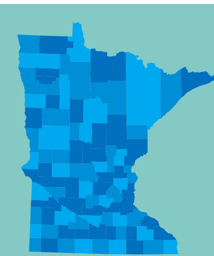
Grant

October 2022

Bluff & Oak Creek Nine Key Element Plan

Federal Clean Water Act Section 319 Small Watersheds Focus Grant Workplan

MINNESOTA POLLUTION CONTROL AGENCY



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Executive summary

The Leaf-Wing-Redeye One Watershed One Plan (LWR1W1P) is a collaboration between local partners who recognize the strong connection between land and water. This team understands the responsibilities we have as stewards to care for our land and water resources and the need to work on private lands.

To implement the full extent of our plan, additional state and federal funding and staff capacity over and above our current levels is necessary. The Section 319 Small Watershed Program funds will set the stage to further our ability to implement best management practices to address the *E. coli* impairments identified in Bluff and Oak Creeks. The *E. coli* impairments in streams makes them unsafe for recreation and are born in the guts of warm-blooded animals such as animals and human beings and at high levels they can make people and animals very sick.

As such, it is our goal to implement bacteria management projects along Bluff and Oak Creeks with the intent to decrease *E. coli* concentration in these impaired streams. Bacteria management projects include bringing septic systems and feedlots into compliance; managing livestock waste through proper storage and application; prescribed grazing and fencing for pasture management and exclusion from surface waters; alternative water systems, heavy use exclusion/access controls to stabilize and protect creek banks and provide quality water sources for livestock; and the enhancement of riparian buffers.

The focus for the Section 319 Small Watershed Program is Bluff and Oak Creek (BOC) Watersheds, impaired for *E. coli*. The BOC project area consists of subwatersheds in two hydrological unit code (HUC) 10 watersheds (Bluff Creek 0701010702 and Middle Leaf River 0701010703). The HUC12 in the BOC are listed in Table 1 and are illustrated in (Figure 1).

Table 1. HUC12s Watersheds that make up the Bluff and Oak Creek (BOC) watershed

HUC 12	Watershed name
070101070201	Headwaters Bluff Creek
070101070202	Blue Creek
070101070203	Bluff Creek
070101070301	Oak Creek

Figure 1. BOC project area with impaired waterbodies (ArcGIS, 2023).

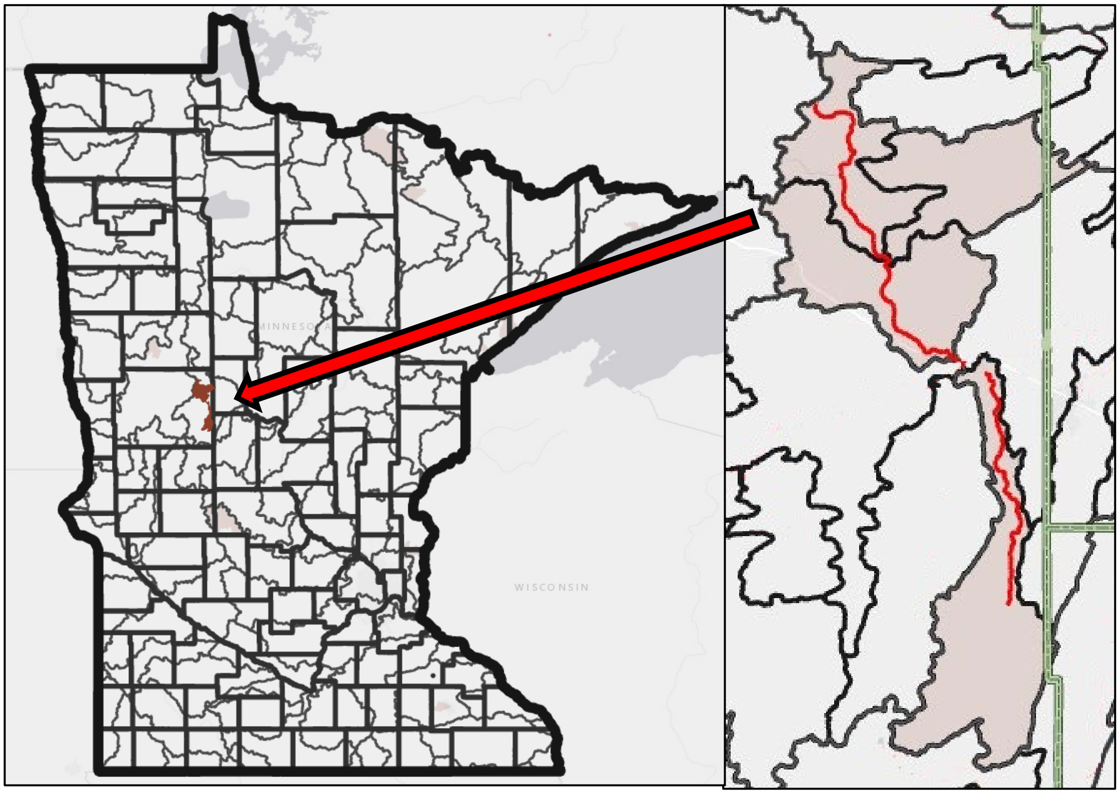


Table 2. Impaired BOC waterbodies to be addressed in this Nine Element Plan

Name	Location	Stream ID	Impairment Status	Year Listed
Bluff Creek	Headwaters to Leaf River	07010107-515	Impaired for *E. coli*	2014
Oak Creek	Unnamed Ditch to T134 R36W S3, north line	07010107-516	Impaired for *E. coli*	2014

