MAPLE RIVER
WATERSHED PROJECT
Phase III

1.0 PROJECT SUMMARY SHEET

LEAD PROJECT SPONSORS/SUBGRANTEES:

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STATE: North Dakota **WATERSHED:** Maple River

HYDROLOGIC UNIT CODE: 09020205 **HIGH PRIORITY WATERSHED:** No

PROJECT TYPES	WATERBODY TYPES	NPS CATEGORY
[x] STAFFING & SUPPORT	[ ] GROUNDWATER	[x] AGRICULTURE
[x] WATERSHED RUNOFF	[ ] LAKES/RESERVOIR	[ ] URBAN
[ ] GROUNDWATER	[x] RIVERS	[ ] SILVICULTURE
[x] I & E	[x] STREAMS	[ ]
CONSTRUCTION		
	[ ] WETLANDS	[ ] RESOURCE
	[ ] OTHER	

EXTRACTION
[ ] STORAGE/LAND DISPOSAL
[ ] HYDRO MODIFICATION
[ ] OTHER

PROJECT: LATITUDE 46 **MIN.** 45 **LONGITUDE** -97 **MIN.** 33

Maple River Watershed Project Phase III

GOAL FOR THE PROJECT: During the course of the project, Cass County Soil Conservation District (SCD) will aim to restore recreational use and aquatic life uses of the impaired reaches of the Maple River Watershed, as recognized in the 2022 Integrated Report. This goal will be achieved through the implementation of Best Management Practices (BMP). This is a long-term goal and will be achieved by multiple phases of 319 projects. For Phase III, education and promotion of water quality management practices and BMP implementation will be used to lower concentrations of E. coli bacteria and reduce modeled nutrient and sediment loading from cropland acres within priority sub watersheds identified with the PTMApp prioritization tool. BMP implementation will be targeted toward priority fields or catchments found in these sub watersheds.

PROJECT DESCRIPTION:

The Maple River Watershed Project will implement comprehensive conservation planning, BMP implementation, monitoring/assessment, and information/education programs on the highest priority ranked sub-watersheds in terms of non-point source pollution (NPS) contribution to the Maple River. To better monitor water quality improvements and focus 319 project funds, this project will use several different prioritization measures as well as extensive outreach to ensure long term success.

The main objectives are:

1) Achieve reductions in E. Coli bacterial levels in the 303(d) listed reaches of the Maple River Watershed through the implementation of BMPs

2) Document long term and short-term water quality trends and improvements (i.e. reductions in E. Coli bacteria) in the Maple River Watershed

3) Utilize the Prioritize, Target, and Measure Application (PTMApp) to identify priority subwatersheds and catchments for BMP implementation to reduce nutrient (N&P) and sediment loads at the field edge where BMPs are applied and, over the long term, within the Maple River Watershed. When planning with producers, the PTMApp will also be used to identify best options for BMP to be implemented in specific fields.

4) Inform and educate local producers on land management practices to improve soil conditions and water quality.

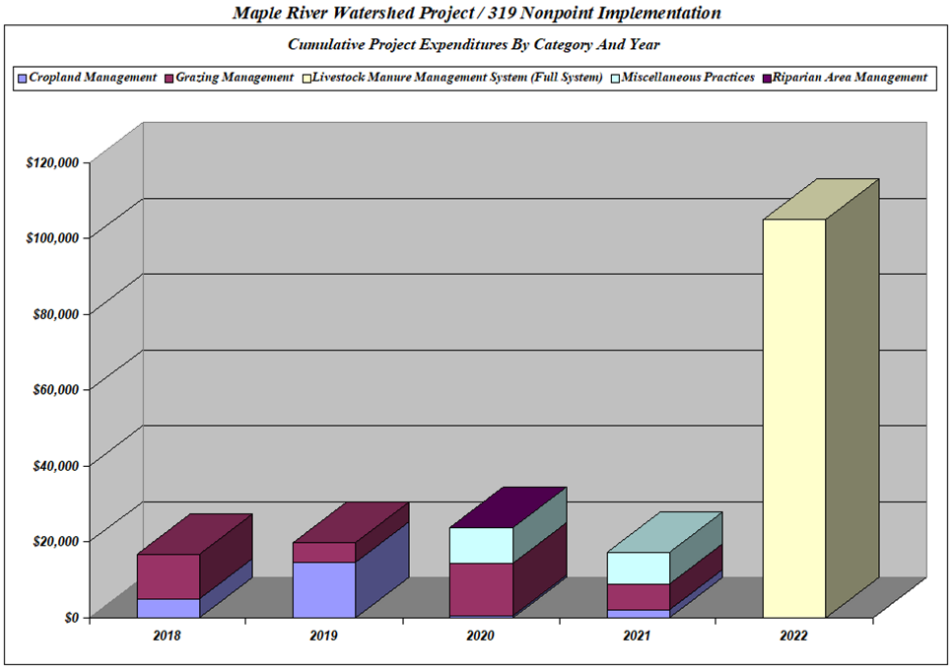
5) Project administration, management, and support

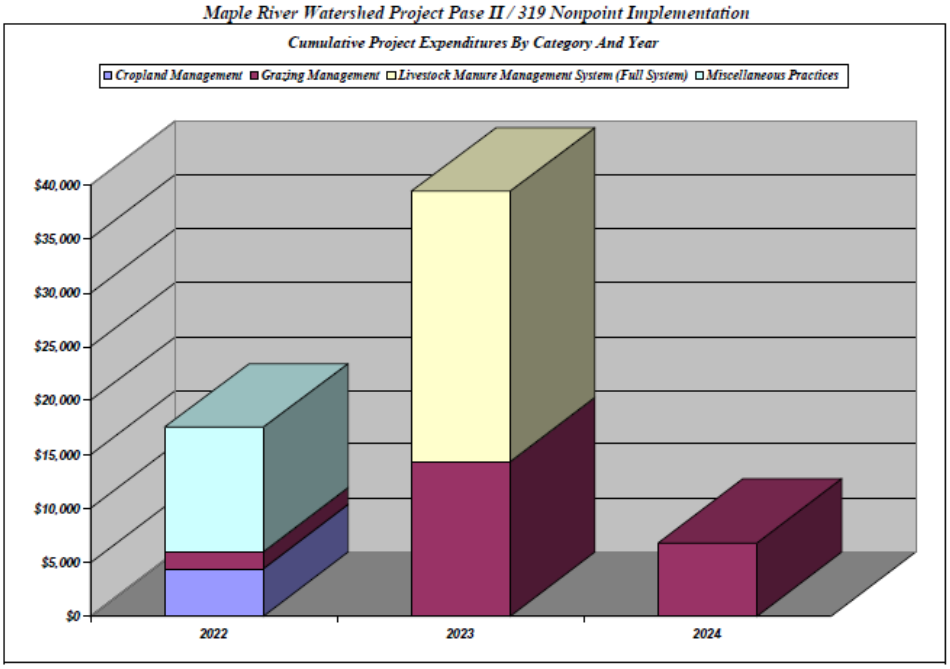
FY 2025 **319 Fund Requested** $434,115 **Match** $289,411

Other Federal Funds $3,000,000 **Total Project Cost** $3,723,526

1.0 Phase I & II Accomplishments

During Phase I & II of the Maple River Watershed Project, Cass Soil Conservation District prioritized the promotion and implementation of agricultural Best Management Practices aimed to improve water quality in the Maple River Watershed. Practices implemented include cover crops, pasture hay land plantings, septic system renovation, and livestock BMPs.





In addition to BMP implementation, the district actively promotes water quality and soil health management. The district hosts an annual soil health workshop every spring where local experts are

invited to share their knowledge about soil and water quality management with producers. These events have been a very effective way to start conversations with producers on how to prevent non-point source pollution from entering the waterways and effectively manage soil resources. Phase III aims to build on the successes of Phases I & II and expand the project's reach in the future.

2.0 Statement of Need

2.1 Project Reference

The Cass Co. Soil Conservation District (CCSCD) has long recognized the natural, economic, and recreational value of the many water bodies in the county. The CCSCD will provide financial and technical assistance to develop, coordinate, and implement tasks to reduce the cumulative effects of the long-term delivery of excess nitrogen, phosphorus, sediment and E. Coli bacteria to the Maple River and its tributaries. The Maple River Watershed spans throughout Cass, Steele, Barnes, Ransom and Richland Counties. Although the watershed covers areas in multiple counties, Cass County holds much of the land area and works as a great central location for watershed project administration.

According to the 2022 Integrated report the North Dakota Department of Environmental Quality has identified 11 reaches within the Maple River Watershed as not supporting for fish and other aquatic biota based on fishes bioassessments and dissolved oxygen levels, and fully supporting but threatened for recreation based on Escherichia coli (E. coli) bacteria.

Considering these water quality impairments, the Cass County Soil Conservation District is proposing a Best Management Practice (BMP) Implementation Project to address the water quality concerns evident in the watershed. The result of BMP implementation will be improvements in the quality of the water in the Maple River and progress toward the removal of the listed stream reaches from the North Dakota Section 303(d) list of impaired waters.

To better monitor water quality improvements and focus 319 project funds, this project will use the PTMApp prioritization tool as well as extensive outreach to ensure long term success. The PTMApp prioritization tool will focus on specific resource concerns and pinpoint sensitive areas, as well as measure water quality improvement by tracking the expected nutrient and sediment load reductions delivered to priority resources. This tool will allow for a focused approach by identifying priority areas for BMP implementation. In addition, due to the large size of the watershed, Cass County SCD is committed to implementing a long-term plan for the Maple River Watershed consisting of multiple phases that collectively work towards the goal of delisting impaired reaches throughout the watershed.

2.2 Watershed Description

The Maple River watershed is a 1,008,912 acre watershed located in Cass, Barnes, Steele, Ransom, and Richland Counties in southeastern North Dakota (Map 1 Appendix A). The Maple River watershed lies within the Level III Northern Glaciated Plains (46) and Lake Agassiz Plain (48) Ecoregions (Map 3 Appendix A)

Based on the 2022 Section 303(d) List of Impaired Waters Needing TMDLs (NDDEQ, 2022), the North Dakota Department of Environmental Quality (NDDEQ) has identified the following impaired waterbodies in the Maple River Watershed:

A 31.5 mile segment (ND-09020205-024-S_00) of the Maple River downstream to its confluence with a tributary near the Steele, Cass, and Barnes county line (ND-09020205-023-S_00) as not supporting for fish and other aquatic biota due to fishes bioassessments and dissolved oxygen.

A 40.5 mile segment (ND-09020205-015-S_00) of the Maple River from its confluence with a tributary watershed near Buffalo, ND (ND-09020205-019-S_00) downstream to its confluence with the South Branch Maple as fully supporting, but threatened for fish and other aquatic biota due to fishes bioassessment, dissolved oxygen and benthic-macroinvertebrate bioassessment.

A 29.9 mile segment (ND-09020205-012-S_00) of the Maple River from its confluence with the South Branch Maple River downstream to its confluence with a tributary near Leonard, ND as fully supporting, but threatened for fish and other aquatic biota due to dissolved oxygen and impaired for fish bioassessments.

A 28.7 mile segment (ND-09020205-001-S_00) of the Maple River from its confluence with Buffalo Creek downstream to its confluence with the Sheyenne River as not supporting fish and other aquatic biota due to sedimentation/siltation, combination benthic/fishes bioassessments.

A 47.9 mile segment (ND-09020205-010-S_00) of the Maple River from its confluence with a tributary near Leonard, ND (ND-09020205-011-S_00) downstream to its confluence with Buffalo Creek as fully supporting, but threatened for fish and other aquatic biota due to fishes and benthic macroinvertebrate bioassessments and sedimentation/siltation.

A 53.1 mile segment (ND-09020205-003-S_00) of the Maple River from its confluence with the Maple River upstream to the Casselton Reservoir, including all tributaries, as not supporting for fish and other aquatic biota due to combined biota and habitat bioassessments. This segment is also impaired due to E. Coli bacteria.

A 55.8 mile segment (ND-09020205-017-S_00) Unnamed Tributary watershed to Maple River (ND-09020205-015-S_00) and A 160.3 mile segment (ND 09020205-018-S_00) Unnamed Tributary watershed to the Maple River (ND-09020205-015-S_00). Both segments not supporting recreation due to E. Coli impairments.

A 51.1 mile segment (ND-09020205-002-S_00) Unnamed tributary watershed to the Maple River (ND-09020205-001-S_00). Located in SE Cass County. Impaired for combiation benthic fishes bioassessment.

A 83.5 mile segment (ND-09020205-004-S_00) Swan Creek, upstream from the Casselton Reservoir, including all tributaries. Located in Central Cass County. Impaired for combiation biota/habitat bioassessment.

A 30.5 mile segment (ND-09020205-006-S_00) Buffalo Creek from Embden Dam, downstream to the Maple River. Located in S.C. Cass County. Impaired for combiation benthic fishes bioassessment.

A 160.6 mile segment (ND-09020205-018-S_00) Unnamed tributary watershed to the Maple River (ND-09020205-015-S_00). Located in Eastern Barnes County. Impaired for E.coli bacteria.

