrigation.
County Ditch 13 07010107-549 Impaired FIBI	DO - The unstable DO levels within the chemistry dataset indicate that DO is a stressor to the aquatic life within the ditch. The low DO conditions appear to be connected to low flow conditions in the channel. Altered hydrology and flow - Altered hydrology and geomorphology have also impacted the aquatic life within CD13, by removing habitat, increasing the amount of nutrients drained from the landscape, and altering the historic flow conditions. Connectivity - Connectivity is also a main stressor to the fish community in CD13. High velocities within the culvert during high flows will impede the ability of fish to migrate through the culvert. This channel also gets very low during periods of low rainfall. During this time the culvert is too shallow to allow for fish passage.

4.2.3 Existing stream impairments

Table 5 shows the streams that were found to be impaired in Cycle 1 and updated information gathered during the second cycle of assessments. Of the eight stream reaches that were impaired by *E. coli* in Cycle 1, those that were sampled in Cycle 2 remain impaired with some showing significant improvement.

Table 5. Status of existing impaired streams from Cycle 1

Stream ID	Impairment	Data update and comments
07010107-503 Redeye River	*E. coli*	**Still Impaired.** New data from 2022-23 confirms that bacteria concentrations are still chronically elevated, and those elevated concentrations occur at several different stations along the length of the Waterbody Identification (WID). June and Sept both exceed the monthly geometric mean standard, and July is very nearly at the standard. See
07010107-505 Leaf River	*E. coli*	**Need more data**. Not sampled Cycle 2, the existing *E. coli* impairment remains. This reach should be sampled to determine if water quality is improving due to changes in land use in the watershed.
07010107-508 Union Creek	*E. coli*	**Need more data**. Not sampled Cycle 2, the existing *E. coli* impairment remains. This reach should be sampled to determine if water quality is improving due to changes in land use in the watershed.
07010107-514 Leaf River	*E. coli*	**Still Impaired.** New *E. coli* bacteria data from 2022-23 at station S005-732 confirm that bacteria concentrations are still elevated, and the listing should remain in place. While only one June sample exceeded the individual standard, June would still exceed the monthly geometric mean standard even if that high value was excluded. This confirms a continued presence of higher than desirable *E. coli* concentrations.
07010107-515 Bluff Creek	*E. coli*	**Improving.** New *E. coli* data from 2022-23 at station S006-849 is inconclusive. Only two samples out of 18 are above the geometric mean chronic standard; however, one extremely high value from 6/21/22 is driving the exceedance seen in the monthly geometric mean calculation for June. Without that sample, there would be zero individual or monthly exceedances, and we could consider a delisting action. This WID is considered "Barely impaired" and suggest that an additional year of monitoring may solidify this as a delisting candidate. This reach has been a priority for BMP implementation including practices such as manure pit closures, livestock exclusion and soil health practices like cover cropping
07010107-516 Oak Creek *reach split into -563 and -564*	*E. coli*	This reach was split into reach -563 and -564 described below.
*07010107-563 Oak Creek	*E. coli*	**Need more data**. This reach was split from -516 and there isn't enough *E. coli* data on this reach to determine that it is not impaired, and the existing parent *E. coli* impairment remains. Need additional monitoring to determine status of *E. coli* impairment.
*07010107-564 Oak Creek	*E. coli*	**Still Impaired**. The *E. coli* bacteria listing from the now retired parents WID (-516) has been carried-forward to this new child WID (-564). All old and new data were collected at S001-433. The original listing was based on 3 out of 3 geometric monthly mean standard exceedances (which also included a single acute exceedance of the individual standard). New data from 2022 and 2023 at S001-433 show that *E. coli* bacteria concentrations continue to be chronically elevated in June (146 MPN/100mL*) and July (140 MPN/100mL). **Most probable*

Stream ID	Impairment	Data update and comments
		number (MPN)/milliliter (mL). The recently completed livestock inventory can help inform causes and potential BMPs.
07010107-526 Un. Cr. (Hay Creek)	*E. coli*	**Need more data**. Not sampled Cycle 2, the existing *E. coli* impairment remains. This reach should be sampled to determine if water quality is improving.
07010107-560 Wing River	*E. coli*	**Improving.** New data from 2022-23 show a large improvement compared to the previous assessment, with only one month (August) now exceeding the geometric mean standard, but to a much lesser degree. Previously, August was at 204 MPN/100mL and now it is at 150 MPN/100ml. That is still confidently above the 126 MPN/100mL standard, but concentrations are consistently lower. This reach is considered 'Barely Impaired' WID and a candidate for a near future delisting of the *E. coli* impairment. Improvements are likely due to manure pit closures in the area.

4.2.4 Stream delistings and corrections

There were three stream reaches found to be impaired in Cycle 1 and updated information gathered during Cycle 2 shows a change in the impairment status. There were no implementation actions taken on these stream reaches so they are considered a list correction rather than a delisting without corrective action.

Table 6. Stream delistings and corrections

Stream ID	Impairment	Data update and comments
07010107-553 South Bluff Creek	FIBI	Delisting from the IWL for FIBI due to recent attainment of water quality standard due to unknown reasons.
07010107-553 South Bluff Creek	MIBI	Correction to the IWL for MIBI. Reassessment of old data utilizing new standards indicates support and is not contradicted by new data.
07010107-554 unnamed creek	FIBI	Correction to the IWL for FIBI due to concerns of original listing data and new data indicates support.

4.3 Water quality trends

4.3.1 Lake clarity trends

There are eight lakes within the Redeye River Watershed, only three have enough data to determine a long term water clarity trend. Two are showing a steady condition and one (West Leaf Lake) is degrading, as shown in the table below.

Table 6. List of lakes with clarity trend data

Lake Name	Lake ID	County	Trends
03-0101-00	Becker	Wolf	Insufficient Data
56-0031-00	Adley	Ottertail	Insufficient Data
56-0069-00	Bear	Ottertail	Insufficient Data
56-0114-00	West Leaf	Ottertail	Degrading
56-0116-01	Middle Leaf	Ottertail	Steady Condition

Lake Name	Lake ID	County	Trends
56-0116-02*	East Leaf	Ottertail	Steady Condition
56-0140-01	Portage	Ottertail	Insufficient Data
56-0200-00	Donalds	Ottertail	Insufficient Data

4.3.2 Stream biological trends

Across the watershed, there is no significant change in stream biological condition over the last 10 years for fish; however, macroinvertebrates showed significant improvements. This may be in part to multiple small scale BMPs in the watershed aimed at reducing sediment and nutrient loads. Continued problems with high levels of bacteria are still present. Continuing water monitoring will be essential to determining whether lakes and streams meet water quality standards designed to ensure that waters are fishable and swimmable.

4.3.3 Stream water quality and flow trends

The Watershed Pollutant Load Monitoring Network (WPLMN) has three monitoring stations in the Redeye River Watershed: one on the Redeye River and two on the Leaf River (Figure 3).

Redeye River Watershed Trends (2009-2020)

- Nitrate-nitrogen showed a significant increasing trend.
- TP and TSS showed no significant trend.
- Average yearly flow decreased by approximately 13% (roughly 40cfs) over the 12-year period of record.
- The Redeye River Watershed contributes 7% of the flow to the Mississippi River but 19% of the nitrogen load.