The suite of BMPs and other management activities utilized by the partners over the years are specifically identified to address the critical pollutant sources needed to achieve the water quality standards for the waterbodies in these watersheds. The activities included in this plan include stormwater management practices, riparian buffers, private forest management plans, pasture management, feedlot and nutrient management practices, and septic system upgrades and replacements. The plan presents the practices and activities, estimated load reductions, milestones, assessment criteria, and estimated costs for a ten-year period to achieve water quality standards for the waterbodies in the watershed. This plan meets all nine key elements (NKE) described by the U.S. Environmental Protection Agency (EPA) for the federal Clean Water Act Section 319 program. The implementation of the practices, pollutant load reductions, and achievement of water quality standards in the waterbodies will support the larger efforts of the LWR1W1P partners in improving the water quality of the other lakes and streams in the overall HUC10 watersheds.

Funding of projects proposed in this plan may be restricted to funding source. Only projects and practices that are allowable by EPA's 2014 program guidelines and Minnesota's Nonpoint Source Program Management Plan (except where noted in the MPCA's NPSMPP) will be funded by the Federal Clean Water Act Section 319 funds. Match funds and activities must also be eligible under the guidelines and plan.

Watershed overview and condition summary

An overview of the watershed characteristics of the two watersheds is given in Table 3.

Table 4 provides a summary of the water quality conditions of the lakes and streams in these watersheds.

Table 3. Aggregated land uses for STEPL in BOC (NLCD, 2022)

Watershed	Watershed name	Urban	Cropland	Pasture/ Hay	Forest	Wetlands	Total acres
070101070201	Headwaters Bluff Creek	403	3572	1225	3210	5327	13737
070101070202	Blue Creek	554	3534	2220	2512	6629	15449
070101070203	Bluff Creek	1177	8242	3454	2560	4694	20127
070101070301	Oak Creek	888	9021	3777	3240	8811	25737

Figure 2. Land use map for BOC (WHAF, 2023)

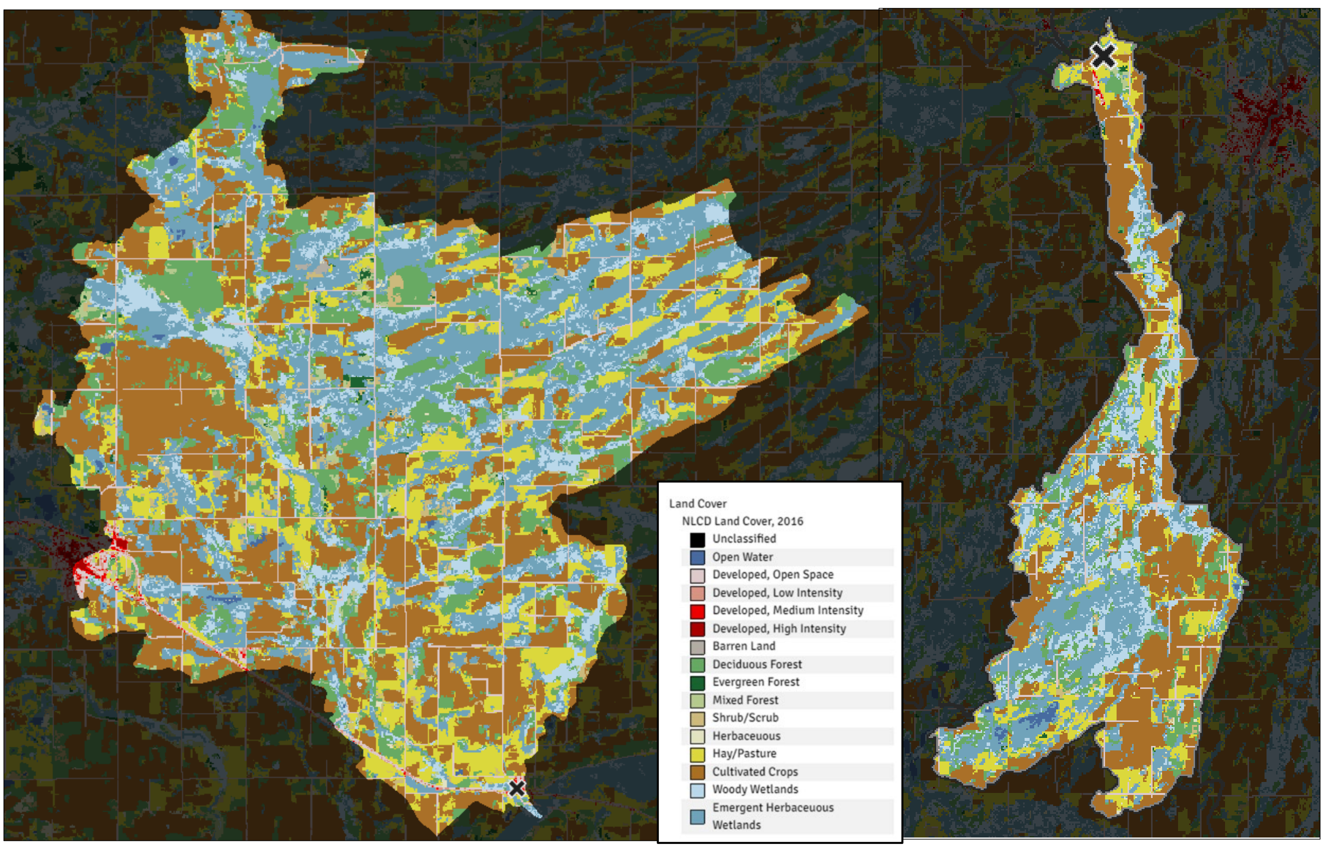


Table 4. Water Quality Summary for targeted streams

Stream Name/WID	Stream Length	Drainage Area (Ac)	Month	# Samples	Geo Mean	Min-Max
Bluff Creek 07010107-515	17.83 mi	46,103	June	6	173	67-548
			July	6	137	64-291
			August	9	130	84-308
			September	2	249	201-308