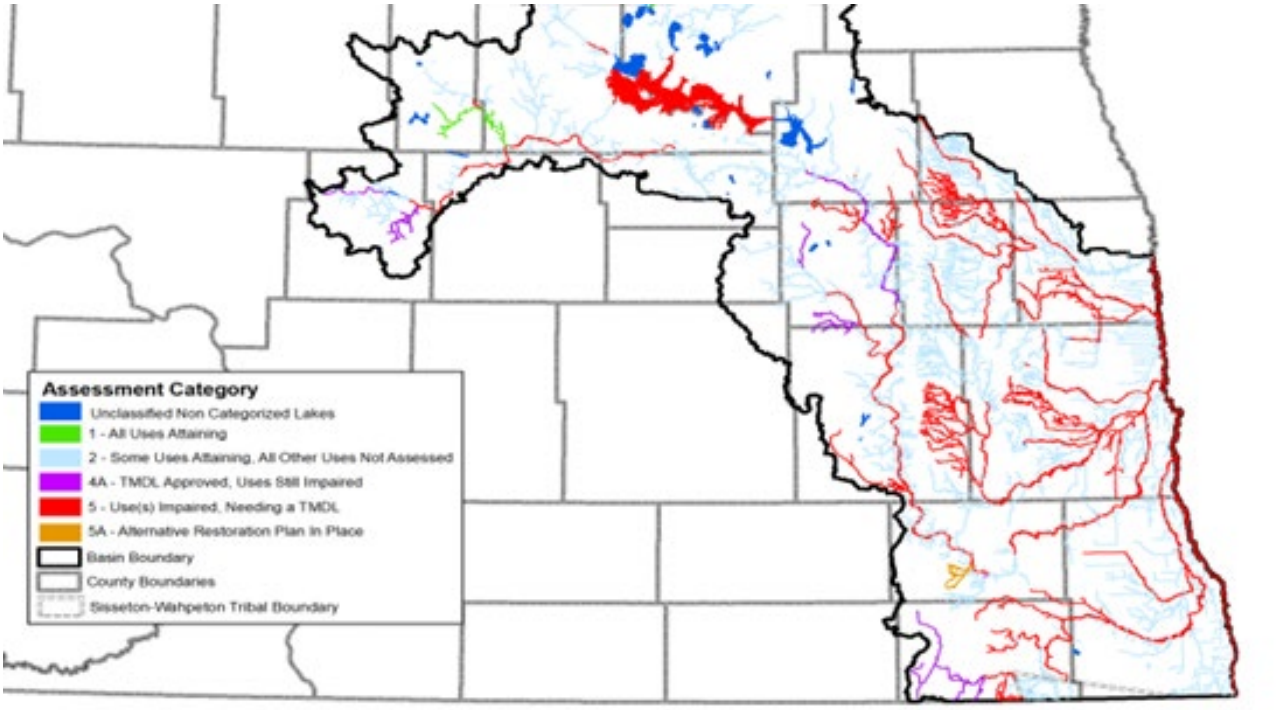


Figure 1. Red River Basin Impaired Reaches

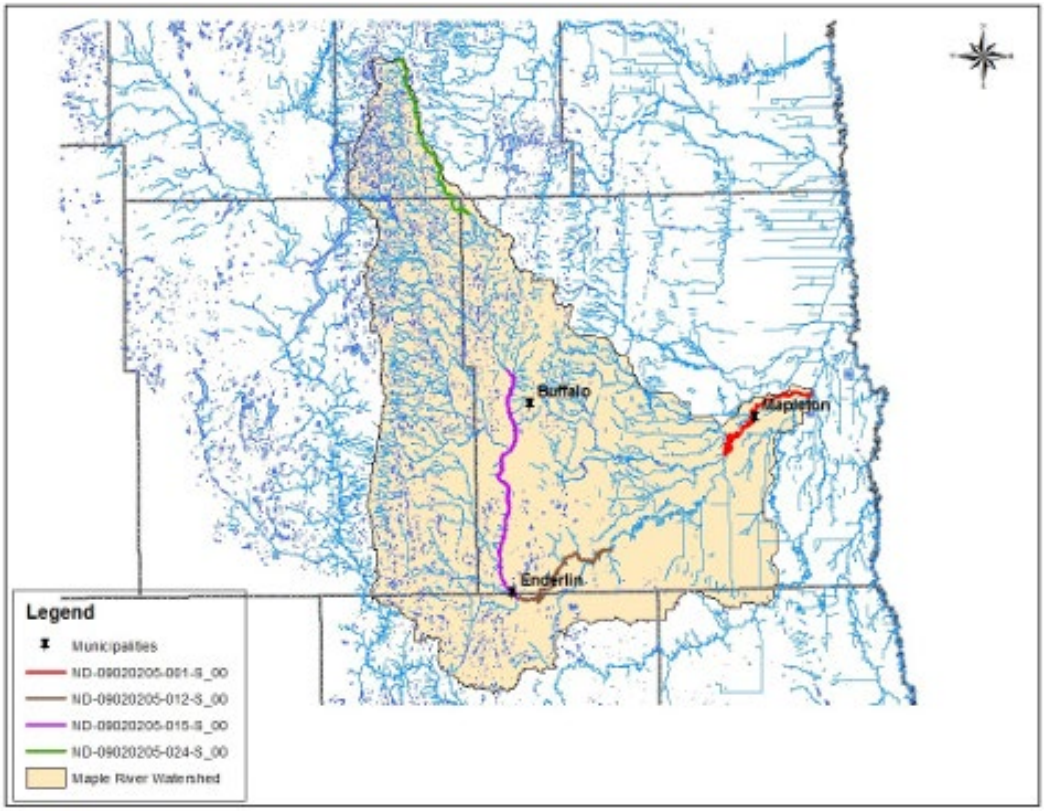


Figure 2. Maple River TMDL Listed Segments

Maple River E. coli Bacteria TMDL Report

In 2016 an E. coli Bacteria TMDL was approved by EPA addressing the Maple River segments (ND-09020205-024-S_00, ND-09020205-015-S_00, ND-09020205-012-S_00 and ND-09020205-001-S_00). In these TMDLs load reduction goals were set to improve E. coli bacteria concentrations to levels that comply with State water quality standards (126 CFU/100 mL and 10 percent exceedance of 409 CFU/100 mL).

The Maple River segments were listed as fully supporting, but threatened to not supporting recreational beneficial uses due to E. coli bacteria. The TMDL identified that E. coli bacteria exceedances of the State water quality standards occurred during high, moist and dry condition and low flows. Possible nonpoint sources cited in the TMDL include unpermitted AFOs, livestock grazing and watering along the river or failing septic systems.

Nonpoint source and point source pollution load allocations were calculated as it pertains to each segment. The point source allocations were given to the towns of Buffalo, Enderlin and Mapleton, ND.

2.3 Maps

PTMApp

The Prioritize, Target, and Measure Application (PTMApp) is a web application that can be used to interactively and in real-time, prioritize resources and the issues impacting them, target specific fields to place BMPs, and measure water quality improvement by tracking the expected nutrient and sediment load reductions delivered to priority resources. **Appendix A**

PTMApp will:

- Rank subwatersheds (and therefore priority) for BMP placement, based on the amount of sediment and nutrient loads (N&P) As applicable, the 12-digit hydrologic units (HU) within a subwatershed will be ranked and the priority catchments in the 12-digit HUs will also be ranked and targeted for BMP implementation, accordingly. Estimated nutrient and sediment loads at the 12-digit HU outlet and catchment field edge will be used to determine the priorities or rankings.
- Target specific areas to refine BMP placement based on the amount of pollutant load within priority and non-priority subwatersheds. Load reduction from each specific area reaching a specific stream, river, or lake is estimated through the application of delivery ratios for the sediment, TP, and TN loads leaving the landscape. The load leaving the landscape, reaching the flowline, reaching the catchment outlet, reaching the subwatershed outlet, and reaching the Maple River is quantified by PTMApp.
- Identify specific BMPs for implementation based on estimated pollutant loads at the field edge or based on pollutant delivery to a specific priority resource point or water body.
- Estimate the cumulative reduction of and the interaction between multiple BMPs within a watershed in reducing downstream loads. The use of these standards/metrics ensures the ability to place BMPs that will maximize load reduction.

See **Appendix A (page v - ix)** for PTMApp Maps and Information

2.4 General Watershed Information

The Maple River watershed is 1,008,912 acres in size. The topography within Cass County is predominately flat. The climate is semi-arid with an average of 21”of precipitation annually, with a majority (14.3”) falling during the growing season of May through September. The monthly average high temperatures range from a max of 83^0 F in July to a low of 17^0 F in January. Monthly lows range from -3^0 F in January to 57^0 F in July. The annual average temperature is 41^0 F.

The Maple River watershed is divided into two main geologic units. The eastern portion of the watershed encompasses the glacial Lake Agassiz offshore sediments and river sediments, while the extreme western portion of the watershed is glacial till material. The soils of the watershed are strongly influenced by the geology of the region. Most of the area of the watershed is described as level and nearly level fine textured soils that formed on glacial lacustrine sediment and on glacial lake plains. A small area of the western portion of the watershed is level to moderately steep, medium and moderately fine textured soils that formed in glacial till and in alluvium over glacial till (UDSA Soil Survey General Soil Map, 1983). Common soils include the Fargo and Bearden series, which are deep, poorly drained and slowly permeable soils. The natural drainage pattern of these soils is poorly defined. The Barnes series, more common in the western portion of the watershed, is deep, well drained, and moderately slowly permeable.

Primary land use throughout the watershed is intensive row crop agriculture. Corn, beans (soy & dry edible), sunflowers, wheat, and sugarbeets are the primary crops produced. In 2017, 52% of the acres planted in Cass County were soybeans, 29% of the acres were planted to corn, while 9% was planted to wheat. Sugar beets, dry edible beans, sunflowers, and barley each constituted about 1 to 2% each of the total acres.

Livestock plays a moderate roll in the agriculture of the watershed, mostly in the west and southwest portions. There are approximately 17,000 head of cattle throughout Cass County, or 1% of all production in North Dakota. Livestock producers in this area are generally small animal feeding operations (AFO) with less than 300 cattle. However, those that do produce livestock are more likely to live near the river or a tributary to the river where the land is less tillable or frequently flooded; therefore it is used as pasture for the animals.

2.5

With intensive agricultural practices dominating much of the land use throughout Cass County, agricultural runoff is a major contributor to nonpoint source pollution in the Maple River Watershed. Significant rain events and spring flooding carry nutrients and sediment to the Maple River and its tributaries. Understanding hydrologic and nutrient data helps identify the extent of nutrient impairments and the threats to recreational uses throughout the watershed.

Hydrology

Hydrology describes the way water flows through a watershed. The water discharge measurement (volume of water) is an important complement to the concentration data collected during water quality analysis, as it allows the determination of what quantity (load) of a pollutant flows through the system over a given time. A concentration value of ten milligrams per liter (mg/L) has a very different effect on the river depending on whether there are three or three thousand liters of water that flow through a system in a day.

Daily stream discharge values were collected at one stream location within the Maple River watershed. This location was at the United States Geological Survey (USGS) gauging station 05060100 (Maple River below Mapleton, ND). The USGS station has operated continuously from 1945 to 1958 and then was reestablished in 1996. USGS gauge station 05060100 is collocated with the NDDEQ monitoring location 384155. For the purposes of this report, the last three years (2013 to 2015) of historical discharge records will be used to describe the hydrology of the Maple River watershed.

Looking at the period of 2013 to 2015 flows on the Maple River seem relatively static with little variation in flow. This is in part due to the drought conditions that were present in 2012. The precipitation amounts in 2013 to 2015 ranged from 25 inches to 15 inches. Normal precipitation amounts for Cass County average out to be 19 inches of annual rainfall. This indicates that through the period of 2013 to 2015 precipitation amounts were comparably normal for Cass County.

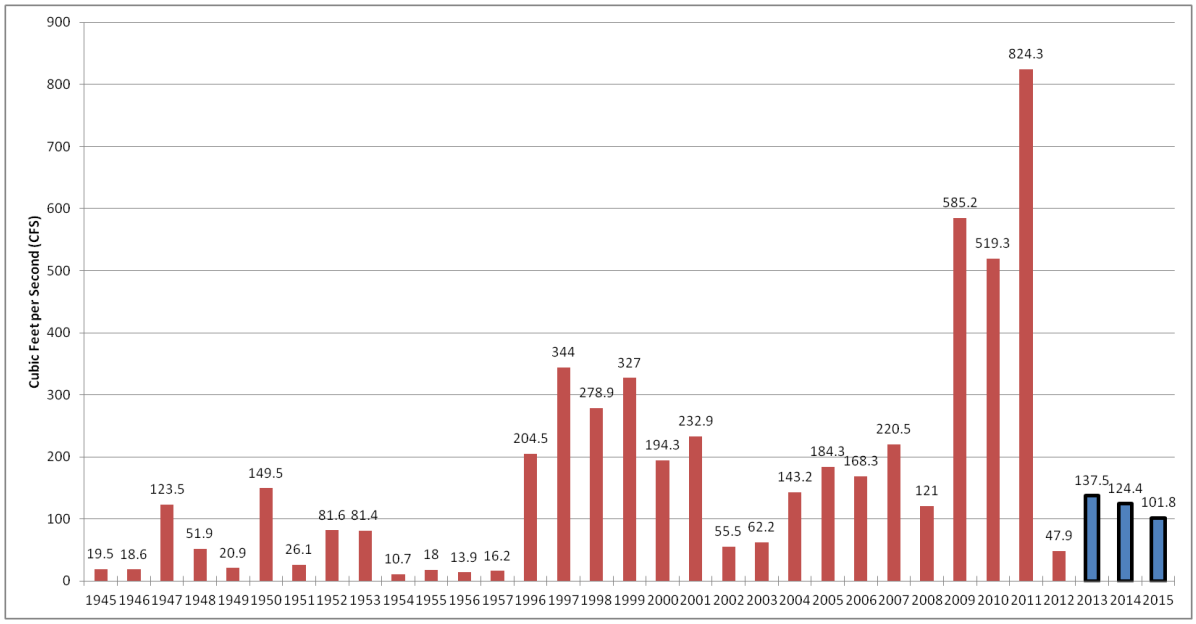


Figure 2. Mean Annual Discharge at the USGS Gauging Station (05060100) on the Maple River below Mapleton, ND (1945-2015).

The following section highlights nutrient data for Nitrogen and Phosphorus at a sampling site 384155 located near Mapleton. This section identifies the extent and the potential causes of nutrient impairments within the watershed.

Nutrients (Nitrogen and Phosphorus)

According to the draft report *An Ecological Assessment of Perennial, Wadeable Streams in the Red River Basin* (Larsen, 2012), Ecoregion 48, Lake Agassiz, had total nitrogen and phosphorus reference values of 0.883 and 0.148 mg/L, respectively. These values were derived from nutrient data collected at a set of "least disturbed" reference sites located in the Lake Agassiz ecoregion of North Dakota. These values are not a water quality standard, as nutrient criteria or standards have not yet been developed, but is provided as a point of reference or goal when evaluating the data collected within the watershed.

Table 1. Nutrient Results for Monitoring Site 384155 (Data from 2011-2016)

	Ammonia	Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Nitrogen	Total Phosphorus
Mean	0.13	0.69	0.89	1.59	0.31
Min	0.02	0.01	0.46	0.49	0.05
Max	0.89	7.18	1.87	7.76	0.73
Non-Detects	16	22	0	0	0

Water quality samples gathered from site 384155 (2011 to 2016) and analyzed indicate that nutrients specifically total nitrogen and phosphorus are at significant high levels when compared to the reference values (Table 1). These results indicate the influence of conventional tillage, over fertilization and other nonpoint sources located within the watershed.

Pathogens

Excessive amounts of fecal bacteria in surface waters used for recreation have been known to indicate an increased risk of pathogen-induced illness to humans. Infections due to pathogen contaminated waters include gastrointestinal, respiratory, eye, ear, nose, throat, and skin disease (EPA, 1986). The fecal bacteria known to cause the most harm to humans is E. coli bacteria and is the parameter now used in NDDEQ water quality standards.