The Redeye River station is located nine miles north of the town of Aldrich on 221st Avenue, roughly two river miles upstream of the confluence with the Leaf River. The upstream Leaf River site is located about eight miles north of Aldrich on CR26, roughly one-half mile upstream of the confluence with the Redeye River. Both Redeye River and upstream Leaf River stations are subwatershed sites, are sampled from snow melt through October 31 annually, and have been monitored since 2015. The downstream Leaf River site is located seven miles north of the town of Staples, downstream of the Aldrich site roughly six river miles and is downstream of the confluence with the Redeye River. This is a major watershed station, at which water samples are collected year-round, and has been monitored since 2009.

All three sites are monitored for: TSS, TP, and NO2+NO3 while the downstream Leaf River site is also monitored for Total Kjeldahl Nitrogen (TKN) and Dissolved Orthophosphate (DOP). The concentrations in Table 7 are expressed as the average Flow Weighted Mean Concentrations (FWMC) - in other words, the average concentration of a pollutant in all the water that passed a monitoring station over the course of the monitoring period. Both stations NO2+NO3 concentrations within the Redeye River are highest during spring melt, then generally decrease throughout the rest of the season. Contrary to this, both Leaf River stations have highest NO2+NO3 concentrations late fall through winter. Concentrations at the Leaf River stations are inverse to flow meaning that when flow increases the concentrations decrease and when flows decrease concentrations increase. Unlike watersheds to the north and east of the Redeye River Watershed, the cropland found within this watershed likely plays a role in the increased nitrate concentrations found within this system. As the Leaf River flows east, it is possible nitrates from

both point and nonpoint sources such as, but not limited to, septic systems, manure and/or fertilizer applications on croplands and decomposition of soils and organic matter, are entering the stream from overland flow during spring snowmelt and fall rain events when crops are absent.

Table 7. Comparison of average total FWMC for the Redeye and Leaf Rivers (Redeye and Leaf at Aldrich 2017-2020, Leaf River at Staples 2009-2020).

Station	Station ID	TSS (mg/L)	N02+N03 (mg/L)	TP (mg/L)
Redeye River at Aldrich (Subwatershed Site)	S006-848	4.1	0.06	0.08
Leaf River at Aldrich (Subwatershed Site)	S001-153	8.5	0.55	0.07
Leaf River at Staples (Major Watershed Site)	S001-931	11.0	0.62	0.07

Similarly, TP and TSS concentrations within the watershed are both representative of the land use transition seen in Minnesota from lower concentrations found north and northeast to the higher concentrations south and southwest. A common pattern exists at all three stations where TSS and TP concentrations increase with flow. Increased flow and pollutant concentrations are commonly associated with rising flows during snow/ice melt and following heavy rain events. This information suggests that since phosphorus is bound within the sediment particles on the landscape, when overland flow during snowmelt and rain events erode the topsoil and/or riverbanks, the sediment that is washed into the river carries phosphorus along with it.

At a broader scale, the concentrations found within this watershed can be compared to those found downstream in both the Crow Wing River and the Mississippi River. This comparison helps gauge the impact that the Redeye River Watershed has on the Upper Mississippi River Basin, specifically the section located within central Minnesota. The Redeye River Watershed pollutant concentrations were compared to those found at the next downstream monitoring location on the Crow Wing River near Pillager, roughly 36 miles downstream of the confluence with the Crow Wing River. In total, the Redeye River Watershed contributes 46% of this total drainage area and an average of 25% of the total flow volume to the Crow Wing River at Pillager.

NO2+NO3 was the largest contributing pollutant to the Crow Wing River at 43% of the annual load while TP and TSS have a lesser impact, although still significant, contributing 40% and 37% of the average loads, respectively.

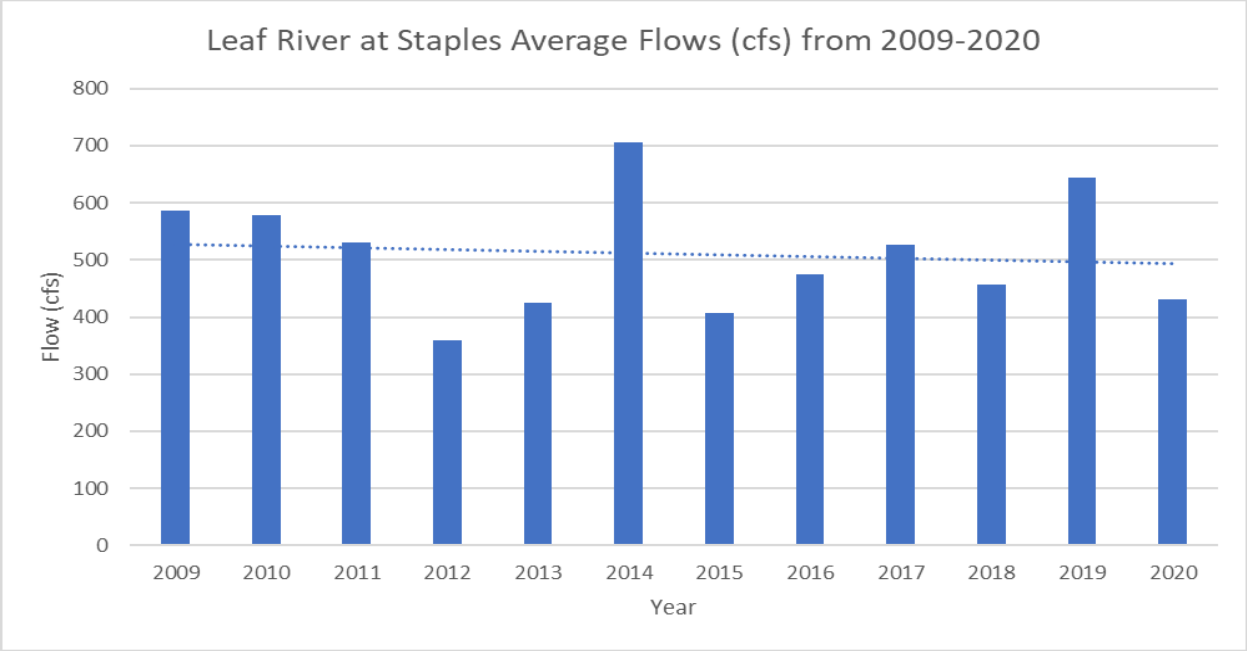
The Crow Wing River flows into the Mississippi River roughly four miles downstream of the Pillager sampling location. Concentrations can then be compared to the closest downstream Mississippi River sampling location (two miles west of Royalton) to find the impact the Redeye River Watershed has on the Mississippi River. In total, the Redeye River Watershed contributes 7% of the total drainage area and an average of 7% of the total flow volume to the Mississippi River at Royalton station.

Nitrates are again the largest contributing pollutant from the Redeye River Watershed at 19% of the annual load at Royalton while TP and TSS inputs have a lesser impact, contributing 12% and 7% of the average loads, respectively.

Trend analysis was conducted for the Leaf River at Staples location (2009 through 2020) and showed mixed results between parameters. NO2+NO3 results showed a significant increasing trend while TP and TSS showed no significant change over this time period. Figure 6 displays the long term yearly average flow data of the Leaf River at Staples from 2009 to 2020. Although there is not enough data to calculate flow trends, the figure shows that over the 12-year period of record, average yearly flows have

decreased by roughly 40cfs (approximately 13%). Peak flows are also decreasing over this time period. Additional maps and supporting data can be found at Watershed pollutant load monitoring | Minnesota Pollution Control Agency (state.mn.us).