This AUID is approximately 18 miles long. Water chemistry data were collected near the outlet of the Bluff Creek subwatershed. Bluff Creek exceeded the standard for bacteria and is considered impaired for aquatic recreation use. This impairment was based on three geometric mean exceedances. No individual sampling event exceeded the water quality standard of 1260 MPN/100ml. Since bacteria can be high at times and moderate or low at other times, recreational use can be limited. It was noted that cattle had direct access to the stream in this reach which may be contributing to the elevated bacteria measurements (*Page 39 Monitoring & Assessment Report).*

Stream Name/WID	Stream Length	Drainage Area (Ac)	Month	# Samples	Geo Mean	Min-Max
Oak Creek 07010107-516	14.2 mi	25737	June	11	175	77-2,420
			July	11	183	72-354
			August	14	139	36-411
			September	2	313	81-1,203

Stream water quality data were available for Oak Creek from unnamed ditch T134 R36W S3 to 1.4 miles upstream of the Leaf River confluence. This AUID is approximately 14.2 miles long. Water chemistry data were collected near the outlet of the Ridge Creek subwatershed. Oak Creek exceeded the standard for bacteria and is considered impaired for aquatic recreation use. This impairment was based on three geometric mean exceedances. No individual sampling event exceeded the water quality standard of 1260 MPN/100ml. Since bacteria can be high at times and moderate or low at other times, recreational use can be limited *(Page 45 Monitoring & Assessment Report).*

Total maximum daily loads

Total maximum daily loads (TMDLs) for the Oak and Bluff Creeks were approved by the EPA in 2017. For the purposes of the NKE, the annual load reductions needed to achieve the *E. coli* standard in Bluff and Oak Creeks are 38 and 30 percent, respectively (Table 5). These reductions represent a conservative approach to setting a reduction goal to meet the water quality standard in all flow categories of the load duration curves. The load duration curve for the Bluff Creek TMDL suggests that elevated *E. coli* levels occur more often at low flow conditions which may indicate that the bacteria sources are failing septic systems and cattle in or near streams. The load duration curve for the Oak Creek TMDL suggests that elevated *E. coli* levels occur more often at high and mid flow conditions which may indicate that the bacteria sources include watershed runoff along with failing septic systems and cattle in or near streams. The presence of limited *E. coli* concentration data limits the confidence in these observations but does provide pieces of evidence for targeting sources for reduction.

Table 5. Total *E. coli* reductions needed to meet TMDLS in Oak and Bluff Creeks

Reach	% Reduction	Load reduction billion MPN/yr
Oak -516	30	16,745
Bluff -515	38	31,076