Monitoring Site 384155

Monitoring site 384155 is a historical site within the Ambient Water Quality Monitoring network that the NDDEQ samples. The data results indicate that during the months of June and August, recreational uses are classified as not supporting and fully supporting but threatened respectively. May and July are fully supporting and September does not have sufficient data to calculate a recreational use assessment but data trends align with fully supporting for recreational uses.

Table 2. Summary of E. coli Bacteria Data for Site 384155 (Collected 2014-2016).

	May		June		July		August		September	
	5/6/2014	10	6/3/2014	100	7/9/2014	70	8/5/2014	110	9/3/2014	140
	5/14/2014	30	6/16/2014	520	7/21/2014	20	8/12/2014	30	9/10/2014	140
	5/21/2014	20	6/25/2014	30	7/23/2014	40	8/20/2014	1600	9/17/2014	90
	5/21/2014	5	6/16/2015	270	7/30/2014	10	8/25/2014	120	9/23/2014	5
	5/27/2014	50	6/21/2016	230	7/21/2015	70	8/27/2014	50		
	5/20/2015	300			7/26/2016	60	8/29/2015	10		
	5/23/2016	40					8/31/2016	40		
Geo Mean	29		157		36		74		54	
% Exceeded 409 CFU/100 mL	0%		20%		0%		14%		0%	
Recreational Use Assessment	FS		NS		FS		FSbT		Insufficient Data	

Sources of Pollution

Typical sources of pollution within the Maple River Watershed can be linked to agricultural runoff. Overland flows across tilled cropland acres can contribute significant fertilizer runoff causing nutrient

impairments. Animal feeding operations, riparian grazing areas, and outdated septic systems are also potential sources of nutrients, sediment and E. coli bacteria. Land use within the watershed consists of extensively tilled landscapes and expansive cropland acres that leave the land exposed and susceptible to wind and water erosion and contribute to sedimentation in waterways. Eleven cities/towns in the watershed have active ND Pollution Discharge Elimination System (NDPDES) permits. Seven of these communities have frequent approved discharges from their facilities and three towns discharge infrequently. One small community has not reported any discharges.

A Detailed Water Quality Summary for the Maple River watershed (2022-2024) can be found in Appendix C

3.0 Project Description

3.1 Goals for the Project: During the course of the project, Cass County Soil Conservation District (SCD) will aim to restore recreational use and aquatic life uses of the impaired reaches of the Maple River Watershed, as recognized in the 2022 Integrated Report. This goal will be achieved through the implementation of Best Management Practices (BMP). This is a long-term goal and will be achieved by multiple phases of 319 projects. For Phase III, education and promotion of water quality management practices and BMP implementation will be used to lower concentrations of E. coli bacteria and reduce modeled nutrient and sediment loading from cropland acres within priority sub watersheds identified with the PTMApp prioritization tool. BMP implementation will be targeted toward priority fields or catchments found in these sub watersheds.

3.2 Objectives & Tasks

Objective 1: Provide local project administration and staffing to deliver technical assistance to landowners in the watershed and coordinate with conservation programs available through other state, federal, local and non-governmental organizations.

Task 1: Employ one full-time Watershed Coordinator for 5 years.

Product: Project coordinator to manage day-to-day project activities; provide technical assistance to landowners/producers; organize and conduct I&E events; and coordinate with NRCS Field office staff, Extension Service and other resource management entities to promote and install BMP.

Cost: $358,176 ($214,906 319 funds $143,271 SCD match)

Task 2: Manage Section 319 funds and local match and oversee all aspects of project implementation to ensure all tasks are completed as scheduled.

Product: Monthly review of project activities and progress; annual evaluations of staff performance; ongoing project promotion; assist with outreach efforts; approve BMP cost

share agreements; coordinate with project partners; provide support staff; and secure necessary matching funds.

Costs: SCD In-kind

Objective 2: Continue to develop and improve a multi-phase schedule for addressing NPS pollution impacts to beneficial uses throughout the Maple River watershed.

Task 3: Continue coordination with the International Water Institute and NDDEQ to prioritize the subwatersheds in the Maple River watershed. Prioritization will be based on N, P and TSS loads at each subwatershed outlet.

Product: Numeric ranking and schedule for targeting the implementation of Phase III (this phase) and future phases of the long-term project.

Cost: $0

Task 4: Focus the delivery of financial and technical assistance on producers and landowners in the Phase III priority subwatersheds and utilize PTMApp to assist in field scale BMP planning and implementation in the priority catchments.

Product: Targeted assistance to maximize pollutant reduction benefits of BMP applied during Phase III.

Cost: $0

Task 5: Hold public stakeholder meetings in each priority 12-digit HUC to establish producer interest and highlight specific targeted BMPs and practices for priority catchments.

Product: 5 local meetings where PTMApp tool capabilities and targeted BMPs will be presented to producers.

Cost: $0

Objective 3: Reduce E. coli bacteria levels to meet state standards for recreation uses in the TMDL listed reaches. State standard criteria for E. coli bacteria during the recreational season are a geometric mean of 126 CFU/100 ml with less than 10% of samples exceeding 409 CFU/100 ml.

Task 6: Identify and repair 5 failed septic systems located within the Maple River Watershed. Emphasis will be placed on addressing the failed systems located within one half mile of the TMDL listed reaches.

Product: Replace or repair 5 failed septic systems contributing to elevated E. coli levels.

Cost: $75,000 ($45,000 319 funds $30,000 producer match)

Task 7: Minimize the length of time livestock are fed in confined areas or riparian areas by assisting producers to implement management systems that utilize fences, water developments, windbreaks, winter grazing management plans, cover crops and/or crop residues to better distribute feeding/grazing locations and move livestock away from riparian areas and confined feeding sites. These funds may also be used to assist partnering agencies with costs of constructing ag waste facilities within the Maple River Watershed.

Product: 8 Partial Maure Management Sysetems. See BMP budget table for details on associated practices.

Cost: $59,500 ($35,700 319 funds $23,800 producer match)

Objective 4: Reduce nutrient (N&P) and sediment loads from catchments within the Phase III priority subwatershed and Maple River Watershed through the implementation of BMP. This objective will focus on reducing nutrient runoff using reduced tillage, cover crops, field buffers, and riparian buffers. PTMApp prioritization tool will aid in identifying high priority areas for implementation.

Task 8: Work with the North Dakota Department of Environmental Quality to further refine PTMApp priority areas for targeting BMP implementation.

Product: AnnAGNPS model and PTMApp web-based prioritization tool.

Cost: $0

Task 9: Using the PTMApp prioritization tool, work with area producers to identify target areas for conservation planning aimed to reduce nutrient and sediment loads. Financial support for planned BMP will be solicited from several sources, including proposed Maple River Watershed Project (section 319 funds), NRCS programs (e.g. EQIP & CSP), CRP, ND Outdoor Heritage Fund, and current and future Climate Smart Ag programs.

Product: Make contacts with 40 producers located within high priority target areas for implementation highlighted by PTMApp tool.

Cost: Section 319 funding and estimated funding from other sources for BMP is provided under task 10.

Task 10: Support the implementation of cropland practices scheduled in producer agreements to reduce surface runoff, improve water infiltration, improve nutrient management and overall soil health. BMPs that may be cost shared include cover crops, pasture/hayland plantings, vegetative buffers, nutrient management, etc. No-till, strip till, and residue management will not be cost shared using section 319 funds but will be actively promoted.

Product: BMP addressing soil erosion and nutrient management on 3,000 acres of cropland.

Cost: $86,500($69,000 319 funds $46,000 producer match)

$3,000,000 Estimated USDA funds available through NRCS and Climate Smart Ag Programs.

Task 11: Establish perennial vegetation in priority catchments highlighted by PTMApp at high priority edge of field locations. These areas seeded back to perennial vegetation may be utilized as pasture/hayland plantings or signed up with management agreements to receive an annual rental payment.

Product: 100 acres of producer management agreements

Cost: $85,050 ($51,030 319 Funds $34,020 producer match)

Objective 5: Monitor the effectiveness of BMP implementation using PTMApp and PLET models as well as analysis of water quality data obtained through sample collection.

Task 12: Utilize PLET (Pollution load estimation tool) to monitor N, P and TSS load reductions associated with applied BMP.

Product: Annual N, P and TSS load reductions for entry in the PLET

Cost: $0

Task 13: Continue monitoring four sites along the mainstem of the Maple River as part of the sampling and analysis plan for the project. This data will result in water quality summary by NDDEQ to determine shifting trends and overall water quality improvements.

Product: Weekly sampling of sites 385360, 385351, 385356, 384155 May1, through October 31st.

Cost: Coordinator will collect samples weekly

Task 14: Utilize data collected at the NDDEQ ambient site 384155 to analyze for long term trends within the Maple River Watershed. Data at this site is be collected by NDDEQ staff.

Product: Continuous record of water quality conditions throughout all project phases.

Cost: $0 NDDEQ staff will collect the samples as part of the ongoing ambient monitoring program.

Objective 6: Increase public awareness on NPS pollution issues and promote the use of effective best management practices to improve soil and water quality.

Task 15: Conduct annual educational events at various locations throughout the county to allow area producers to see and learn about soil health practices. Bus tours, field days, and educational workshops will be put on to increase public awareness on NPS issues and effective BMPs. When possible, these events will be coordinated with ongoing state and/or federal I/E programs in the area.

Product: 1 Farm tour/year, 5 Educational workshops, and stakeholder meetings within priority subwatershed.

Cost: $15,000 ($9,000 319 funds $6,000 local match) * In kind match will be used where applicable*

Task 16: Prepare brochures, quarterly newsletter articles, and direct mailings, to local land users and the public to promote the project and disseminate information on water quality and NPS pollution management.

Product: 5 Quarterly newsletters, one brochure, 2 direct mailings

Cost: $1,250 ($750 319 funds, $500 SCD Match)

3.2 PROJECT MILESTONES:

See Milestone Table, **Appendix B**.

3.4 PERMITS:

All necessary permits will be acquired. These may include CWA Section 404 permits and NDPDES permits. Project sponsors will work with NDDEQ to determine if National Pollution Elimination System permits are needed for the proposed livestock systems. The State Historic Preservation Officer will be consulted regarding potential cultural resource affects.

3.5 LEAD PROJECT SPONSOR:

Cass County Soil Conservation District (CCSCD) is sponsoring this water quality project. The CCSCD's annual and long-range plans help to prioritize and guide the field service staff. The CCSCD has legal authorization to employ personnel and receive and expend funds. They have a track record for personnel management and addressing conservation issues for the constituency. The Maple River Water Resource Board (MRWRB) is responsible for the management of water resources in the Maple River watershed. They will provide technical support for the project.

3.6 BMP OPERATION AND MAINTENANCE:

Proper operation and maintenance will be assured utilizing the Natural Resources Conservation Service (NRCS) Operation and Maintenance (O&M) guidance as listed under the standard and specification for the associated BMP applied or other standard approved by the NDDEQ.

COORDINATION PLAN

4.1 The project sponsor for the Maple River Watershed project is the Cass County Soil Conservation District (CCSCD). Major partners include the Natural Resources Conservation Service (NRCS), ND County Extension Service (Cass), Farm Service Agency (FSA), Barnes County SCD, Ransom County SCD, and the Lake Agassiz Resource Conservation & Development Council. The CCSCD will be the lead project sponsor.

1. The lead project sponsor is the Cass County Soil Conservation District (CCSCD). The ND Department of Environmental Quality (NDDEQ) will hold a contract with the district. Land use assessment, BMP implementation (demonstration sites), project administration, computer entry, landowner contacts, water sampling, and water quality education will be the responsibility of the district.

2. Ransom County SCD and Barnes County SCD have both expressed support for the project. Cass County SCD will work directly with the staff to address resource concerns in these areas and potentially work on projects within the boundaries of these SCD areas and the Maple River Watershed.

3. USDA Natural Resources Conservation Service (NRCS) – The NRCS will provide day to day assistance in conservation planning, plan writing, contract writing, and technical assistance for construction and installation of planned BMP. NRCS personnel will conduct quality review and compliance checks of BMP that are designed by NRCS personnel. Local NRCS personnel will provide approved BMP standards and specifications from the NRCS technical guide. Conservation planning assistance will be provided to the Resource Management System (RMS) level. Environment Quality Incentive Program funds will also be available in limited amounts. (NRCS will aid by facilitating local involvement and participating in educational outreach programs during the project period. Regional Conservation Partnership Program (RCPP) may also be pursued as an additional source of funding for the project. An annual review will be conducted with ASTC (FO), DC, and the SCD to reconfirm and acknowledge NRCS's ability to commit to the project). NRCS also provides office space and computer program resources for the project.

4. North Dakota Department of Environmental Quality– The NDDEQ will oversee 319 funding as well as provide training for proper water quality sample collection, preservation, and transportation to ensure reliable data is obtained. The NDDEQ will provide the sponsor oversight to ensure proper management and expenditures of Section 319 funds. They will assist NRCS and the Cass SCD personnel in review of O & M requirements for Section 319 funded BMP.

5. North Dakota State University Extension Service (EXT) – To complement the project's information and education activities, local and state Extension personnel will be asked to contribute in-kind assistance. This will entail workshops and field tours. The specific role of Extension will be dependent on the type of information/education activity being implemented and availability of staff and materials.

6. Maple River Water Resource Board (WRB) – Maple River Water Resource Board will be involved in the project by acting as advisors. Maple River WRB will contribute technical assistance for the project and promote the project in Cass County.

7. North Dakota Game & Fish Department (NDG&F) – Will be asked to provide technical and financial assistance to the project when applicable.

8. Farm Services Agency (FSA) – Programs available through FSA will be pursued for cost share assistance.

9. US Fish and Wildlife (USF&W) – Programs and technical assistance available through USF&W will be pursued for project assistance.

10. International Water Institute (IWI) - Will provide technical assistance with the use of the PTMApp tool.

11. BMP Team- Will be used if any projects require engineering support.

12. ND Industrial Commission- Outdoor Heritage fund could be a potential financial contributor if grant money is applied for and granted.

4.2 Members of the Cass County SCD board, some of whom live in the watershed, express their support for this project. In addition, other government and private entities have stake in the watershed including: NRCS, Farm Service Agency, ND G&F, Red River Basin Commission, NDSU Ext., Maple River WRB, Ransom Co. SCD, Lake Agassiz RC&D and US F&W.

4.3 The Maple River Watershed Project will be working closely to coordinate activities with the NRCS, NDG&F Department, and the Maple River Water Resource Board.

Ransom County has a significant number of cattle operations that may fall within Maple River's project area. CCSCD will work with the staff and board members of Ransom County Soil Conservation District (RCSCD) when necessary to implement BMPs in high priority areas.

4.4 There are currently no similar non-point source pollution projects being undertaken in the watershed. Past and current projects, most of which are associated with USDA programs are planned as a part of county-wide efforts to address conservation issues in the area.