Figure 6. Long term yearly average flow data of the Leaf River at Staples from 2009 to 2020



4.3.4 Climate trends

Temperature - the average, minimum and maximum temperatures show a slight increase, most notably in the winter.

Precipitation - data show a slight increase in precipitation in the fall, spring, and summer but a decrease during the winter.

According to the DNR Climate Summary for the Redeye River Watershed (June 2019), climate measurements are showing a shift in foundational climate conditions. According to the climate summary report and summarized in the table below, the average, minimum and maximum temperatures show a slight increase, most notably in the winter. The precipitation data show a slight increase in precipitation in the fall, spring and summer but a decrease during the winter.

Other ecological processes are changing in response. Communities and individuals making decisions about managing land and water resources for infrastructure, flood protection, habitat protection, water supply, and other needs must be aware of this shift and informed about its potential impacts.

The DNR Climate Summary Report for the Redeye Watershed summarizes climate data using 30-year averages and compares the most recent 30-year average (1989 through 2018) to the entire climate record average (1895 through 2018). This approach generates values for the amount of change (deviation) seen in the most recent 30 years when compared to the entire 120-year period of record for temperature and precipitation.

Additional details about this climate summary report (https://www.dnr.state.mn.us/whaf/about/watershed-reports.html), as well as the Watershed Health

Assessment Framework (WHAF) tool as a whole, can be found at Watershed Health Assessment Framework | Minnesota DNR (state.mn.us).

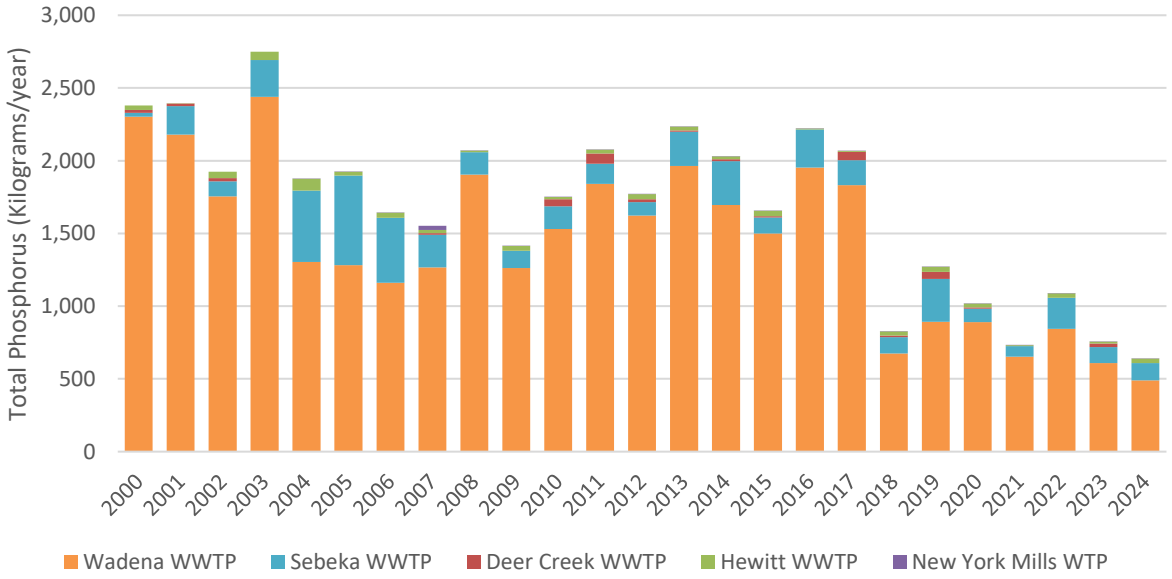
Table 9. Redeye River Watershed Climate Trends

Time Period	Watershed Average Departure			
	Average Temperature (degrees)	Minimum Temperature (degrees)	Maximum Temperature (degrees)	Average Precipitation (inches)
Annual	1.3°	1.7°	1.0°	1.3"
Winter (Dec. - Feb.)	2.8°	3.3°	2.3°	-0.1"
Spring (March - May)	1.2°	1.4°	0.9°	0.3"
Summer (June - Aug.)	0.1°	0.7°	-0.4°	0.1"
Fall (Sept. Nov.)	1.2°	1.5°	0.8°	0.8"

4.3.5 Wastewater treatment facility trends

Annual loading data from the four WWTFs and the New York Mills Water Treatment Plant (WTP) located in the watershed was compiled from 2000 through 2024 for TP, TSS, and TN values. The TP loads have been decreasing over time. This is due to the new phosphorus effluent limits that have gone into effect recently, most notably Wadena WWTF in 2018.

Figure 7. Redeye River Watershed WWTF TP Loads 2000-2024

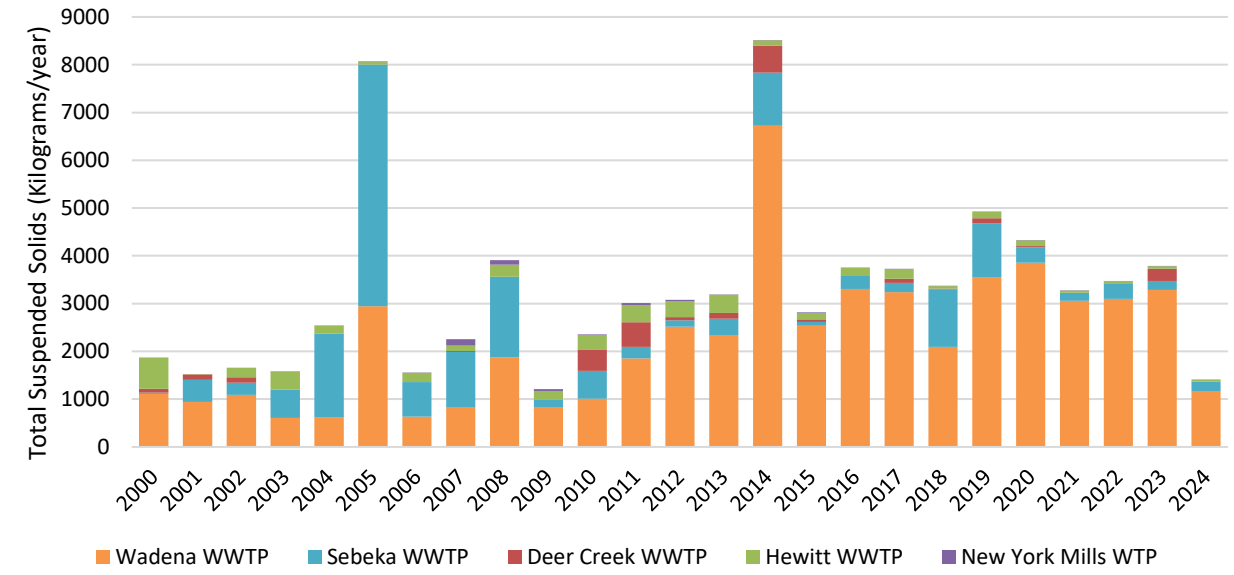


TSS effluent limits have been in effect since the original construction of each of the water and wastewater treatment facilities that are currently operating in the watershed. From January 2000 through December 2024, seven of the 1,868 reported compliance values exceeded permitted effluent limits, resulting in a 99.6% compliance rate.