Figure 3. Bluff Creek (0701010507-515) *E. coli* load duration curve

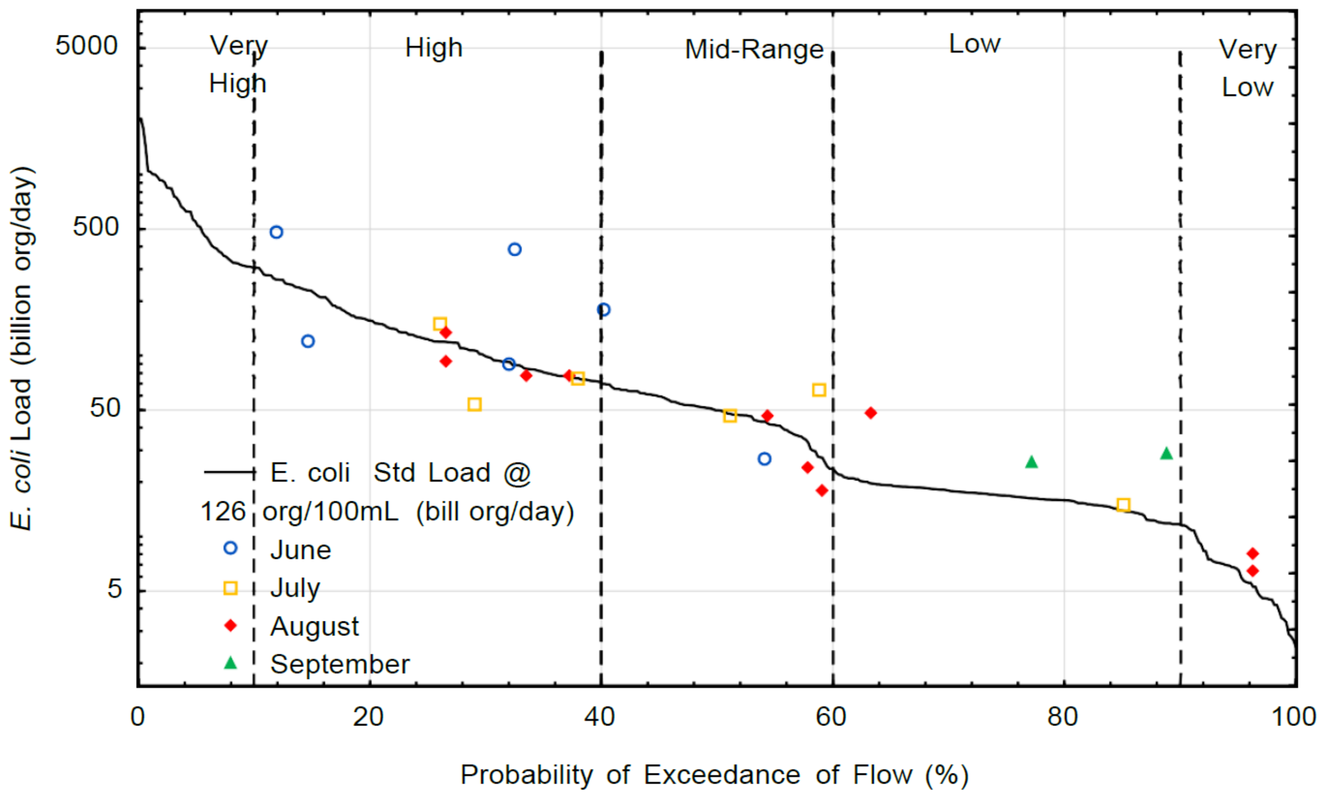


Table 6. Bluff Creek (071010507-515) *E. coli* TMDL summary

Bluff Creek 07010107-515 Load Component		Flow Regime				
		Very High	**High**	**Mid**	**Low**	**Very Low**
		Billion organisms per day				
Existing Load		*No Data*	*122.9*	*43.6*	*27.2*	*7.3*
Wasteload Allocations	***None***	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
	Total WLA	0.0	0.0	0.0	0.0	0.0
Load Allocations	***Watershed runoff***	*482.4*	*111.2*	*44.8*	*15.1*	*5.8*
	Total LA	482.4	111.2	44.8	15.1	5.8
10% MOS		53.6	12.4	5.0	1.7	0.6
Total Loading Capacity		536.0	123.6	49.8	16.8	6.4
Estimated Load Reduction		*n/a*	*0*	*0*	*10.4*	*0.9*
		n/a	*0%*	*0%*	*38%*	*14%*