4.0 EVALUATION AND MONITORING PLAN

The project sponsors will coordinate with the ND Department of Environmental Quality to reevaluate the water quality monitoring approach for the project. Field edge reduction values generated with PTMApp and/or STEPL will continue to be used to estimate N, P, and TSS load reductions associated with BMP implementation. NDDEQ staff will also continue to collect samples at the NDDEQ ambient site (384155) on the Maple River to evaluate long term trends through Phase II and subsequent phases of the Maple River Watershed project.

6.0 BUDGET

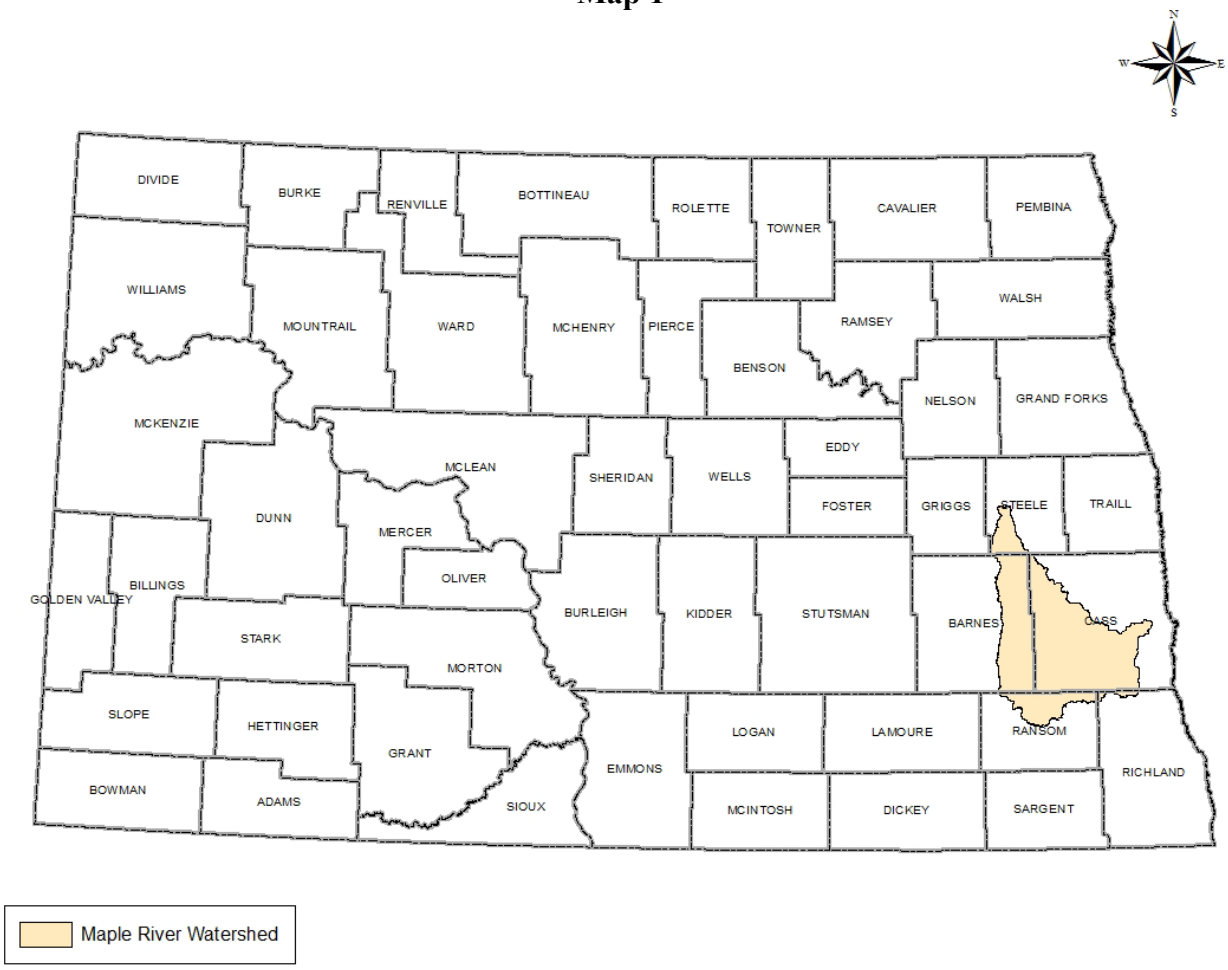
6.1 See **Appendix B**.

7.0 PUBLIC INVOLVEMENT

7.1 Information and education meetings will be held to keep the community informed. Community leaders, commissioners, water resource board members, and district supervisors will be involved in decision-making processes involving the implementation of the Maple River Watershed Project.

Appendix A
Maps

Map 1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DIVIDE
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TOWNER
CAVALIER
PEMBINA
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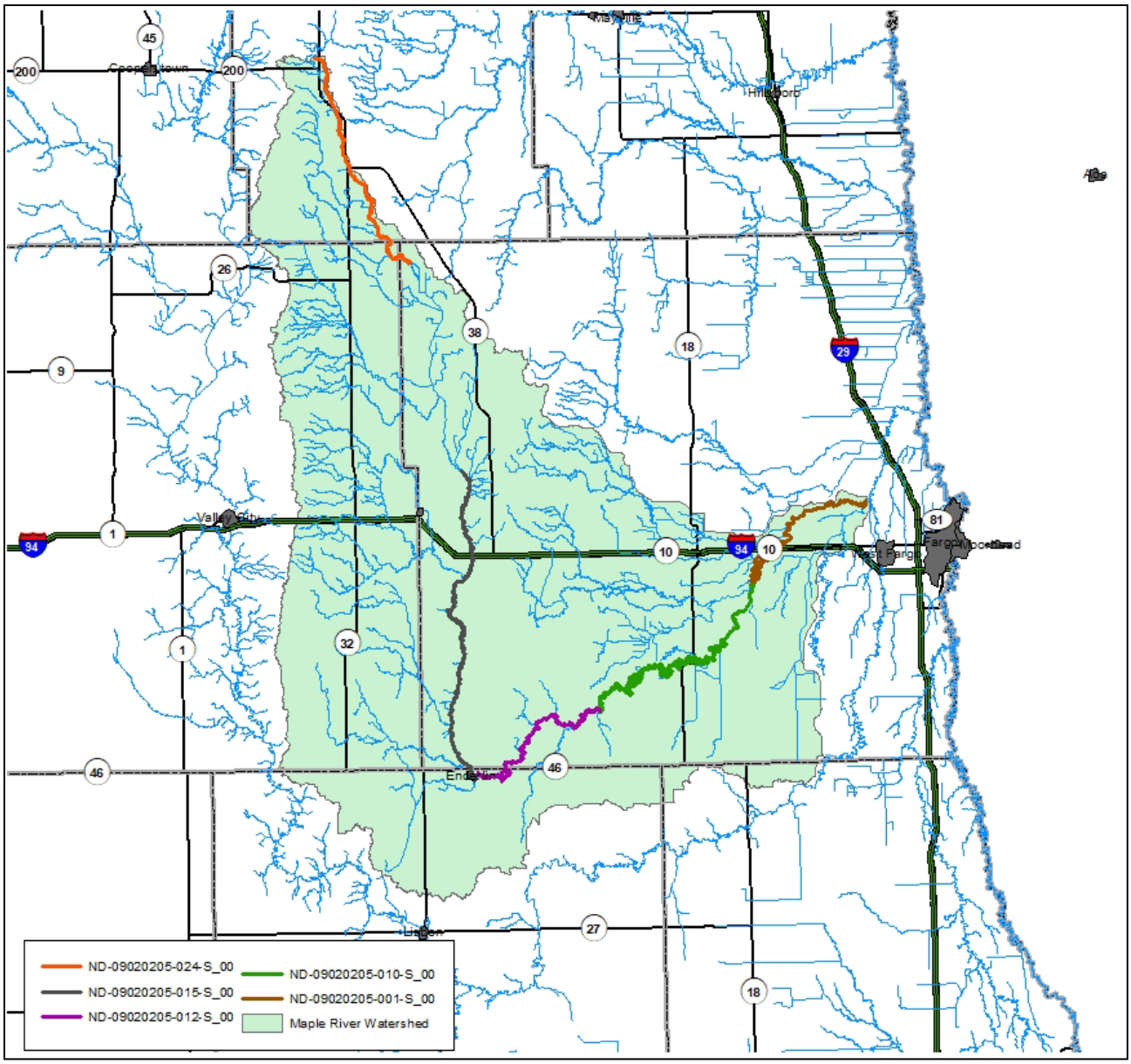
MOUNTRAIL
WARD
MCHENRY
PIERCE
BENSON
RAMSEY
WALSH
NELSON
GRAND FORKS
MCKENZIE
MCLEAN
SHERIDAN
WELLS
EDDY
FOSTER
GRIGGS
STEELE
TRAILL
DUNN
MERCER
OLIVER
BILLINGS
GOLDEN VALLEY
STARK
BURLEIGH
KIDDER
STUTSMAN
BARNES
CASS
MORTON
SLOPE
HETTINGER
GRANT
EMMONS
LOGAN
LAMOURE
RANSOM
RICHLAND
BOWMAN
ADAMS
SIOUX
MCINTOSH
DICKEY
SARGENT
Maple River Watershed

Map 2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ND-09020205-015-S_00
ND-09020205-012-S_00
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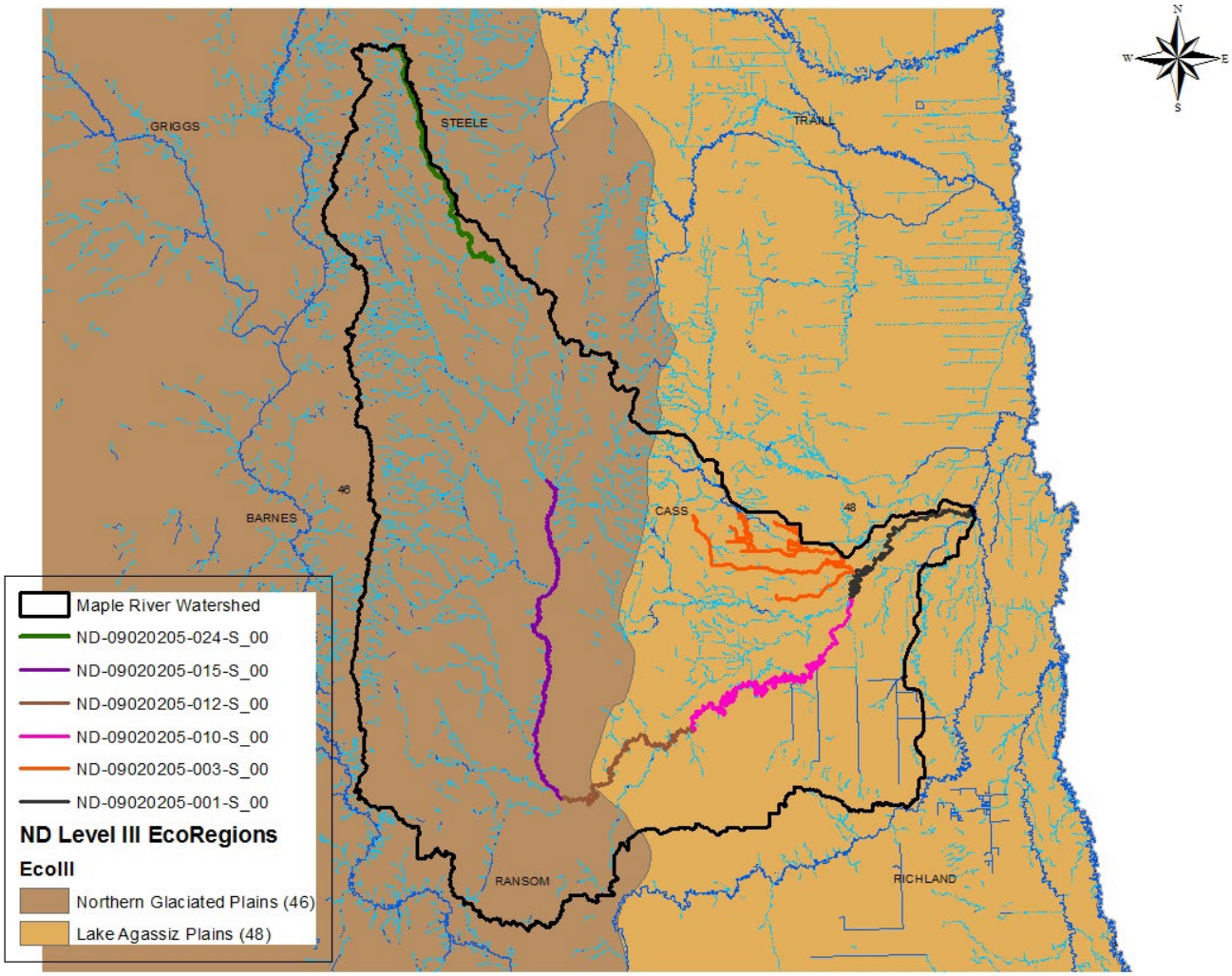
Maple River Watershed