The Sebeka WWTP had a relatively high effluent TSS load in the spring 2005 which looks to have been a combination of frequent discharges (April, May, and June) and a relatively high effluent concentration/load in May. This was likely due to a wet spring, but no effluent violation was reported.

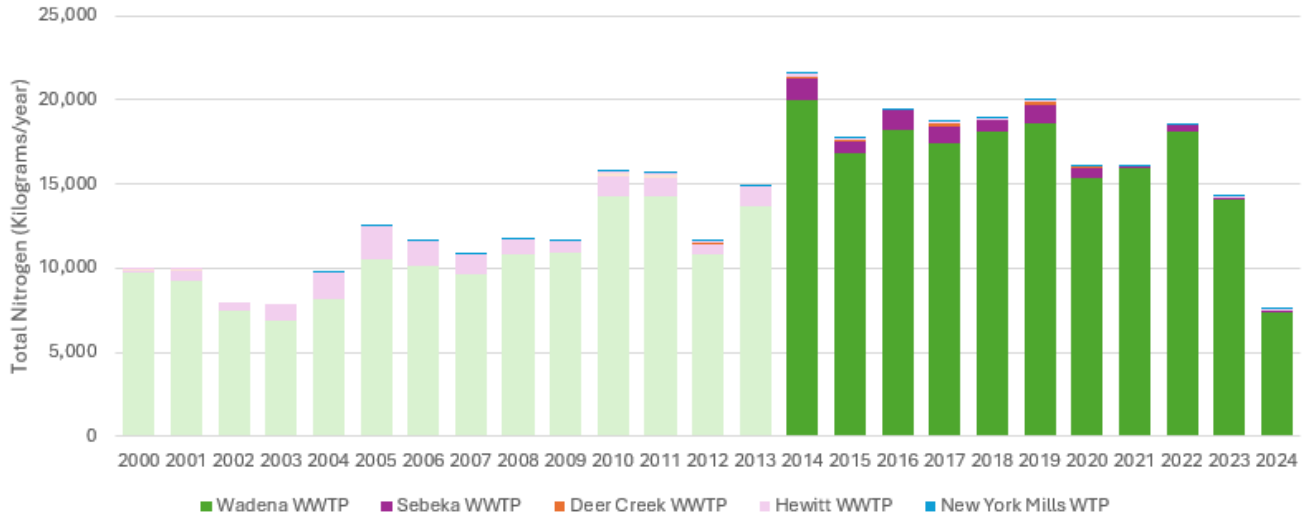
Wadena's annual TSS loads have increased since the 2000-2010 period, probably as a result of increased wastewater flows. The facility's performance with respect to effluent TSS remains excellent. TSS concentrations averaged 1.9 mg/L from 2000-2010 and 4.4 mg/L from 2011-2024.

Figure 8. Redeye River Watershed WWTF TSS Load 2000-2024



The apparent increasing trend in TN loads is actually a result of increasing wastewater flows in Wadena and the availability of monitoring data in recent years. No TN data were available for any of these facilities before 2014 so all the load data for earlier years were estimated from effluent flows and typical pollutant concentrations (lightly shaded in Figure 9). There are still relatively few TN data available, but it appears that measured TN loading data is decreasing over time. Very low TN concentrations reported by the three stabilization pond WWTPs and the New York Mills WTP. Relatively high effluent concentrations reported by the Wadena WWTP dominate the annual load chart. We had assumed that Wadena was discharging 17 mg/L based on the probable effluent concentrations for this facility type, size and class, which turned out to be an underestimation once better data became available.

Figure 9. Redeye River Watershed WWTFs total nitrogen load 2000-2024



5. Pollution sources, risks, and natural conditions

There are several tools available to look at different sources of pollution throughout the watershed. The HSPF model gives a good watershed-wide visual look at locations throughout the watershed with higher concentrations of TSS, TP, and TN. Compilations of locally collected data on culverts and livestock /pasture locations were also developed during the watershed assessment process. This information can help inform locations for project implementation to improve and protect water quality.

5.1 Watershed models - HSPF

HSPF models were used to identify values (ranges) of TP, TN, and TSS across the watershed at a larger scale. The gradients can be used to prioritize or locate appropriate BMPs throughout the watershed. These figures were created using the HSPF Scenario Application Manager (SAM) v2.12. Data for these figures came from the MPCA's 2020 Redeye River Watershed HSPF model outputs for the 1996 through 2020 time period. Modeled sediment and nutrients were calibrated by the MPCA using the MPCA's WPLMN's loading information. Modeled hydrology was calibrated by RESPEC consultants.

Figure 10. Modeled TSS in the Redeye River Watershed.