Figure 4. Oak Creek (07010107-516) *E. coli* load duration curve

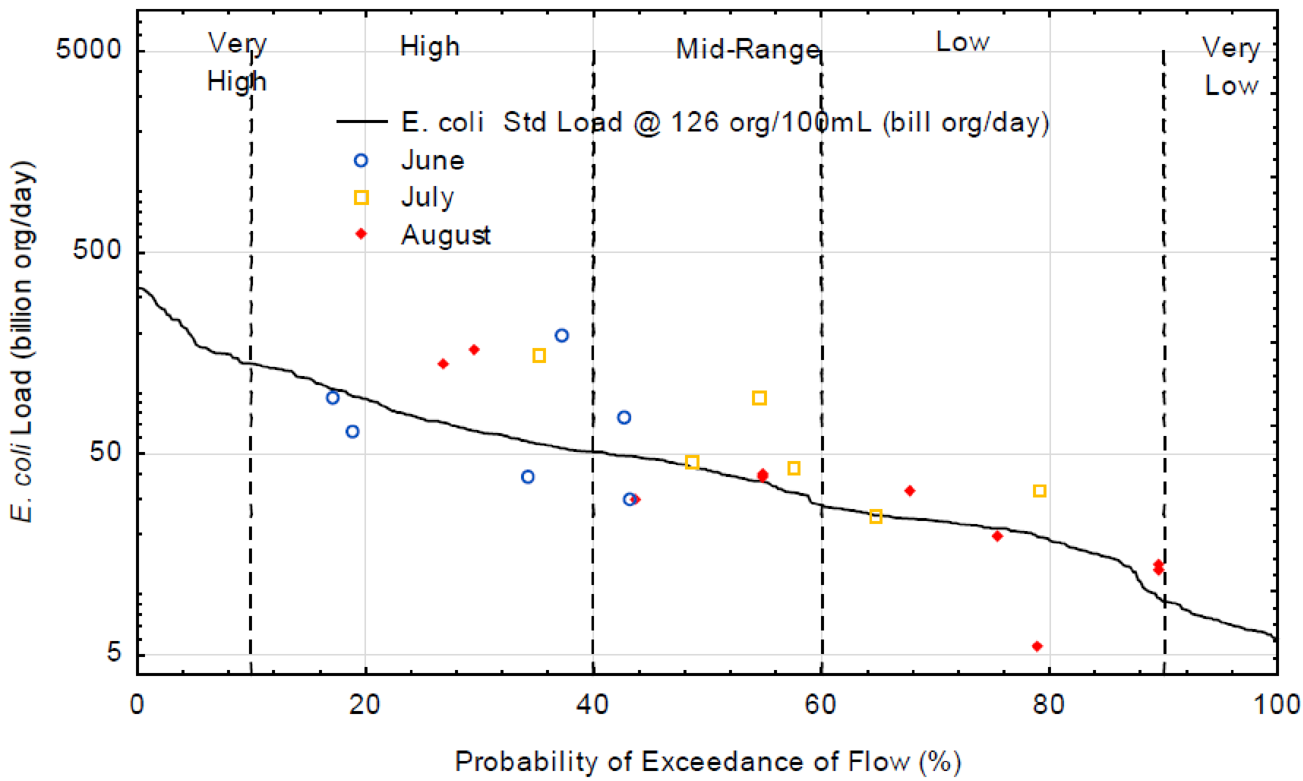


Table 7. Oak Creek (0701010507-516) *E. coli* TMDL summary

Oak Creek 07010107-516 Load Component		Flow Regime				
		Very High	**High**	**Mid**	**Low**	**Very Low**
		Billion organisms per day				
Existing Load		*No Data*	*108*	*46*	*18*	*No Data*
Wasteload Allocations	***None***	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
	Total WLA	0.0	0.0	0.0	0.0	0.0
Load Allocations	***Watershed runoff***	*163*	*68*	*38*	*18*	*6*
	Total LA	163	68	38	18	6
10% MOS		18	8	4	2	1
Total Loading Capacity		181	75	42	21	7
Estimated Load Reduction		*n/a*	*33*	*4*	*0*	*n/a*
		n/a	*30%*	*8.5%*	*0%*	*n/a*

Implementation strategies

The implementation strategies, schedule, milestones, assessments, and costs are described in the following table and estimated to yield the reductions needed to reach water quality standards within 10 years.

Table 8. Implementation strategies, schedule, milestones, assessment, and costs

BMP	**Milestones**					**Assessment**	**Cost**	**TSS**	**N**	**P**	***E. coli* by watershed (billion MPN/yr)**	
	2-year (2023)	**4-year (2025)**	**6-year (2027)**	**8-year (2029)**	**10-year (2031)**			**t/yr**	**lbs/yr**	**lbs/yr**	**Oak Creek**	**Bluff Creek**
Enforce ordinances related to Subsurface Sewage Treatment Systems (SSTS). SSTS found to be in need of replacements will be added to the replacement list below.	20 inspections	20 inspections	20 inspections	20 inspections	20 inspections	# inspections	$25,000					
Replace/upgrade 30 SSTS in Oak Creek Watershed	Replace/upgrade 6 SSTS	Replace/upgrade 6 SSTS	Replace/upgrade 6 SSTS	Replace/upgrade 6 SSTS	Replace/upgrade 6 SSTS	# SSTS			874.8	342.6	26.0	
Replace/upgrade 16 SSTS in Headwaters Bluff Creek Watershed	Replace/upgrade 3 SSTS	Replace/upgrade 3 SSTS	Replace/upgrade 3 SSTS	Replace/upgrade 3 SSTS	Replace/upgrade 4 SSTS	# SSTS			463.5	181.6		55.0
Replace/upgrade 22 SSTS in Blue Creek Watershed	Replace/upgrade 5 SSTS	Replace/upgrade 5 SSTS	Replace/upgrade 4 SSTS	Replace/upgrade 4 SSTS	Replace/upgrade 4 SSTS	# SSTS			522.3	204.6		
Replace/upgrade 29 SSTS in Bluff Creek Watershed	Replace/upgrade 6 SSTS	Replace/upgrade 7 SSTS	Replace/upgrade 6 SSTS	Replace/upgrade 5 SSTS	Replace/upgrade 5 SSTS	# SSTS			685.5	268.5		
Conduct feedlot windshield surveys in Otter Tail and Becker counties. Confirming animal types, numbers, and locations.	Generate updated list of sites/animal #s					# surveys	$5,200					
Implement feedlot diversion in Oak Creek Watershed		1 feedlot diversion to treat all runoff				# feedlot diversions			4,365.4	740.5	2,125	
Implement one feedlot diversion in Headwaters Bluff Creek Watershed			1 feedlot diversion to treat all runoff			# feedlot diversions			4,949.6	1,338.9		964
Implement one waste management system in Blue Creek Watershed				1 feedlot diversion to treat all runoff		# feedlot diversions			4,283.4	669.5		964
Implement one feedlot diversion in Bluff Creek Watershed					1 feedlot diversion to treat all runoff	# feedlot diversions			1,371.7	362.2		694
Implement one filter strip in Oak Creek Watershed		1 feedlot filter strip to treat all runoff				# feedlot filter strips				899.2	2,125	
Implement one filter strip in Headwaters Bluff Creek Watershed			1 feedlot filter strip to treat all runoff			# feedlot filter strips				1,625.8		964
Implement one filter strip in Blue Creek Watershed				1 feedlot filter strip to treat all runoff		# feedlot filter strips				813.0		964