Map 3


N
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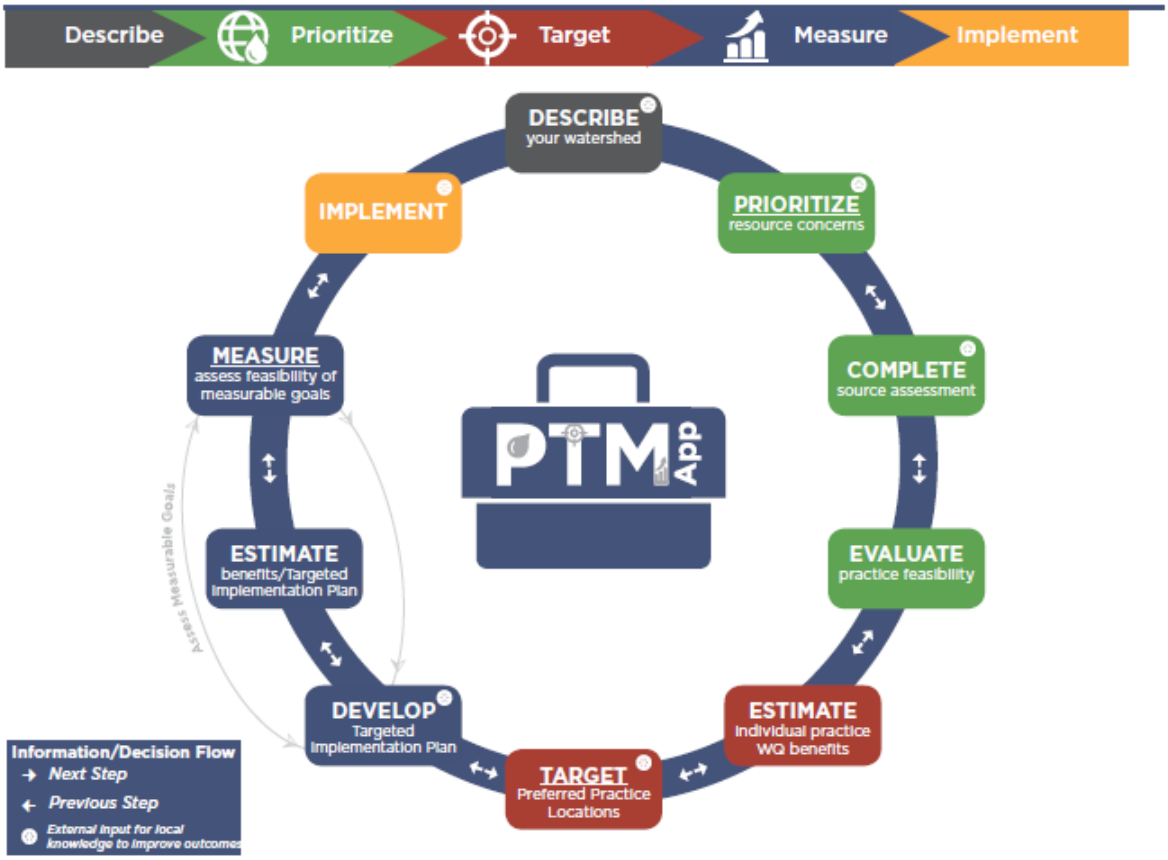
GRIGGS
STEELE
TRAILL
BARNES
46
CASS
48
RANSOM
RICHLAND
Maple River Watershed
ND-09020205-024-S_00
ND-09020205-015-S_00
ND-09020205-012-S_00
ND-09020205-010-S_00
ND-09020205-003-S_00
ND-09020205-001-S_00
ND Level III EcoRegions
EcoIII
Northern Glaciated Plains (46)
Lake Agassiz Plains (48)

PTMApp

PTMApp Products and Business Workflow

The Prioritize, Target, Measure Application (PTMApp) is an innovative new tool that will help users with aspects of surface water quality planning from describing the watershed to developing implementation plans. Learn more about how you can use the application to improve every day decisions for more accurate results.

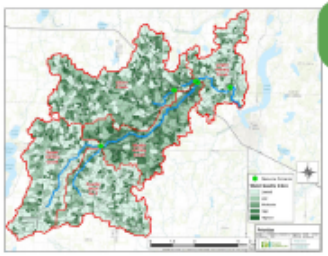
Available for free download: www.rrbdin.org/prioritize-target-measure-application-ptmapp



The following examples were completed as a pilot case study in the Sauk River Watershed District:

DESCRIBE your watershed

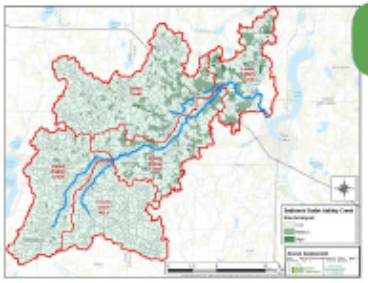
Identify and describe important resources, features, and factors associated with your watershed. PTMApp contains a pre-packaged publicly available watershed data set to the boundary of your watershed. This simplifies the process of gathering and summarizing GIS and resource data needed for your watershed. Data from PTMApp can help visualize and summarize the number of impaired waters and assessed waters in the study area.



PRIORITIZE resource concerns

Establish the relative importance of resources within the area you manage. Lakes, streams and wetlands are frequently potential resource concerns included in prioritization processes. Use PTMApp products in conjunction with other models and Zonation to help prioritize resource concerns. PTMApp can help select resources that are a priority and locations where management actions should be taken.

Continued ▶

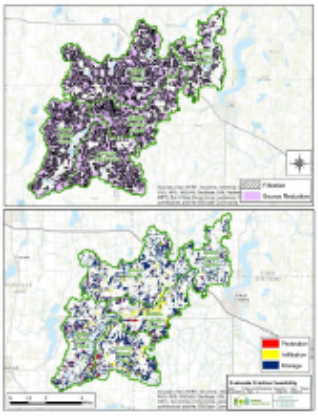


COMPLETE source assessment

Identify the magnitude and spatial distribution of potential pollution sources across the landscape. Understand how various parts of the watershed contribute sediment, total phosphorus, and total nitrogen loads to downstream locations including impaired waters. Use PTMApp to identify the highest areas of sediment loading and show the best areas for practices.

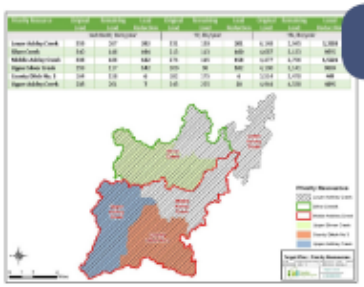
DEVELOP Targeted Implementation Plan

Specific locations to place practices must also be targeted based on practical and social factors. PTMApp data can incorporate additional information to refine the practices targeted. It is likely that many areas in the watershed may already have numerous Best Management Practices implemented, lack willing landowners, or have benefits beyond water quality that would impact the targeted locations for practices. PTMApp can adjust scenarios to restrict targeting to certain areas.



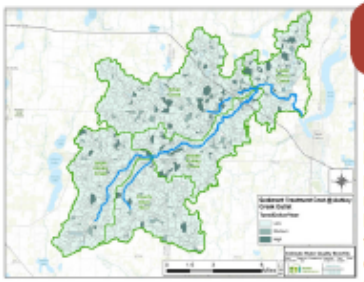
EVALUATE practice feasibility

The feasibility of placing best management practices (BMPs) on the landscape depends on several factors: the size of contributing drainage area, land slope, and flow regime. Feasibility is often based on technical factors and excludes societal factors. PTMApp creates products to facilitate these conversations: BMP opportunities can be combined with the source assessment data to estimate the "measurable" water quality benefits for implementing the practices.



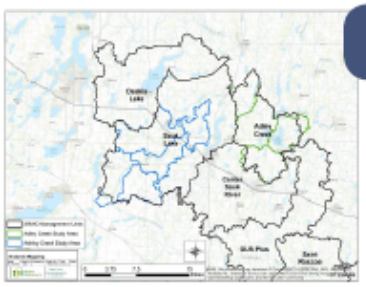
ESTIMATE benefits/Targeted Implementation Plan

Combined benefits can be compared to a measurable goal. PTMApp can use the combined benefits of many practices to assess the effectiveness of the targeted implementation plan. Annual load reduction estimates can be calculated at each priority resource point within a study area and used to assess progress toward a measurable water quality goal. This information can be used directly within a Targeted Implementation Plan.



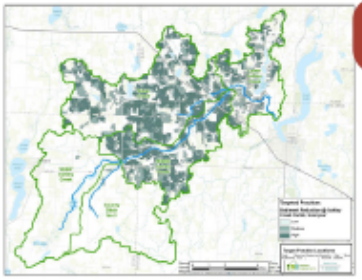
ESTIMATE Individual practice WQ benefits

Selecting specific practices to implement is based on their probable benefits, ranging from pollutants removed or the related cost. PTMApp can help estimate benefits at the location of the practice or resource. Outputs from PTMApp can show areas that provide the most bang for your buck and can help target practice locations to provide the most cost-effective ways to create measurable progress.



MEASURE assess feasibility of measurable goals

A measurable goal may be the load reduction needed to restore a lake or river reach, or a maximum load to protect a resource. PTMApp can compare the estimated benefits of the Targeted Implementation Plan to water quality goals. Results of this analysis can show the scenarios that will provide the reductions needed to reach your planning goals.



TARGET preferred practice locations

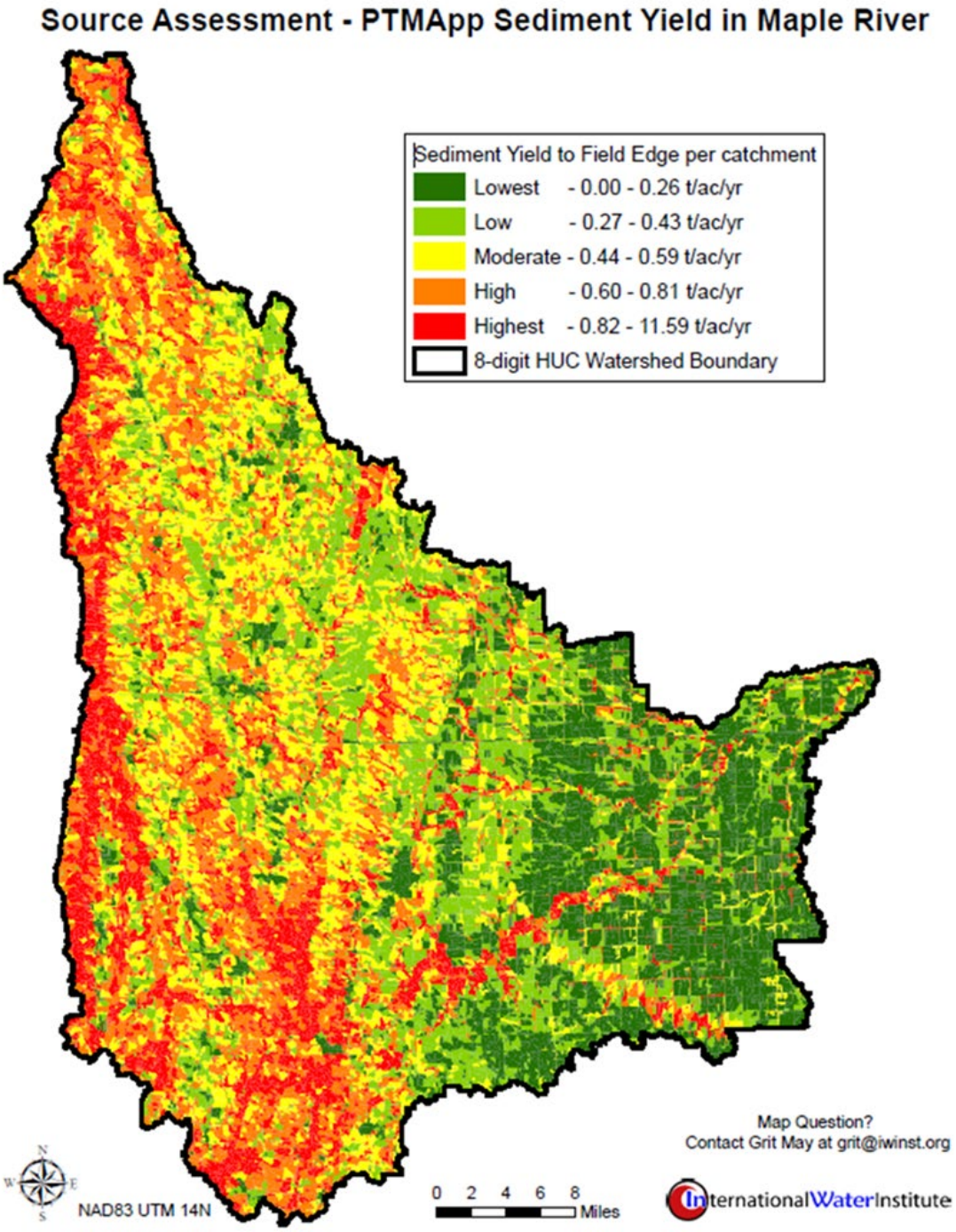
Once possible BMP locations are identified for feasibility, potential locations must be evaluated for their combined effectiveness. PTMApp can generate data to provide feasible locations for implementing practices that will provide measurable water quality improvements for priority resources. There are a number of factors that might influence preferred practices, including existing practices in place and landowner participation.