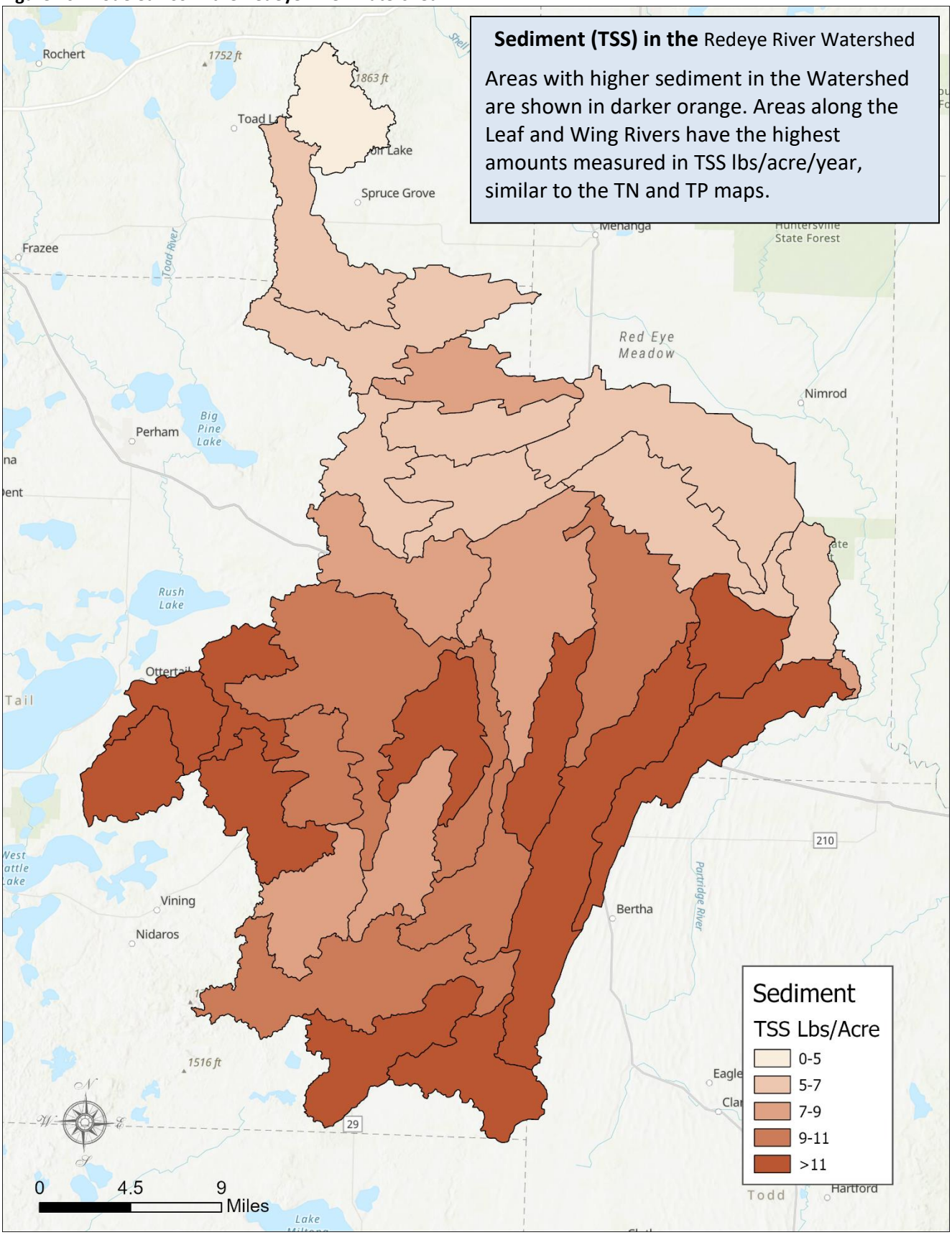


Figure 11. Modeled TN in the Redeye River Watershed.

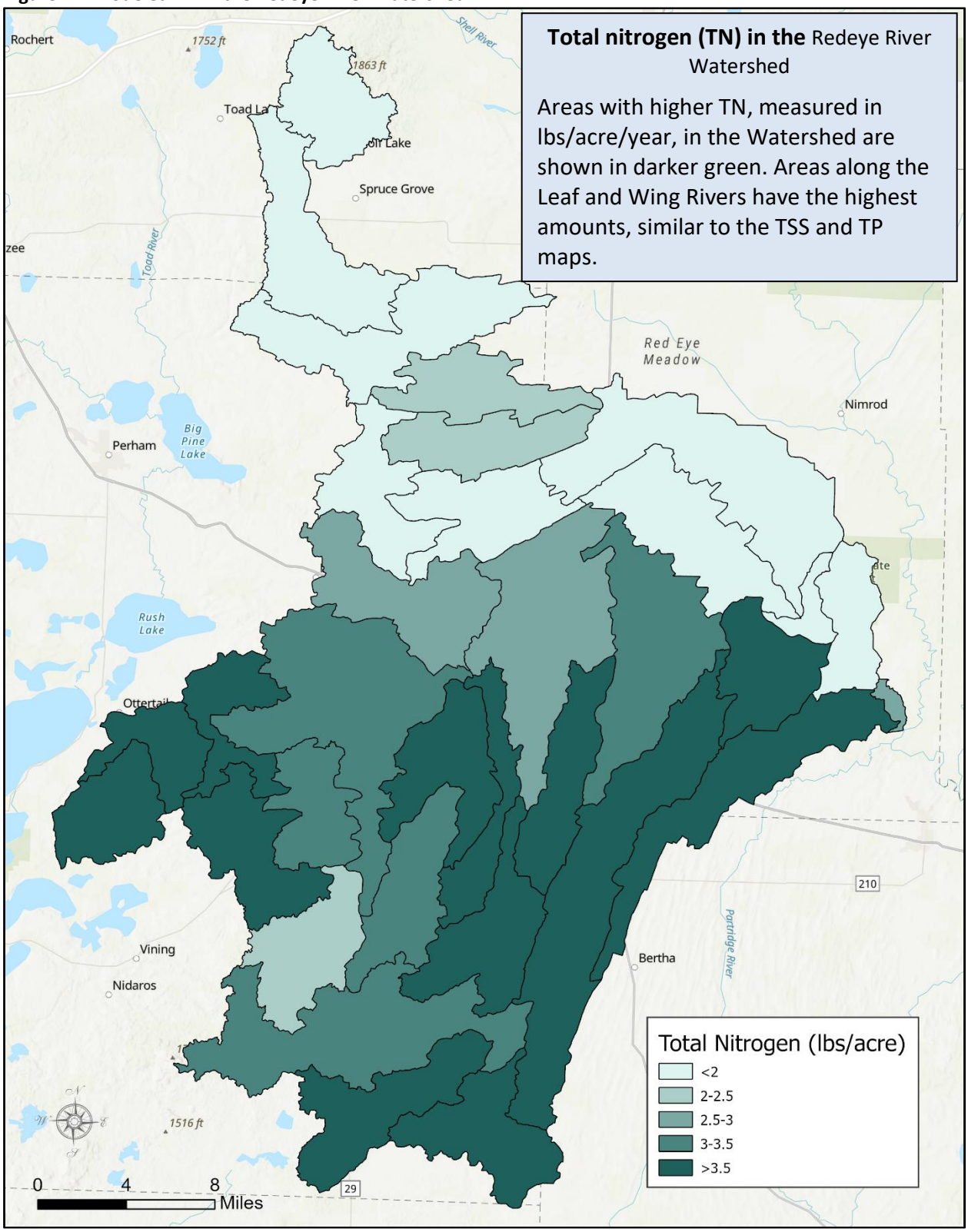
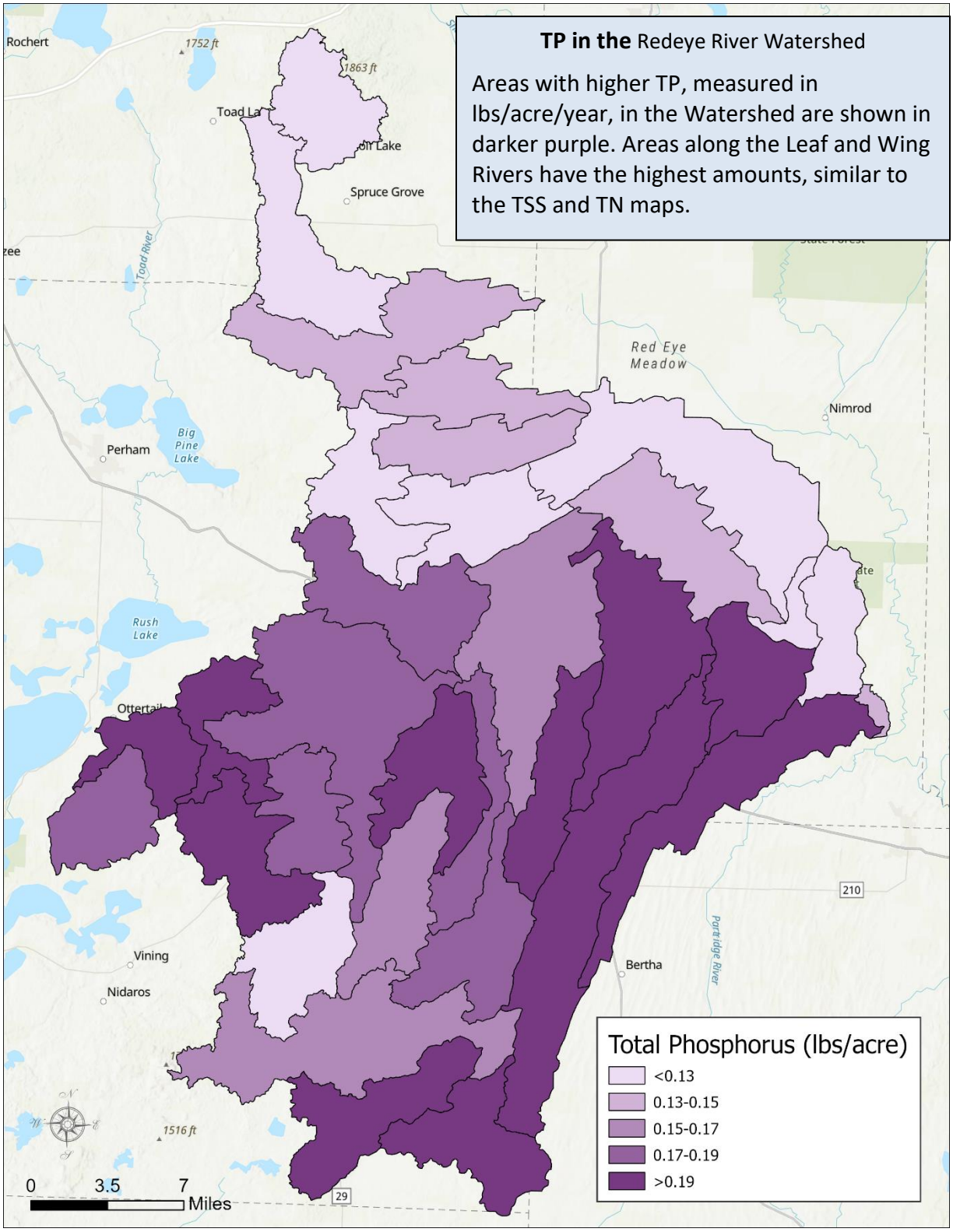