BMP	Milestones					Assessment	Cost	TSS	N	P	*E. coli* by watershed (billion MPN/yr)	
	2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)			t/yr	lbs/yr	lbs/yr	Oak Creek	Bluff Creek
Implement one filter strip in Bluff Creek Watershed					1 feedlot filter strip to treat all runoff	# feedlot filter strips				439.8		964
Implement one waste management system in Oak Creek Watershed		1 waste management system				# waste management systems			38,804.0	4,760.4	2,125	
Implement one waste management system in Headwaters Bluff Creek Watershed			1 waste management system			# waste management systems	$1,000,000		28,157.9	5,508.7		964
Implement one waste management system in Blue Creek Watershed				1 waste management system		# waste management systems			53,250.9	6,019.4		964
Implement one waste management system in Bluff Creek Watershed					1 waste management system	# waste management systems			12,193.3	2,328.6		964
Implement 2 feedlot pit closures in Oak Creek Watershed	1 pit closure		1 pit closure			# pits closed		0	10,671.1	1,798.4	4,250	
Implement 2 feedlot pit closures in Headwaters Bluff Creek Watershed		1 pit closure		1 pit closure		# pits closed		0	12,099.1	3,251.7		964
Implement 2 feedlot pit closures in Blue Creek Watershed			1 pit closure		1 pit closure	# pits closed		0	10,250.8	1,591.8		1,928
Implement 2 feedlot pit closures in Bluff Creek Watershed		1 pit closure		1 pit closure		# pits closed		0	3,353.2	879.7		1,928
Implement 160 acres of prescribed grazing in Oak Creek Watershed	80 acres prescribed grazing				80 acres prescribed grazing	# acres prescribed grazing		3	149.3	9.5	8,974	
Implement 80 acres of prescribed grazing in Headwaters Bluff Creek Watershed		80 acres prescribed grazing				# acres prescribed grazing		1.7	75.5	5.1		2,030
Implement 80 acres of prescribed grazing in Blue Creek Watershed			80 acres prescribed grazing			# acres prescribed grazing		1.7	75.4	5.0		2,030
Implement 80 acres of prescribed grazing in Bluff Creek Watershed				80 acres prescribed grazing		# acres prescribed grazing		1.6	75.1	4.9		2,030
Analyze the longitudinal *E. coli* monitoring data to further identify loading points and sources. DNA analysis conducted, if current results are deemed inconclusive	Data analysis of 2022 data in 2023. Adapt strategies if needed.					# each						

BMP	Milestones					Assessment	Cost	TSS	N	P	*E. coli* by watershed (billion MPN/yr)	
	2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)			t/yr	lbs/yr	lbs/yr	Oak Creek	Bluff Creek
SWCD staff to conduct outreach to landowners (staff hours) (Mainly 1 on 1, targeted efforts, meeting landowners where they are, providing for their needs) to educate landowners and to adopt BMPs to mitigate pollutant loading	200 hours	200 hours	200 hours	200 hours	200 hours	# hours # stakeholders adopting BMPs	$50,000					
Education & Outreach Events - workshop, presentations to groups	2	2	2	1	1	# each	$20,000					
Implement 1-acre heavy use exclusion/access control in Oak Creek Watershed	.5-acre heavy use exclusion				.5-acre heavy use exclusion	# acres heavy use exclusion	$15,000	22.63237557	553.0	65.9	8,947	
Implement .5-acre heavy use exclusion/access control in Headwaters Bluff Creek Watershed		.5-acre heavy use exclusion				# acres heavy use exclusion	$15,000	4.148233822	88.1	11.0		2,030
Implement .5 acre heavy use exclusion/access control in Blue Creek Watershed			.5-acre heavy use exclusion			# acres heavy use exclusion	$15,000	7.316081041	159.4	19.8		2,030
Implement .5-acre heavy use exclusion/access control n Bluff Creek Watershed				.5-acre heavy use exclusion		# acres heavy use exclusion	$15,000	11.02003109	254.5	30.9		2,030
Implement 400 acres manure management in Oak Creek Watershed	200 acres manure management				200 acres manure management	# acres manure management	$15,645	0	220.4	144.8	2,817	
Implement 200 acres manure management in Headwaters Bluff Creek Watershed		200 acres manure management				# acres manure management	$7,825	0	110.3	72.5		1,286
Implement 200 acres manure management in Blue Creek Watershed			200 acres manure management			# acres manure management	$7,825	0	110.3	72.5		
Implement 200 acres manure management in Bluff Creek Watershed				200 acres manure management		# acres manure management	$7,825	0	110.5	72.6		
Implement 4 alternative watering facility in Oak Creek Watershed	1 alternative watering facility	1 alternative watering facility	1 alternative watering facility		1 alternative watering facility	# alternative watering facility	$1,223	25.4	780.0	76.6	17,894	
Implement 1 alternative watering facility in Headwaters Bluff Creek Watershed				1 alternative watering facility		# alternative watering facility	$1,223	2.3	61.8	6.4		2,030