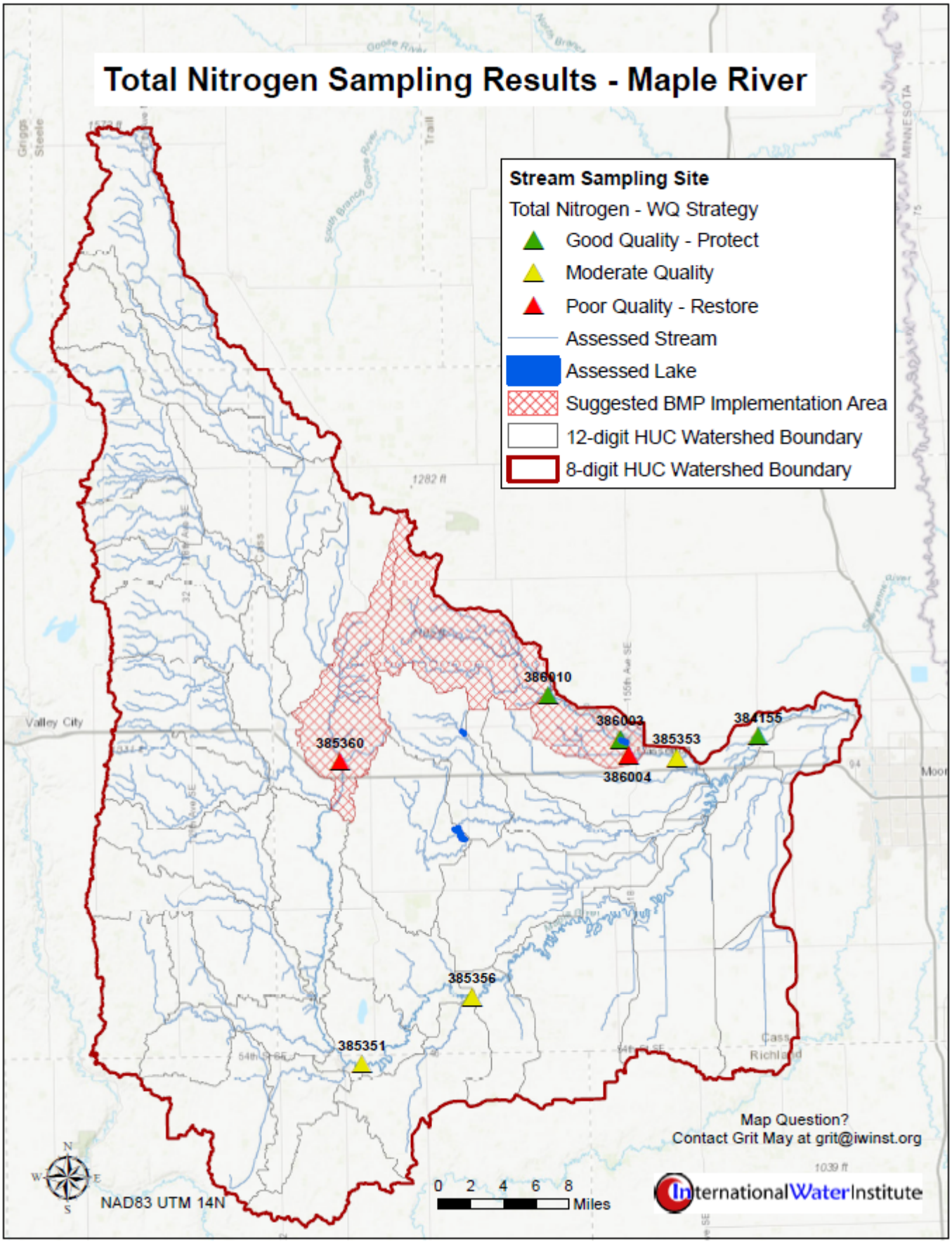
IMPLEMENT

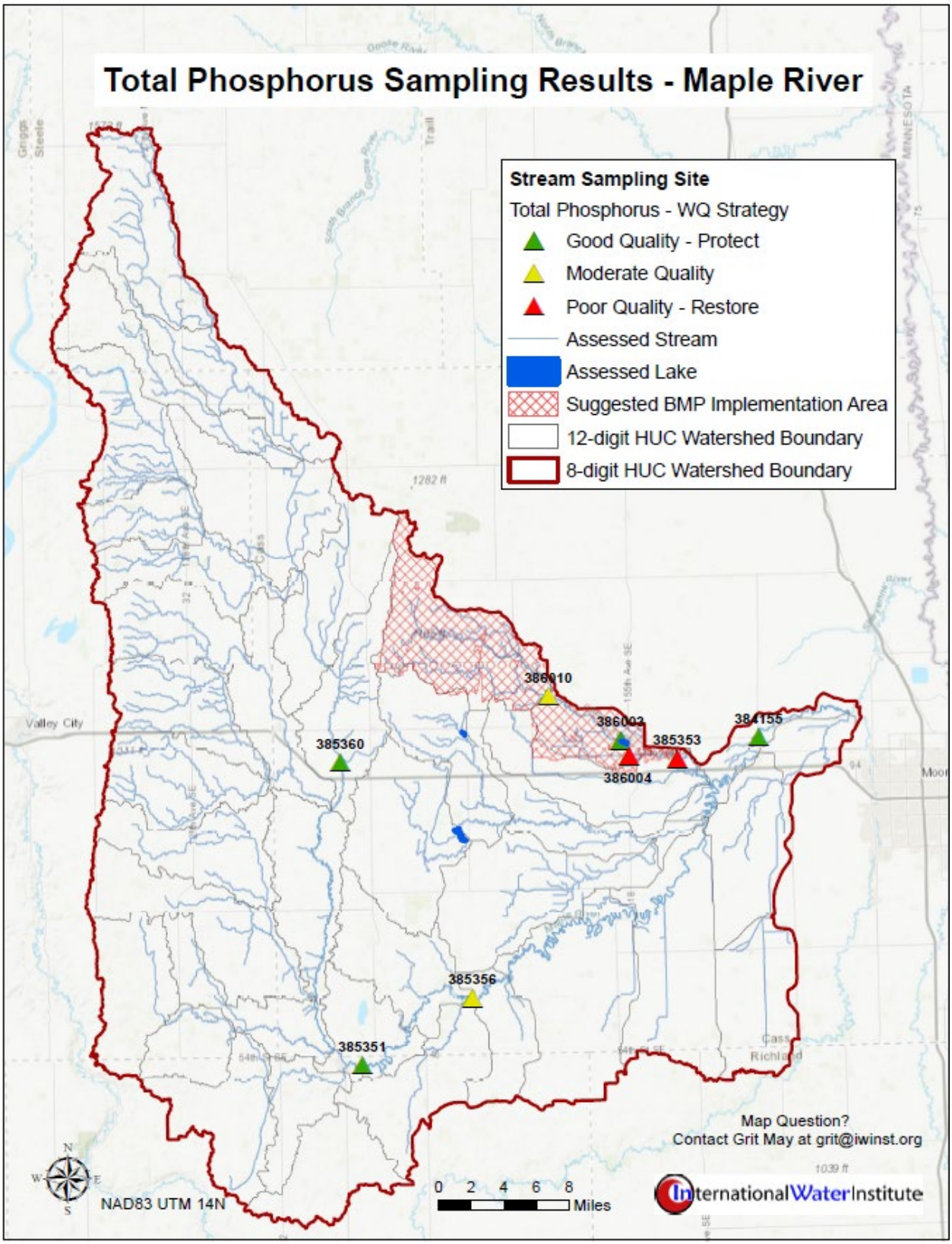
By running various scenarios in PTMApp, managers can identify scenarios to implement the best, targeted solutions. PTMApp can analyze various practices and estimate the largest load reductions for specific areas within the watershed. This information helps users implement the best possible practices in the most effective locations.

For more information, contact: Chuck Fritz, Administrator—International Water Institute, 701.388.0861, charles@iwinst.org

Phase II PTMApp Source Assessment and Priority Watersheds




Total Nitrogen Sampling Results - Maple River
Stream Sampling Site
Total Nitrogen - WQ Strategy
Good Quality - Protect
Moderate Quality
Poor Quality - Restore
Assessed Stream
Assessed Lake
Suggested BMP Implementation Area
12-digit HUC Watershed Boundary
8-digit HUC Watershed Boundary
386010
386003
384155
385353
385360
386004
385356
385351
Valley City
Cass
Richland
Map Question?
Contact Grit May at grit@iwinst.org
NAD83 UTM 14N
0 2 4 6 8
Miles
InternationalWaterInstitute


Total Phosphorus Sampling Results - Maple River
Stream Sampling Site
Total Phosphorus - WQ Strategy
Good Quality - Protect
Moderate Quality
Poor Quality - Restore
Assessed Stream
Assessed Lake
Suggested BMP Implementation Area
12-digit HUC Watershed Boundary
8-digit HUC Watershed Boundary
386010
386003
384155
385353
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385356
385351
Valley City
Map Question?
Contact Grit May at grit@iwinst.org
NAD83 UTM 14N
0 2 4 6 8
Miles
InternationalWaterInstitute

Appendix B
Budget & Milestones

Maple River Watershed Project						
BUDGET TABLE						
PART 1: FUNDING SOURCES	**2025**	**2026**	**2027**	**2028**	**2029**	**TOTAL**
EPA SECTION 319 FUNDS						
1) FY18 Section 319 Funds	$ 86,823	$ 86,823	$ 86,823	$ 86,823	$ 86,823	$ 434,115
Subtotals	***$ 86,823***	***$ 86,823***	***$ 86,823***	***$ 86,823***	***$ 86,823***	***$ 434,115***
OTHER FEDERAL FUNDS *						
1) NRCS EQIP & CSP (FA)	$ 600,000	$ 600,000	$ 600,000	$ 600,000	$ 600,000	$ 3,000,000
Subtotals	***$ 600,000***	***$ 600,000***	***$ 600,000***	***$ 600,000***	***$ 600,000***	***$ 3,000,000***
STATE/LOCAL MATCH						
1) Local SCD (TA, FA)	$ 31,118	$ 31,118	$ 31,118	$ 31,118	$ 31,118	$ 155,591
5) Cass County Participating Producers (cash/inkind)	$ 26,764	$ 26,764	$ 26,764	$ 26,764	$ 26,764	$ 133,820
Subtotals	***$ 57,882***	***$ 57,882***	***$ 57,882***	***$ 57,882***	***$ 57,882***	***$ 289,411***
TOTAL BUDGET	**$ 744,705**	**$ 744,705**	**$ 744,705**	**$744,705**	**$744,705**	**$3,723,526**
319 BUDGET	**$ 144,705**	**$ 144,705**	**$ 144,705**	**$144,705**	**$144,705**	**$ 723,526**

BUDGET TABLE									
PART 2: Section 319 / Non-Federal Budget Funds		2025	2026	2027	2028	2029	TOTAL	In-Kind Match	319 Funds
OBJECTIVE 1: Personnel/Support									
	Task 1								
1)	Salary/Fringe - Watershed Coordinator (full-time: 2080 hrs/yr)	$ 68,000	$ 69,360	$ 71,441	$ 73,584	$ 75,792	**$ 358,176**	**$ 143,271**	**$ 214,906**
2)	Travel (3,000 miles/year at $.67/mile)	$ 2,010	$ 2,010	$ 2,010	$ 2,010	$ 2,010	**$ 10,050**	**$ 4,020**	**$ 6,030**
3)	Training	$ 300	$ 300	$ 300	$ 300	$ 300	**$ 1,500**	**$ 600**	**$ 900**
4)	Cell phone (12/mo @ $50/mo.)	$ 600	$ 600	$ 600	$ 600	$ 600	**$ 3,000**	**$ 1,200**	**$ 1,800**
	Subtotals	***$ 70,910***	***$ 72,270***	***$ 74,351***	***$ 76,494***	***$ 78,702***	***$ 372,726***	***$ 149,091***	***$ 223,636***
OBJECTIVE 2 - 3: BMP's									
	Tasks 3 - 8								
1)	Implement BMP Practices (see attached BMP priority list)	$ 66,910	$ 66,910	$ 66,910	$ 66,910	$ 66,910	**$ 334,550**	**$ 133,820**	**$ 200,730**
	Subtotals	***$ 66,910***	***$ 66,910***	***$ 66,910***	***$ 66,910***	***$ 66,910***	***$ 334,550***	***$ 133,820***	***$ 200,730***
OBJECTIVE 4: Water Quality Monitoring									
	Subtotals	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
OBJECTIVE 5: Information/Education									
1)	Information/Education Meetings	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	**$ 15,000**	**$ 6,000**	**$ 9,000**
2)	Publications	$ 250	$ 250	$ 250	$ 250	$ 250	**$ 1,250**	**$ 500**	**$ 750**
	Subtotals	***$ 3,250***	***$ 3,250***	***$ 3,250***	***$ 3,250***	***$ 3,250***	***$ 16,250***	***$ 6,500***	***$ 9,750***
TOTAL 319/NON-FEDERAL BUDGET		**$ 141,070**	**$ 142,430**	**$144,511**	**$146,654**	**$ 148,862**	**$ 723,526**	**$ 289,411**	**$ 434,116**

MAPLE RIVER WATERSHED PROJECT

Maple River Watershed Project
PART 3: Priority Best Management Practices (BMPs)

								FUNDING		
Objectives	**NRCS Code**	**Practice****	**No.***	**Acres***	**Linear Feet (LF)***	***Rate***	**TOTAL**	**Cost-share Rate**	**Cash Costs**	**319 Match**
Objective 2	19	Septic System Rennovation	5			*$ 15,000.00*	$ 75,000	60%	$ 30,000	**$ 45,000**
	614	Watering Facility	8			*$ 1,500.00*	$ 12,000	60%	$ 4,800	**$ 7,200**
	516	Pipelines			5,000	*$ 5.50*	$ 27,500	60%	$ 11,000	**$ 16,500**
	382	Fencing			10,000	*$ 2.00*	$ 20,000	60%	$ 8,000	**$ 12,000**
Objective 3	340	Cover Crop		2,500		*$ 35.00*	$ 87,500	60%	$ 35,000	**$ 52,500**
	69	Short Term Management Agreement (5 year)		100		*$ 715.50*	$ 71,550	60%	$ 28,620	**$ 42,930**
	327	Conservation Cover		100		*$ 135.00*	$ 13,500	60%	$ 5,400	**$ 8,100**
	512	Pasture/Hayland Planting		500		*$ 55.00*	$ 27,500	60%	$ 11,000	**$ 16,500**
		SUBTOTALS	**13**	**2,600**	**15,000**		**$334,550**		**$ 133,820**	**$ 200,730**

MAPLE RIVER WATERSHED PROJECT

Maple River Watershed Project								
Milestone Table								
				Year 1	Year 2	Year 3	Year 4	Year 5
	Task/Responsible Organization	Output	Quantity	2025	2026	2027	2028	2029
Objective 1:	Entity 1							
Task 2	Employ Watershed Coordinator		1	x	x	x	x	x
Objective 2:	Multi phase schedule for							
	addressing NPS pollution							
	in the Maple River Watershed							
Task 3	Priority 10 digit HUs based on	N, P and TSS at each outlet	1	x	x	x	x	x
Task 4	Priority 12 digit Hus/catchments	PTMApp to highlight target BMP	1	x	x	x	x	x
Task 5	BMP implementation on 12 Hus	Delivery of BMP to priority area	1	x	x	x	x	x
Objective 3:	Entity 1,2,3							
Task 6	Reduce E. Coli Bacteria	Septic System Renovations	5	1	1	1	1	1
Task 7	Livestock BMP	Grazing Management Plans	8	2	2	2	1	1
		Watering Facility	8	2	2	2	1	1
		Fencing	10,000 ft	2,000 ft	2,000 ft	2,000 ft	2,000 ft	2,000 ft
		Pipelines	5,000 ft.	1,000 ft	1,000 ft	1,000 ft	1,000 ft	1,000 ft
Objective 3:	Entity 1,2,3							
Task 8	PTMApp	Maps & Web app for BMP prioritization	1	x	x	x	x	x
Task 9	Using prioritization tools	Make contacts with producers	8	8	8	8	8	8
Task 10	Cover Crop, soil improvement	Cover Crop, residue management	2500 ac	500 ac	500 ac	500 ac	500 ac	500 ac
		Pasture/haland planting	500 ac	100 ac	100 ac	100 ac	100 ac	100 ac
Task 11	PTMApp perennial vegetation	100 acres of management agreements	100 ac	20 ac	20 ac	20 ac	20 ac	20 ac
Objective 4:	Entity 1,4							
Task 12	PTMApp STEPL	Estimate load reductions N,P,TSS w/BMP						
Task 13	Baseline and post project WQ	Evaluate feassiblity of collecting						
Task 14	NDDEQ water sampling	site 384155 to document long term trends						
Objective 5:	Entity 1,3,5							
Task 15	SCD and Cooperating Agencies	Field Tours and Stakeholder meetings		Farm tour annually, 5 workshops				
Task 16	SCD	Newsletters, Mailings, Brochures		Quarterly newsletter, 2 mailings, 1 brochure				

Entity 1 - Cass County SCD - Local project sponsor, responsible for project coordination, reimbursement payments, match tracking, and progress reporting to the NDDEQ. Also provides technical assistance to plan, design and implement BMP.
Entity 2 - Landowners in the Maple River Watershed in Cass County - Make land management decisions and provide cash and in-kind match for BMP.
Entity 3 - Natural Resource Conservation Service - Provides technical assistance to the Cass County SCD for implementation of BMP. Also provides financial assistance for BMP to landowners through the EQIP program.