Figure 12. Modeled TP in the Redeye River Watershed.



5.2 Point sources in the watershed

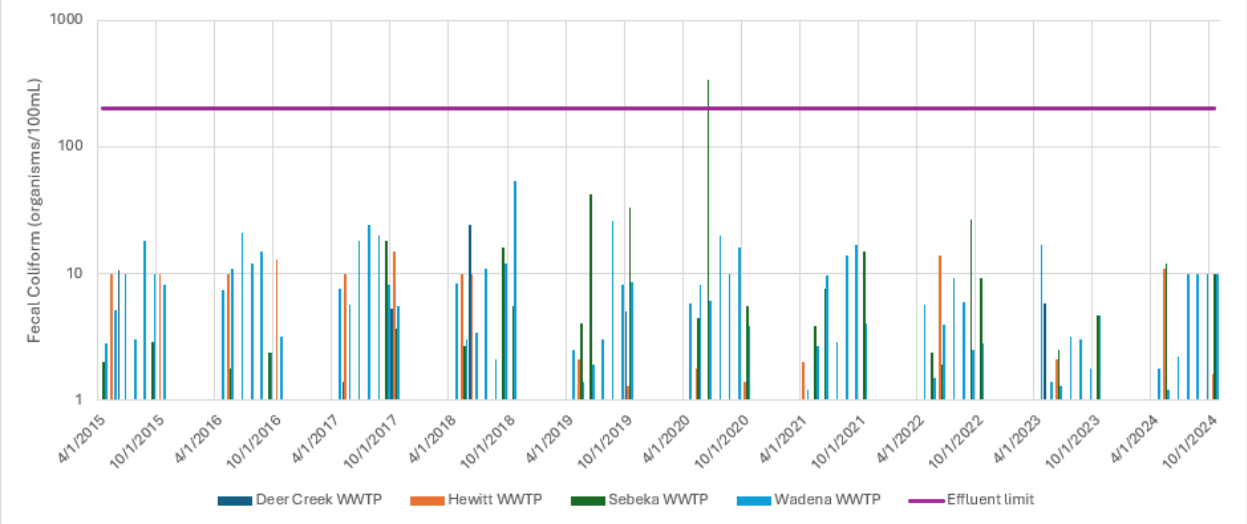
5.2.1 Wastewater treatment facilities

Section 4.3.5 discussed the WWTF and WTP trends within the watershed for sediment, phosphorus, and nitrogen. The following figure shows how these facilities are meeting their *E. coli* wasteload allocations (WLA). Excluding a single effluent limit violation in 2020, all four WWTFs are in compliance with fecal coliform effluent limits and achieving appliable TMDL WLAs from 2015 to 2024.

Minnesota's *E. coli* water quality standard is an indicator of the potential presence of pathogens in surface and ground water. Minnesota's wastewater permits include fecal coliform effluent limits as indicators of the effective effluent disinfection. Compliance with the National Pollutant Discharge Elimination System (NPDES) permit's 200 organism/100 mL fecal coliform effluent limit as a calendar month geometric mean indicates that effluent wastewater is effectively disinfected and is therefore achieving applicable *E. coli* WLA.

Four municipal wastewater treatment facilities have been assigned *E. coli* WLAs for TMDLs in the Redeye River Watershed. Discharge monitoring report data include a single reported violation of calendar month geometric mean fecal coliform effluent limits during the 2015-2024 review period. For the month of June 2020, the Sebeka WWTP reported a fecal coliform calendar month geometric mean concentration of 336 organisms/100 mL.