BMP	Milestones					Assessment	Cost	TSS	N	P	*E. coli* by watershed (billion MPN/yr)	
	2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)			t/yr	lbs/yr	lbs/yr	Oak Creek	Bluff Creek
Implement 2 alternative watering facility in Blue Creek Watershed		1 alternative watering facility	1 alternative watering facility			# alternative watering facility	$1,223	8.2	223.9	22.9		4,060
Implement 3 alternative watering facility in Bluff Creek Watershed	1 alternative watering facility	1 alternative watering facility		1 alternative watering facility		# alternative watering facility	$1,223	18.6	537.3	53.9		6,090
Implement 4510.5 acres of Soil Health Practices in Oak Creek Watershed	Implement 902.1 acres of soil health practices	Implement additional 902.1 acres of soil health practices	Implement additional 902.1 acres of soil health practices	Implement additional 902.1 acres of soil health practices	Implement additional 902.1 acres of soil health practices	# acres	$225,525	542.8	6,324.1	2,020.1		
Implement 1786 acres of Soil Health Practices in Headwaters Bluff Creek Watershed	Implement 357.2 acres of soil health practices	Implement additional 357.2 acres of soil health practices	Implement additional 357.2 acres of soil health practices	Implement additional 357.2 acres of soil health practices	Implement additional 357.2 acres of soil health practices	# acres	$89,300	253.0	2,626.0	846.8		
Implement 1767 acres of Soil Health Practices in Blue Creek Watershed	Implement 353.4 acres of soil health practices	Implement additional 353.4 acres of soil health practices	Implement additional 353.4 acres of soil health practices	Implement additional 353.4 acres of soil health practices	Implement additional 353.4 acres of soil health practices	# acres	$88,350	243.0	2,574.7	828.8		
Implement 4121 acres of Soil Health Practices in Bluff Creek Watershed	Implement 824.2 acres of soil health practices	Implement additional 824.2 acres of soil health practices	Implement additional 824.2 acres of soil health practices	Implement additional 824.2 acres of soil health practices	Implement additional 824.2 acres of soil health practices	# acres	$206,050	529.4	5,885.3	1,887.0		
Water quality monitoring (sampling and lab analysis) for *E. coli* and general water chemistry as detailed in Element i	Annual monitoring per Element i	Annual monitoring per Element i	Annual monitoring per Element i	Annual monitoring per Element i	Annual monitoring per Element i	# samples # sites monitored # data entered in EQuIS	$24,000					
Annual mailings about SSTS care and compliance	2 mailings	2 mailings	2 mailings	2 mailings	2 mailings	# mailings	$5,000					
Visit 1:1 with livestock producers, 10 per year	20 1:1 visits	20 1:1 visits	20 1:1 visits	20 1:1 visits	20 1:1 visits	# 1:1 visits	$10,000					
Annual Soil Health Workshops, with 5 new participants	2 workshops	2 workshops	2 workshops	2 workshops	2 workshops	# workshops # participants # new participants	$20,000					

Element a. Sources

The causes of high *E. coli* measurements are from a variety of non-point sources as there are no permitted point sources in the watershed and are summarized in Table 9. *E. coli* impairments are attributed to improper livestock and nutrient management as well as failing subsurface sewage treatment systems (SSTS) or septic systems.

Table 9. Breakdown of *E. coli* loading by source in billion MPN/yr (TMDL Tables 22, 2017)

Annual *E. coli* production estimates by source	Source type	-515 (Bluff Creek)	-516 (Oak Creek)
Humans and pets	WWTF effluent	0	0
	ITPH SSTS	55	26
	Dogs	441	117
Livestock	Cattle	21268	9626
	Dairy	54605	20759
	Turkey	0	0
	Chickens	10	8
	Hogs	208	25052
	Sheep	4460	0
	Horses	635	475
Wildlife	Deer	550	163
	Ducks	54	42
	Geese	9	63

SSTS

There are approximately 390 parcels with septic systems in the drainage area. Twelve are new systems installed since 2020, eleven have current compliant inspections and one is known to be failing based on vertical separation. There are approximately 366 parcels with unknown septic status within the drainage area. Based on an estimate of 22% noncompliance rates, approximately 81 SSTS are likely to require upgrades or replacement. The estimated noncompliance rate is consistent with statewide estimates.

Animal agriculture

The main source of the *E. coli* is from livestock/manure management runoff with several sites where cattle have direct access to the steams.

Table 10 summarizes the number of feedlots in the BOC watershed that are over 50 animal units, but do not have NPDES/SDS status. Open lot and pastures increase the likelihood of runoff from the feedlots near surface waters. There are no CAFOs (NPDES-permitted facilities) in the BOC watersheds.

Table 10. Animal counts by subwatershed in the Bluff and Oak Creek Watersheds (MPCA Feedlots Tableau Report, 2022)

	Headwaters Bluff Creek	Blue Creek (trib to Bluff)	Lower Bluff Creek	Oak Creek	Total
Feedlots #	5	7	5	5	**22**
Beef	22	30	410	177	**639**
Chickens	60	-	-	120	**180**
Dairy	570	1,365	95	906	**2,936**
Swine	30	-		15	**45**
Turkey	29,310	-		5	**29,315**
Other	594	40		10	**644**
Open lots	4	7	5	5	**21**
Pasture	2	8	3	4	**17**

Element b. Reductions

This plan will reduce *E. coli* loading by 49,282.7 billion MPN/yr to Oak Creek (-516) and by 38,927.2 billion MPN/yr to Bluff Creek (-515), exceeding the amount required by the TMDL. It is expected that both streams will meet water quality standards when this plan is fully implemented.

All *E. coli*, phosphorus, TSS, and nitrogen load reductions for the activities and practices described in Element c were calculated using the Spreadsheet Tool for Estimating Pollutant Load (STEPL) tool.

The Redeye River TMDL identified that human sources are 1% of the bacterial load, with livestock sources accounting for about 99% of the load in the Oak and Bluff Creeks Watersheds. The livestock BMPs provide an estimated reduction of 75% (Oak) and 40% (Bluff Creek Watersheds). This will meet the TMDL written for the waterbodies. SSTS replacement and upgrades will eliminate the human source of *E. coli* to the streams. Although the human source is estimated at 1% in the TMDL, it is still important to address these systems that have a high human health risk.

In addition to reducing *E. coli* loading to meet the TMDL requirements, this plan will also reduce TSS by 1,676 t/yr, N by 207,292 lbs/yr, and P by 40,282 lbs/yr.

Element c. BMPs

Planned implementation for the BOC is described fully in Table 8.