Entity 4 - North Dakota Department of Health- Statewide section 319 program management including oversight of local 319 planning and expenditures. Also provides technical assistance for water quality analysis and documentation.

Entity 5 – NDSU Extension Service. Assist with planning I/E events. Provide technical assistance and source of in-kind match.

Appendix C
RNIMAPLE Water Quality Summary

Maple River Watershed Project Phase II

2022-2024 Water Quality Summary

Prepared by:

Emily Joynt
Environmental Scientist
ND Dept. of Environmental Quality

Prepared for:

Cass County Soil Conservation District
Cass County, North Dakota

SEPTEMBER 2024

Table of Contents

PURPOSE

This water quality summary was developed for the Cass County Soil Conservation District (SCD) to support the Maple River Watershed Project – Phase II (RNIMAPLE). The project aims to reduce nonpoint source pollution impacts to aquatic life and recreation uses in the watershed. To achieve this, the SCD is applying the Prioritize, Target, and Measure Application (PTMApp) to identify subwatersheds showing the highest sources of nutrients and sediment. The SCD will focus Best Management Practice (BMP) implementation in priority fields or catchments in the identified subwatersheds. In coordination with PTMApp, water quality sampling will assess conditions throughout the watershed and measure nutrient, sediment, and bacteria reduction progress. The following provides an overview and analysis of the water quality data collected (July 2022-July 2024) and future monitoring planning for the project.

LOCATION

Water quality sampling took place at four sites on the Maple River in Cass County (Figure 1). Macroinvertebrate sampling is scheduled for fall 2025.

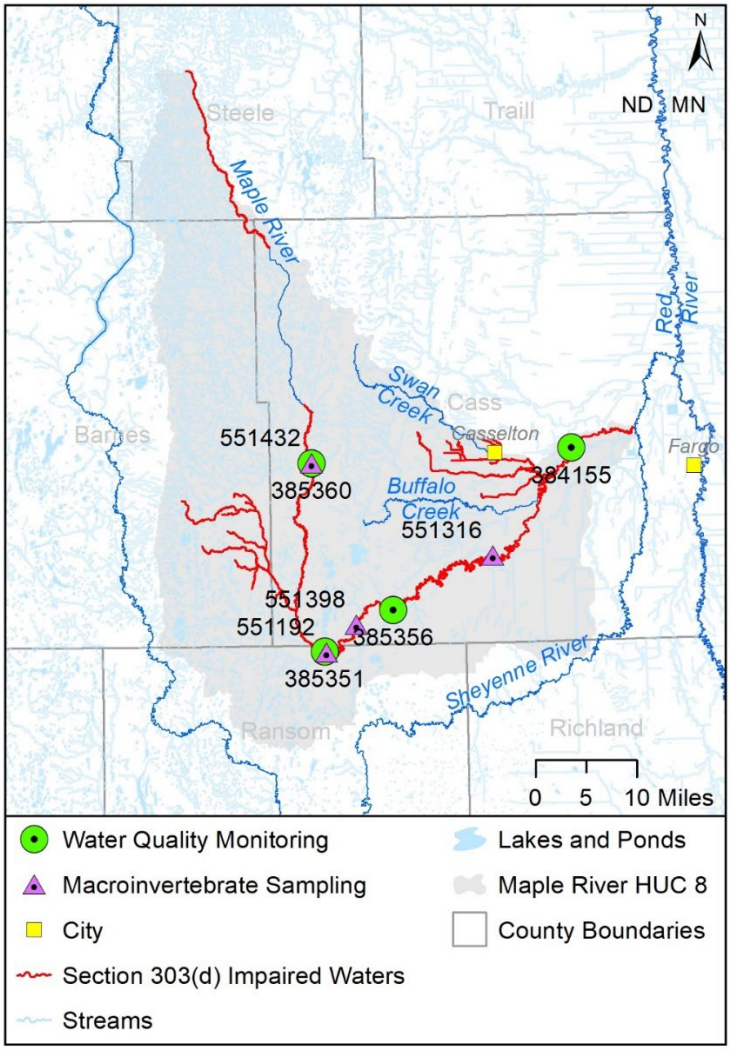

Figure 1: RNIMAPLE project area and sampling locations.

SAMPLING OVERVIEW

To determine impacts to recreation and aquatic life, water quality samples were collected by the Cass County SCD and analyzed for *Escherichia coli* bacteria (*E. coli*), total suspended solids (TSS), and nutrients complete (ammonia as nitrogen, nitrate + nitrite, total Kjeldahl nitrogen, total nitrogen, total phosphorus); macroinvertebrate samples were collected by the North Dakota Department of Environmental Quality (NDDEQ).

Each water body in the state is assigned a unique ID to track water quality status. Table 1 details each water body sampled under RNIMAPLE, including status relative to state water quality standards (supporting standards vs impaired). "Pre-Project Status" reflects water quality conditions *prior to* the start of this project. Updated status' will appear in the next iteration of the ND Integrated Report (https://deq.nd.gov/WQ/3_Watershed_Mgmt/2_TMDLs/TMDLs_IR.aspx).

Table 1. Project sampling sites and pre-project conditions on the Maple River in Cass County listed from furthest upstream > downstream).

Site IDs	Assessment Unit ID	Pre-Project Status*
385360 551432	ND-09020205-015-S_00	Recreation: Impaired based on high levels of *E. coli* Aquatic Life: Impaired based on benthic and fish populations, habitat alteration, and low dissolved oxygen levels
385351 551192 551398 385356	ND-09020205-012-S_00	Recreation: Impaired based on high levels of *E. coli* Aquatic Life: Impaired based on fish populations and habitat alteration
551316	ND-09020205-010-S_00	Recreation: Insufficient data Aquatic Life: Impaired based on benthic and fish populations, habitat alteration, and sedimentation
384155	ND-09020205-001-S_00	Recreation: Supporting Aquatic Life: Impaired based on habitat alteration and sedimentation

*Based on data collected from 2008 - 2018

WATER QUALITY STANDARDS

Recreation and aquatic life uses are assessed based on North Dakota surface water quality standards for rivers and streams. The following sections list the numeric standards used to determine water quality conditions and project progress. The state also has narrative water quality standards describing conditions needed to support uses, such as "All waters of the state shall be free from nutrients attributed to municipal, industrial, or other discharges or agricultural practices, in concentrations or loadings which will cause accelerated eutrophication…to the extent that it threatens public health or welfare or impairs present or future beneficial uses."

Complete water quality standards can be found at:
https://ndlegis.gov/information/acdata/pdf/33.1-16-02.1.pdf.

Recreation

Recreation use is assessed based, in part, on the amount of *Escherichia coli (E. coli)* bacteria in a river or stream.

E. coli Bacteria

Monthly geometric mean ≤ 126 CFU/100mL (CFU = colony forming units)
AND
≤ 10% monthly samples exceed 409 CFU/100mL

Aquatic Life

Aquatic life use is assessed based, in part, on the amount of sediment and nutrients in a river or stream and it's biological integrity.

Total Suspended Solids (TSS)

North Dakota does not currently have numeric water quality standards for TSS. Similar projects in the Red River Basin have used a guideline target of ≤ 35 mg/L.

Total Nitrogen (TN)

North Dakota does not currently have numeric water quality standards for TN. At the time of project development RNIMAPLE used an ecoregion target of < 0.883 mg/L.

Total Phosphorus (TP)

North Dakota does not currently have numeric water quality standards for TP. At the time of project development RNIMAPLE used an ecoregion target of < 0.148 mg/L.

Index of Biological Integrity (IBI)

A macroinvertebrate IBI score > 70 for streams in this ecoregion is considered "Least Disturbed" (target of ≥ 71) which corresponds with the TN and TP targets above.

Nutrient and IBI targets for the Red River Basin can be found at:
https://deq.nd.gov/publications/WQ/3_WM/River-Stream/RedRiver/Final_RBARED_20130401.pdf.

RESULTS

Between July 2022 and July 2024 over 700 water quality samples were collected and analyzed for this project. Samples were analyzed for *E. coli*, nutrients, and total suspended solids. The following sections summarize results for each. A complete set of water quality data can be found at: https://deq.nd.gov/WQ/3_Watershed_Mgmt/SWDataApp/viewer/index.html.

***E. coli* Bacteria**

E. coli concentrations in rivers and streams can be highly variable. As a result, the state water quality standard is represented by a *monthly* geometric average (≤ 126 CFU/100mL). To compare the average to the state water quality standard a minimum of five samples should be used per month. Each sampling site had datasets with less than five samples for one or more months; however, for the purposes of this summary all data was used to calculate and display monthly geomeans even if less than five samples were available. Several months during the sampling period had no data available (typically due to site inaccessibility or little/no flow).

The furthest upstream sampling site, Maple River near Buffalo (385360), showed results consistently below water quality standards. Similarly, the furthest downstream site, Maple River at Mapleton (384155) showed monthly geometric averages at or below water quality standards. However, site 384155 exceeded the second water quality standards criteria (≤ 10% greater than 409 CFU/100mL) in May and September of 2023. Sites 385351 and 385356 (Maple River near Enderlin and Leonard, respectively) only met water quality standards in May of each year (in June 2023 site 385356 met the geometric mean but > 10% of samples exceeded 409 CFU/100mL). Site 385356 (Maple River near Leonard) showed the highest monthly geometric mean in Sept 2023 (~800 CFU/100mL) and the highest single sample maximum in July 2024 (3,400 CFU/100mL).

Overall, the two furthest upstream sites showed a decrease in monthly geometric average *E. coli* concentration, whereas the two furthest downstream sites increased (Table 2). Data for August and September 2024 were not available at the time of this report and may shift overall results described below.

Table 2. Overall change in monthly *E. coli* geometric mean July 2022 – July 2024.

Site ID	Water Body	Overall Change
385360	Maple River near Buffalo	Decrease
385351	Maple River near Enderlin	Decrease
385356	Maple River near Leonard	Increase
384155	Maple River at Mapleton	Increase

Figure 2 below shows the monthly *E. coli* geometric mean for each sampling site during the recreation season compared to the state water quality standard (≤ 126 CFU/100mL).

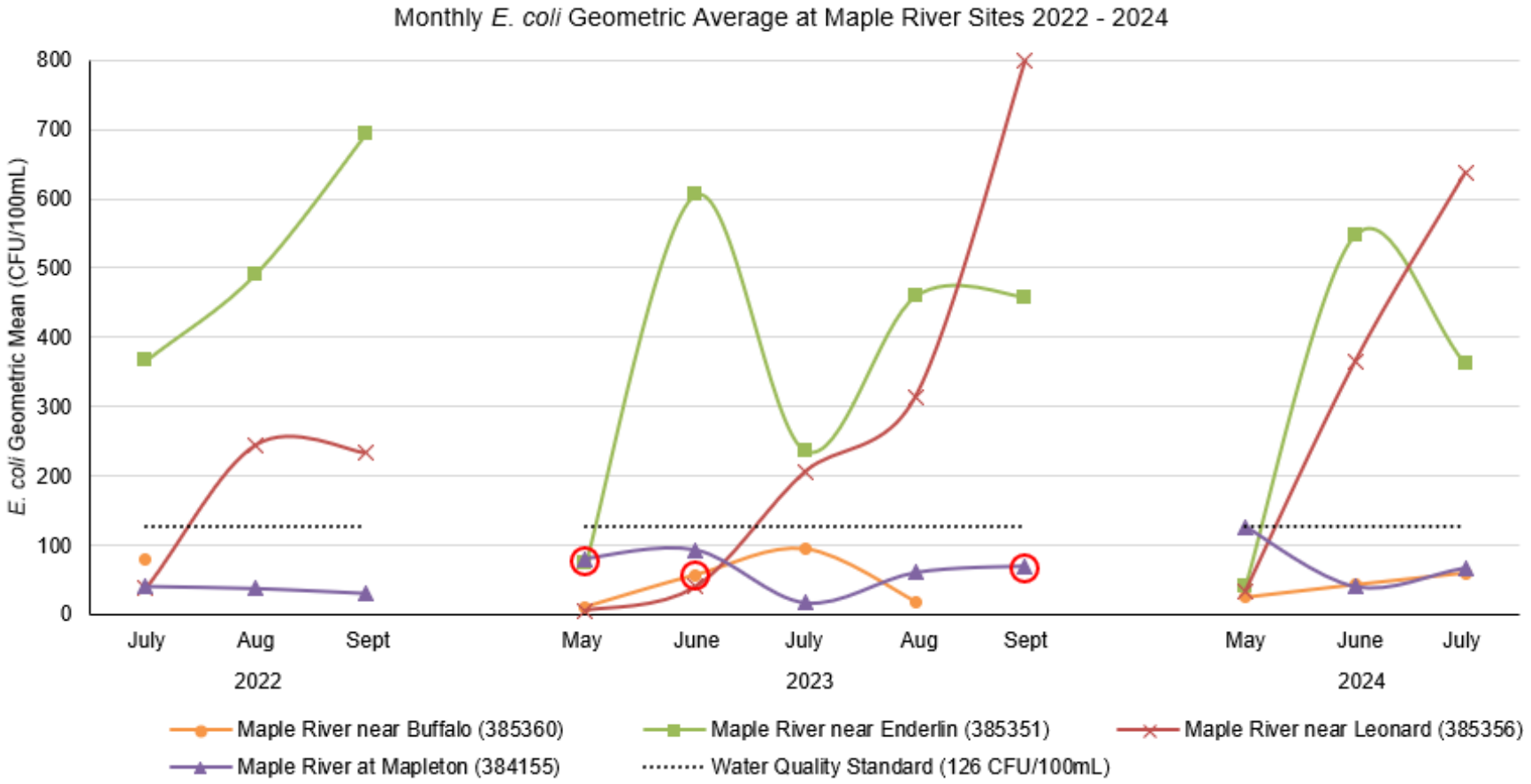

Figure 2. *E. coli* bacteria monthly geometric means at sampling locations. Red circles indicate that the monthly geometric mean ≤ 126 CFU/100mL was met, but the monthly percent > 409 CFU/100mL was exceeded (> 10%). The following datasets had less than five monthly samples available: 385360 – June 2023, Aug 2023, May 2024, June 2024; 385351 – June 2023; 385356 – June 2023, May 2024, June 2024; 384155 – June 2023, May 2024.

Total Suspended Solids (TSS)

Similar to *E. coli*, TSS concentrations in rivers and streams can be highly variable. The state does not currently have a water quality standard for TSS. Similar projects in the Red River Basin have used a guideline target of ≤ 35 mg/L which will be used in this summary for comparison. TSS samples are collected from April-October.