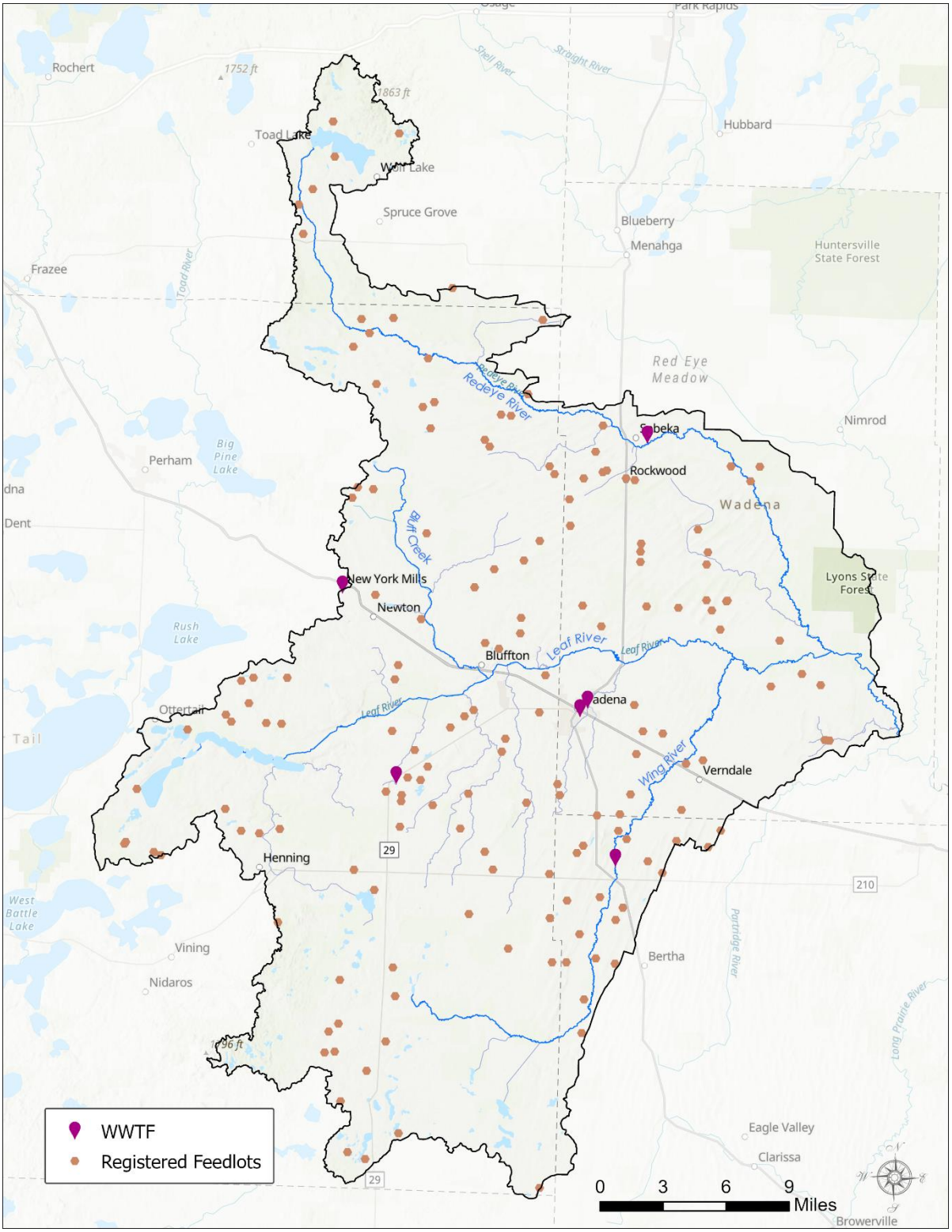
Figure 13. Redeye River Watershed WWTF *E. coli* data



5.2.2 Feedlots

There are many registered feedlots throughout the watershed that are monitored by the counties, and five Concentrated Animal Feeding Operations (CAFOs), which are monitored by the MPCA. The livestock inventory conducted as part of the WRAPS Update also provides data on potential locations to apply BMPs (for those areas that have livestock but don't fall within the feedlot requirements) that will reduce impacts to lakes and streams throughout the watershed. Table 23 of the 2016 Redeye River TMDL estimates that the majority of *E. coli* in the watershed comes from livestock, but other sources such as failing SSTS and abandoned manure pits should also be investigated.

Figure 14. Feedlots and WWTFs in the Redeye River Watershed.



6. Goals, priorities, and strategies to protect and restore water quality in lakes and streams

It is important to take the information gathered during this second cycle of watershed monitoring and adaptively manage to develop priority areas to focus implementation efforts. The MPCA is required by the Clean Water Act to monitor and assess waters in the state and then develop strategies to restore waters that do not meet standards. Minnesota also has the opportunity to work with local partners who specialize in implementing BMPs that can address many of these impaired waters, as well as protecting high value lakes and streams. This is accomplished, in large part, through the One Watershed, One Plan | MN Board of Water, Soil Resources (1W1P) framework. The Redeye One Watershed, One Plan was approved in 2020. The timing of the WRAPS Update is approximately mid-cycle allowing new data to inform implementation efforts, as well as the mid-point plan review being considered for 2026. Below are the recommendations from the MPCA as priority areas to consider for future implementation.

6.1 Restoration goals

6.1.1 Lakes

As discussed in Section 2, East Leaf Lake is vulnerable to impairment, West Leaf Lake has a declining transparency trend, and the Leaf River flowing through these lakes is impaired, so addressing these waters is both restoration and protection. The Leaf chain of lakes should be prioritized for implementation efforts to keep them off the IWL. Because East Leaf Lake has such a large watershed to lake surface area ratio (157:1), implementation efforts throughout this entire subwatershed are needed. These lakes are already a top priority in the Redeye River Watershed 1W1P Final Plan, and specific BMPs and targets are identified and should be continued.

6.1.2 Streams

There are 13 stream impairments in the watershed. Several of the streams with *E. coli* impairments are improving in areas where there has been local BMP implementation such as cattle exclusion and manure pit closures. The streams with biological impairments have been investigated through the SID process. The table below highlights each of these stream reaches to discuss in detail implementation considerations for their subwatersheds. The livestock and culvert inventories that were developed as part of the WRAPS Update will help identify areas for potential protection and restoration projects. The interactive inventory that includes both culvert and livestock information can be found at Redeye Watershed Culvert Inventory.

Table 10. Stream restoration goals

Stream ID	Impairment	Strategies for Restoration
Redeye River 07010107-503	*E. coli*	• Inventory livestock and/or Subsurface Sewage Treatment Systems (SSTS) and provide outreach where needed • Inventory manure land application sites within the subwatershed • Restore problematic culverts identified on culvert inventory • Increase size and amount of riparian buffers on areas that don't meet the requirements or that are not covered by the Buffer Law. • Implement cattle exclusion projects where needed
Leaf River 07010107-505	*E. coli*	• Monitor for *E. coli* to determine if the levels are improving • Inventory livestock and/or SSTS and provide outreach where needed • Inventory manure land application sites within the subwatershed • Implement BMPs, for areas identified in the livestock inventory as well as non-compliant SSTS on the upstream reach of the Leaf River -514 and Oak Creek -516 to improve downstream reach • Implement cattle exclusion projects identified during inventory • Increase size and amount of riparian buffers • Restore problematic culverts identified on culvert inventory
07010107-506	FIBI	• Conduct another fish sampling event to determine if this FIBI impairment can be removed from the IWL
07010107-514	*E. coli*	• Inventory livestock and target BMPs • Inventory septic systems and/or provide outreach in this area • Inventory manure land application sites within the subwatershed • Implement BMPs on the upstream reach of Bluff Creek -515
Union Creek 07010107-508	*E. coli* FIBI MIBI	• Monitor for *E. coli* to determine if the levels are improving • Inventory livestock and target BMPs • Inventory manure land application sites within the subwatershed • Increase size and amount of riparian buffers • Implement cattle exclusion projects identified during inventory • Implement urban BMP(s) in Wadena to serve as a demonstration site
07010107-509	MIBI	• Implement BMPs that reduce phosphorus and nitrogen levels. • Document current bank conditions and eroded areas in the headwaters where agricultural fields are dominant and implement erosion control BMPs such as replacing culverts, bank stabilization, etc.to stop erosion and habitat degradation.
Bluff Creek 07010107-515	*E. coli*	• Monitor for *E. coli* to determine if improvements resulting from the CWA Section 319 implementation project are enough to delist* • Inventory livestock and target BMPs • Inventory manure land application sites within the subwatershed • Increase size and amount of riparian buffers • Implement cattle exclusion projects, filter strips, prescribed grazing and soil health practices identified during inventory ** This WID is considered "barely impaired" and suggest that an additional year of monitoring may solidify this as a delisting candidate.*