All sites exceeded the TSS target during the sampling period. Concentrations were highest at the furthest downstream sites (385356 Maple River near Leonard and 384155 Maple River at Mapleton). With the exception of site 385360 (Maple River near Buffalo), all showed an increase in overall TSS concentration across the sampling period; however, site 385351 (Maple River near Enderlin) showed only a marginal increase (nearly unchanging).

Table 3 below describes overall change in concentration throughout the sampling period. Data for August-October 2024 were not available at the time of this report and may shift overall results described below.

Table 3. Overall change in annual average TSS concentration July 2022-July 2024.

Site ID	Water Body	Overall Change
385360	Maple River near Buffalo	Decrease
385351	Maple River near Enderlin	Increase
385356	Maple River near Leonard	Increase
384155	Maple River at Mapleton	Increase

Figure 3 displays annual TSS ranges for each site compared to the target.

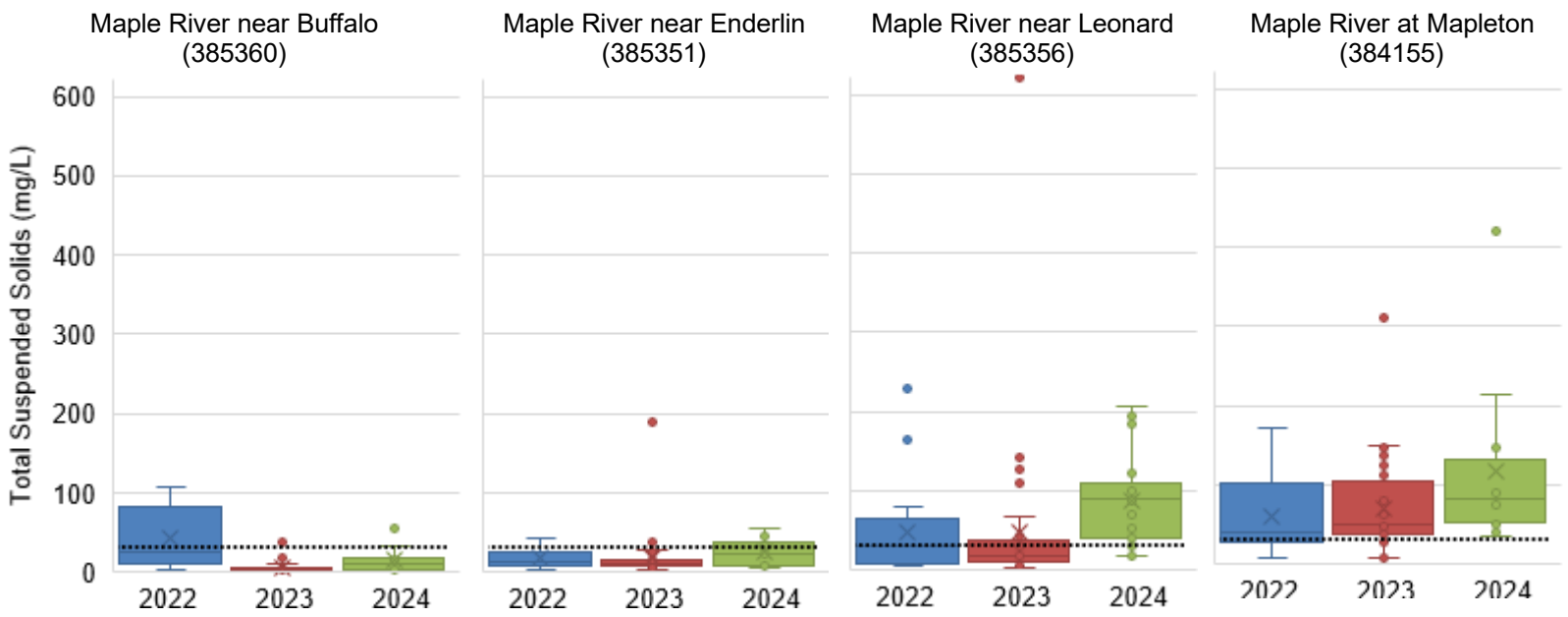

Figure 3. Annual TSS ranges at each sampling site for the sampling period (July 2022-July 2024) compared to the target value (dotted line, 35 mg/L).

Total Nitrogen (TN)

The state does not currently have a water quality standard for TN; an ecoregion target value of < 0.883 mg/L was used in project development and is used in this summary for comparison. TN samples are collected from April-October.

All sites exceeded the TN target during the sampling period. Concentrations were highest at the furthest downstream site (384155 Maple River at Mapleton). All four sites showed an increase in overall TN concentration across the sampling period. With the exception of site 385360, all sites had peak TN concentration in 2024 (April and May).

Table 4 below describes overall change in concentration throughout the sampling period. Data for August-October 2024 were not available at the time of this report and may shift overall results described below.

Table 4. Overall change in annual average TN concentration July 2022-July 2024.

Site ID	Water Body	Overall Change
385360	Maple River near Buffalo	Increase
385351	Maple River near Enderlin	Increase
385356	Maple River near Leonard	Increase
384155	Maple River at Mapleton	Increase

Figure 4 displays annual TN ranges for each site compared to the target.

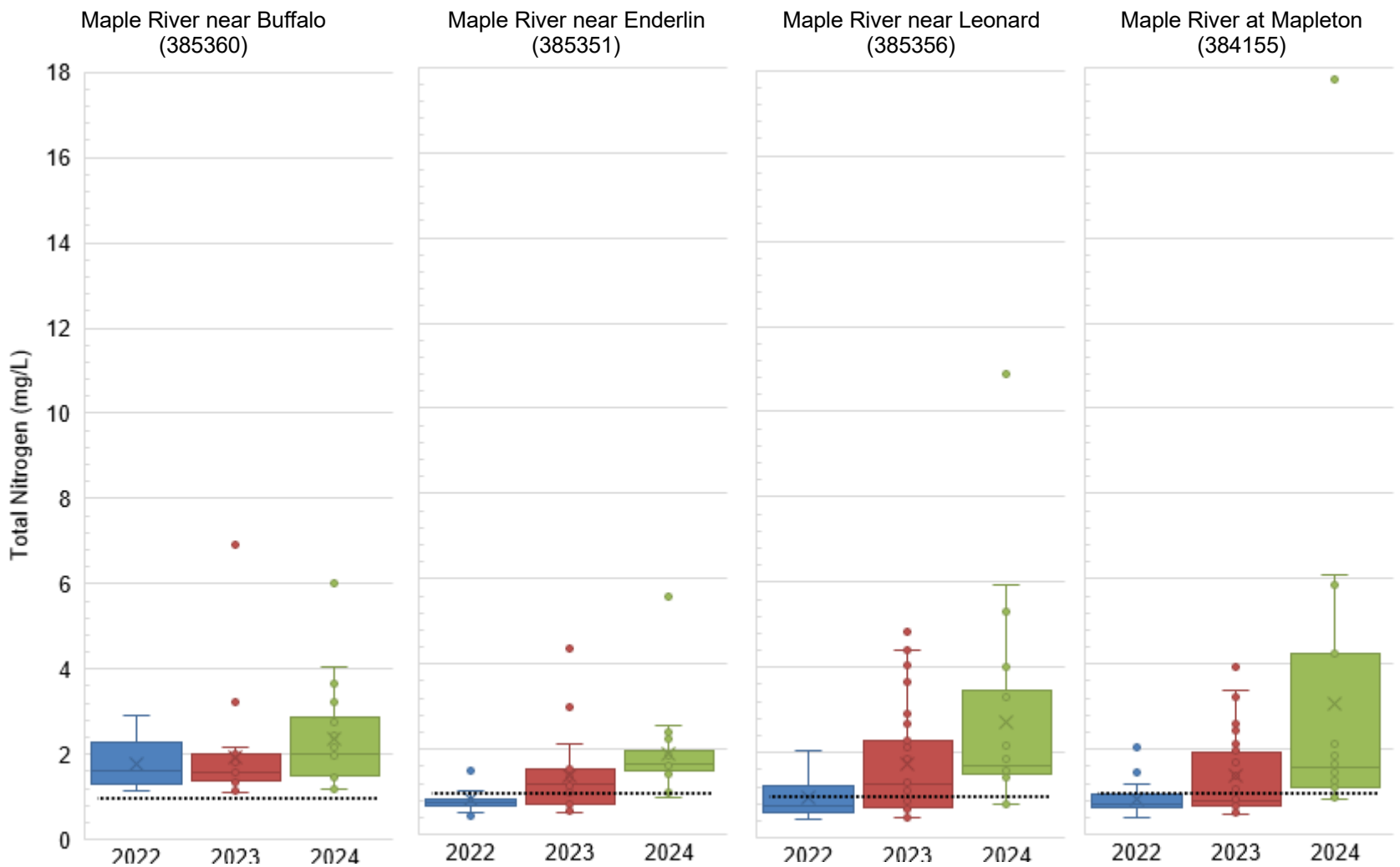

Figure 4. Annual TN ranges at each sampling site for the sampling period (July 2022-July 2024) compared to the target value (dotted line, 0.883 mg/L).

Total Phosphorus (TP)

The state does not currently have a water quality standard for TP; an ecoregion target value of < 0.148 mg/L was used in project development and is used in this summary for comparison. TP samples are collected from April-October.

All sites exceeded the TP target during the sampling period. The furthest upstream site (385360, Maple River near Buffalo) nearly exclusively exceeded the target, with only three samples < 0.148 mg/L. Concentrations were consistently higher further downstream. With the exception of the upstream site (385360), all sites showed an increase in overall TP concentration across the sampling period.

Table 5 below describes overall change in concentration throughout the sampling period. Data for August-October 2024 were not available at the time of this report and may shift overall results described below.

Table 5. Overall change in annual average TP concentration July 2022-July 2024.

Site ID	Water Body	Overall Change
385360	Maple River near Buffalo	Decrease
385351	Maple River near Enderlin	Increase
385356	Maple River near Leonard	Increase
384155	Maple River at Mapleton	Increase

Figure 5 displays annual TP ranges for each site compared to the target.

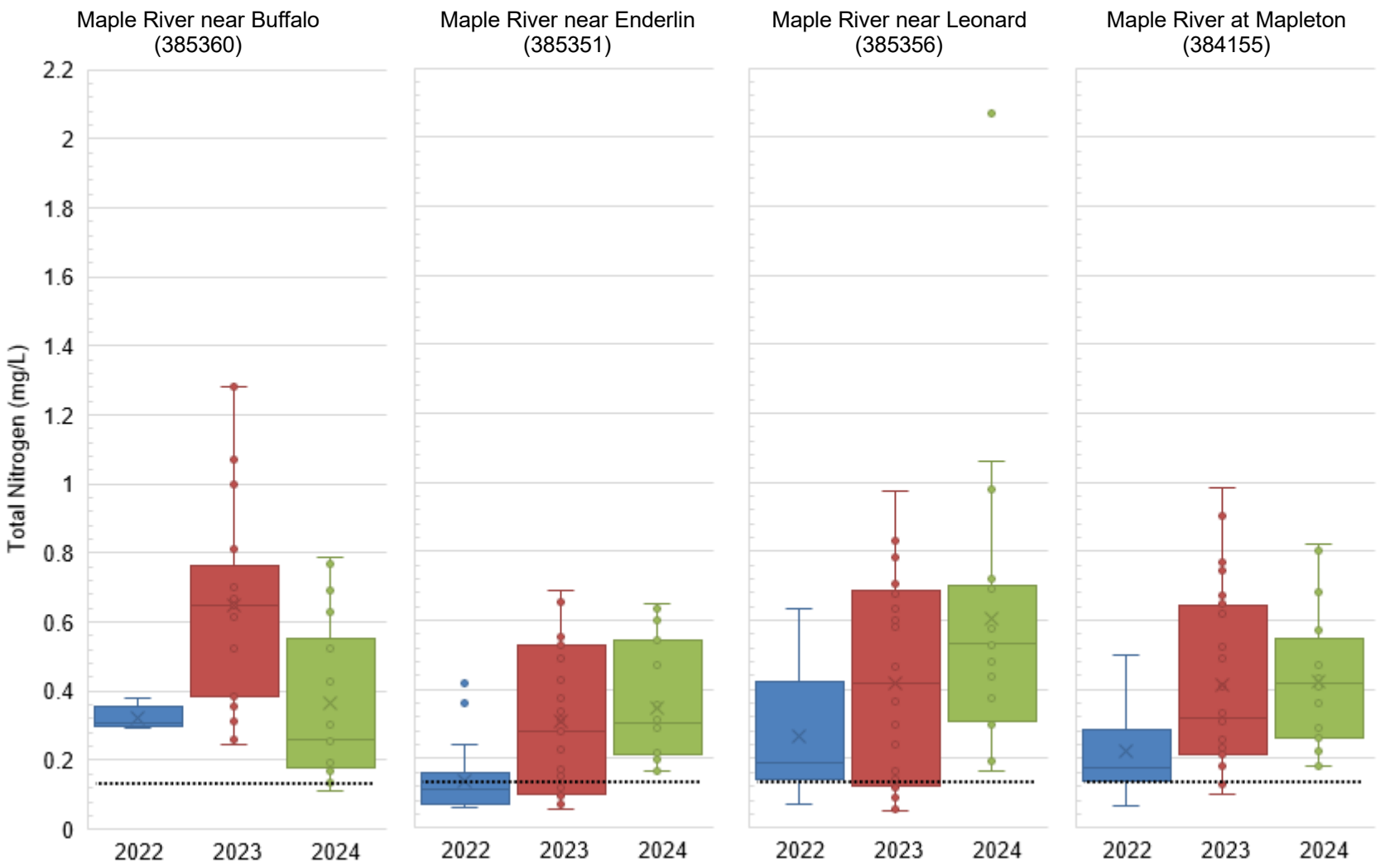

Figure 5. Annual TP ranges at each sampling site for the sampling period (July 2022-July 2024) compared to the target value (dotted line, 0.148 mg/L).

Macroinvertebrates (IBI)

Macroinvertebrate sampling is planned for 2025 (see Figure 1) to supplement aquatic life assessments. Samples will be analyzed by an external laboratory; results are expected in 2026.

NEXT STEPS

The above data reflects water quality conditions at project sampling locations from July 2022-July 2024. Each site and water body exceeded state standards and/or projects targets, but in some cases showed signs of improving (decreasing) conditions. As PTMApp is used to prioritize locations for BMP implementation, sampling should continue in order to determine effectiveness. Future efforts should also consider re-sampling previous priority areas that received BMP implementation (for example, areas targeted under previous watershed projects) to determine effectiveness and identify reduction efforts.