Stream ID	Impairment	Strategies for Restoration
Oak Creek 07010107-516	*E. coli*	**This reach was split into reach -563 and -564 described below.*
07010107-563	*E. coli*	• Monitor for *E. coli* to determine status of impairment **This reach was split from -516 and there isn't enough E. coli data on this reach to determine that it is not impaired, and the existing parent E. coli impairment remains. Need additional monitoring to determine status of impairment.*
07010107-564	*E. coli*	• Inventory livestock and target BMPs • Inventory manure land application sites within the subwatershed • Increase size and amount of riparian buffers • Implement cattle exclusion projects, filter strips, prescribed grazing and soil health practices identified during inventory
Hay Creek 07010107-526	*E. coli* FIBI MIBI	• Monitor for *E. coli* to determine if the levels are improving • Inventory livestock and target BMPs • Increase size and amount of forested areas in subwatershed • Implement cattle exclusion projects identified during inventory • Protect undisturbed habitat at risk for conversion to irrigated agriculture • Restore natural stream meander to areas impacted by ditching
County Ditch 13 07010107-549	FIBI	• Restore problematic culvert on 106th Street that has very high velocities during high flows and very shallow water levels during low flows as a probable fish barrier leading to the impairment
Wing River 07010107-560	*E. coli*	• Inventory livestock and target BMPs • Inventory manure land application sites within the subwatershed • Increase size and amount of riparian buffers • Implement cattle exclusion projects identified during inventory

6.2 Protection goals

Protection efforts throughout the watershed can provide many benefits for improving surface and ground water quality, providing water storage and resilience through changing climate conditions, and improving habitat. Protection efforts can be accomplished with both permanent protection measures, as well as land management efforts. Permanently protecting high value areas through easements and fee title acquisitions are already outlined and identified in the 1W1P Final Plan. Land management activities are another tool to help protect water quality but take more effort because of the time and expense to educate and encourage landowners to implement these practices. Some of the land management activities outlined in the 1W1P Final Plan include:

- Soil health practices – cover crops, tillage management, and grazing plans
- Forest stewardship plans
- BMPs for irrigation and nutrient reduction
- Enforcing existing rules for development, SSTSs, and the Wetland Conservation Act

6.3 Environmental justice goals

The MPCA is committed to ensuring that every Minnesotan has healthy air, sustainable lands, clean water, and a better climate. This WRAPS Update strives to support meaningful involvement of watershed residents regardless of race and income status, as well as equitable restoration and protection of water quality resources. Strategies to address this commitment include implementing the protection goals outlined in Section 6.2, providing cost share or other financial incentives for landowners within certain income levels and providing education and outreach through expanded means to reach a broader audience.

7. Future monitoring and data collection

The MPCA has a detailed statewide monitoring approach outlined in the Minnesota's Water Quality Monitoring Strategy 2021 to 2031. Here are the types of monitoring to be considered in the watershed in the upcoming 10 years.

WPLMN - All WPLMN stations record streamflow on a continuous basis every year, either year-round or during open water (non-ice cover) conditions. Water quality samples are also collected on a regular basis year-round during these same periods, such that on-going records of load can be calculated. With this design, between 20 to 35 mid-stream grab samples are collected per year from each load monitoring station.

Monitoring is targeted to characterize:

- major precipitation events, particularly spring runoff
- base flow conditions, which typically occur during the winter months
- and background flow conditions, primarily during the summer months.

The water quality samples are analyzed for TSS, nitrate, phosphorus, TKN (subset of sites), orthophosphate (subset of sites), pH, conductivity and transparency. These water quality and discharge data are then used to compute annual pollutant loads for nitrate-plus-nitrite nitrogen, TP, DOP, and TSS.

The three WPLM sites in this watershed are on the Redeye River nine miles north of Aldrich, the Leaf River eight miles north of Aldrich, and on the Leaf River seven miles north of Staples (Figure 3 from monitoring location map).

Stream Biological Monitoring – Sites that were sampled in 2022 to 2023 are likely to be monitored again during the next 10-year monitoring effort. Oak Creek 11UM073 is also one of the statewide long-term biological monitoring sites and will be sampled every two years. Leaf River -506 is recommended for another fish sample as this site has shown improvement in water chemistry and FIBI from Cycle 1 to Cycle 2. This reach has the potential for delisting if conditions continue to improve.

Stream Chemistry 10X sites - Sites that were sampled in 2022 and 2023 are likely to be monitored again during the next 10-year monitoring effort. Streams with existing impairments due to *E. coli* are recommended be sampled again to determine if water quality is improving or declining, especially those areas that have had focused implementation.

Lake Water Quality Sampling – Lakes that will be monitored during the next assessment cycle have not been selected yet but will likely include many of the lakes that have been monitored in the past. It is recommended to sample West, Middle and East Leaf lakes because they are showing water quality decline and vulnerable to impairment. It is also recommended to collect Secchi disc data for Wolf, Adley, Bear, Portage and Donalds lakes (Table 7). It is an inexpensive way to observe water quality changes over time. The volunteer monitoring program at MPCA is a great resource to help implement this activity Volunteer water monitoring | Minnesota Pollution Control Agency.

Lake IBI Sampling – For the next assessment cycle, the DNR will be sampling East Leaf Lake because of its vulnerability to impairment, a suite of 'anchor lakes' selected from a stratified random sample of previously sampled lakes, as well as any lakes requested during stakeholder engagement, or that may be experiencing significant impacts from new stressors.

8. Public participation

Public outreach

Public outreach refers to education, outreach, marketing, training, technical assistance, and other methods of working with stakeholders to achieve water resource management goals. In this second cycle of the Watershed Approach there was less emphasis on public outreach for the WRAPS Update report. This is because of active engagement already occurring in the watershed through local government efforts and because outreach activities were not identified as a WRAPS Update priority task.

The following is a list of stakeholder meetings held by the MPCA and/or local partners regarding the watershed assessment and WRAPS Update process.

- 8/9/2022 – meeting with stakeholders and agency staff to discuss monitoring for watershed assessment.
- 10/11/2022 – stakeholder meeting to discuss WRAPS Update project charter, funding, and review of Cycle 1 data.
- 2/13/2024 – stakeholder meeting to discuss water quality updates and WRAPS Update format.
- 4/30/2024 – professional Judgement Group stakeholder meeting to discuss water quality assessments for lakes and streams in the watershed.
- 5/14/2024 – stakeholder meeting to discuss WRAPS Update, coordination with 1W1P efforts, and project workplan.
- 8/13/2024 – stakeholder meeting to discuss draft reports.
- 5/13/2025 – stakeholder meeting to discuss draft reports, stressor ID report and WRAPS Update.
- 11/4/2025 - stakeholder meeting to discuss draft reports, stressor ID report and WRAPS Update and inventory.

Public notice for comments

An opportunity for public comment on the draft WRAPS Update Report was provided via a public notice in the State Register from November 17, 2025, through December 17, 2025. There were no comments received and responded to as a result of the public comment period.

9. References

Minnesota Department of Natural Resources (DNR). 2019. Climate Summary for Watersheds. Redeye River. Climate Summary for Watersheds, Redeye River

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Minnesota Pollution Control Agency (MPCA). Watershed approach to water quality | Minnesota Pollution Control Agency

Watershed Health Assessment Framework (WHAF) Tool Watershed Health Assessment Framework | Minnesota DNR

Minnesota DNR Score Your Shore Tool Score Your Shore: | a citizen shoreline description survey | Minnesota DNR