The BMPs to be implemented to address the *E. coli* impairments are described in Table 11. The BMPs encompass a combination of agricultural and SSTS practices. The

Table 11. BMP descriptions for BOC

BMP	BMP Description	Critical Area
SSTS upgrades	Repairing or installing a new septic system to property treat wastewater.	SSTS upgrades are a requirement for all the lakes and stream within the study area. Imminent public health threats, known failing systems closets to riparian areas and systems with no information within the last 10 years.
Riparian buffers	An area of native vegetation along the water's edge.	The critical area for shoreland buffers are riparian lots with less than 75% native buffers/shoreline.
Exclusion fencing	Funds the installation of fencing to exclude livestock from sensitive areas.	Anywhere livestock has access to the stream.
Heavy use protection	Heavy Use Area Protection is a way to stabilize a ground surface that is frequently and intensively used by people, animals, or vehicles.	Animal Operations within 1000 ft of shoreline areas.*
Access control	Access control includes temporary or permanent exclusion of animals, people, vehicles, and equipment from an area. Payments are made to the landowner for the land taken out of production.	Animal Operations within 1000 ft of shoreline areas.*
Prescribed grazing	The controlled harvest of vegetation with grazing or browsing animals, managed with the intent to maintain or improve water quality and quantity.	Animal Operations within 1000 ft of shoreline areas.*
Pit Closure	Removing manure from a closed operation.	Animal Operations within 1000 ft of shoreline areas.*
Nutrient/manure Management	Manage rate, source, placement, and timing of plant nutrients and soil amendments while reducing environmental impacts.	Animal Operations within 1000 ft of shoreline areas.*
Watering facility	A watering facility is a means of providing drinking water to livestock or wildlife, and are needed when livestock are excluded from surface waters.	Animal Operations within 1000 ft of shoreline areas.*
Well	Installation of a well as an alternate water source for livestock instead of fragile lakes, streams and wetland areas.	Animal Operations within 1000 ft of shoreline areas.*

* To preserve the privacy and confidentiality of the landowners, this is meant to describe the critical areas, without identifying individual sites. There are practices selected and targeting in each of the subwatersheds and the numbers of practices, costs, and reductions are included in Table 8.

Critical loading areas

Imminent Public Health Threat (IPHTs) and failing SSTS within the shoreland zone are the most critical loading for P and for *E. coli*. These systems will be targeted for upgrades and replacements. Pastures located along the creeks are the critical areas for implementation efforts. Longitudinal *E. coli* sampling is being conducted in 2022 to better pinpoint where *E. coli* levels are higher throughout the stream reaches of Bluff and Oak Creek. Areas with higher *E. coli* concentrations will be targeted or prioritized for implementation efforts. Figure 5 and Figure 6 below show farms and monitoring sites along the creeks with cattle. Farms with animals, particularly cattle, in pastures and with access to the streams and riparian areas are critical loading points for bacteria.

Projects in these critical loading areas will be the primary focus of attention and these projects will be prioritized over projects with less impact. The SWCD has prioritized specifics, but for privacy concerns, will not identify parcels in this plan.

Figure 5. Planned *E. coli* monitoring sites and cattle pastures within shoreland of Bluff Creek

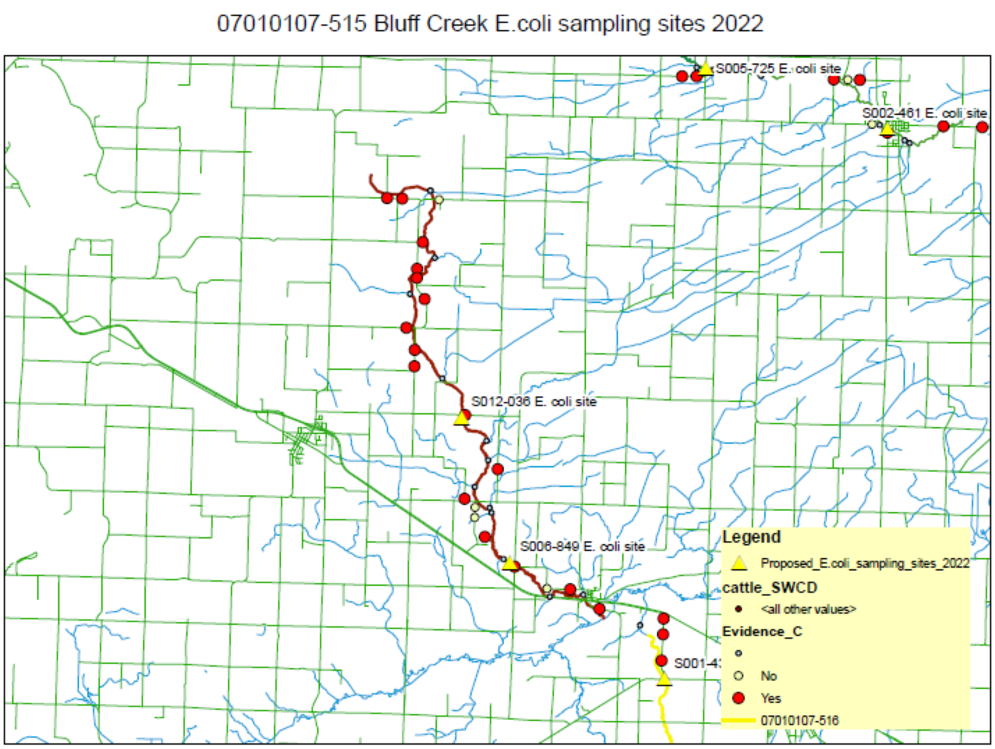
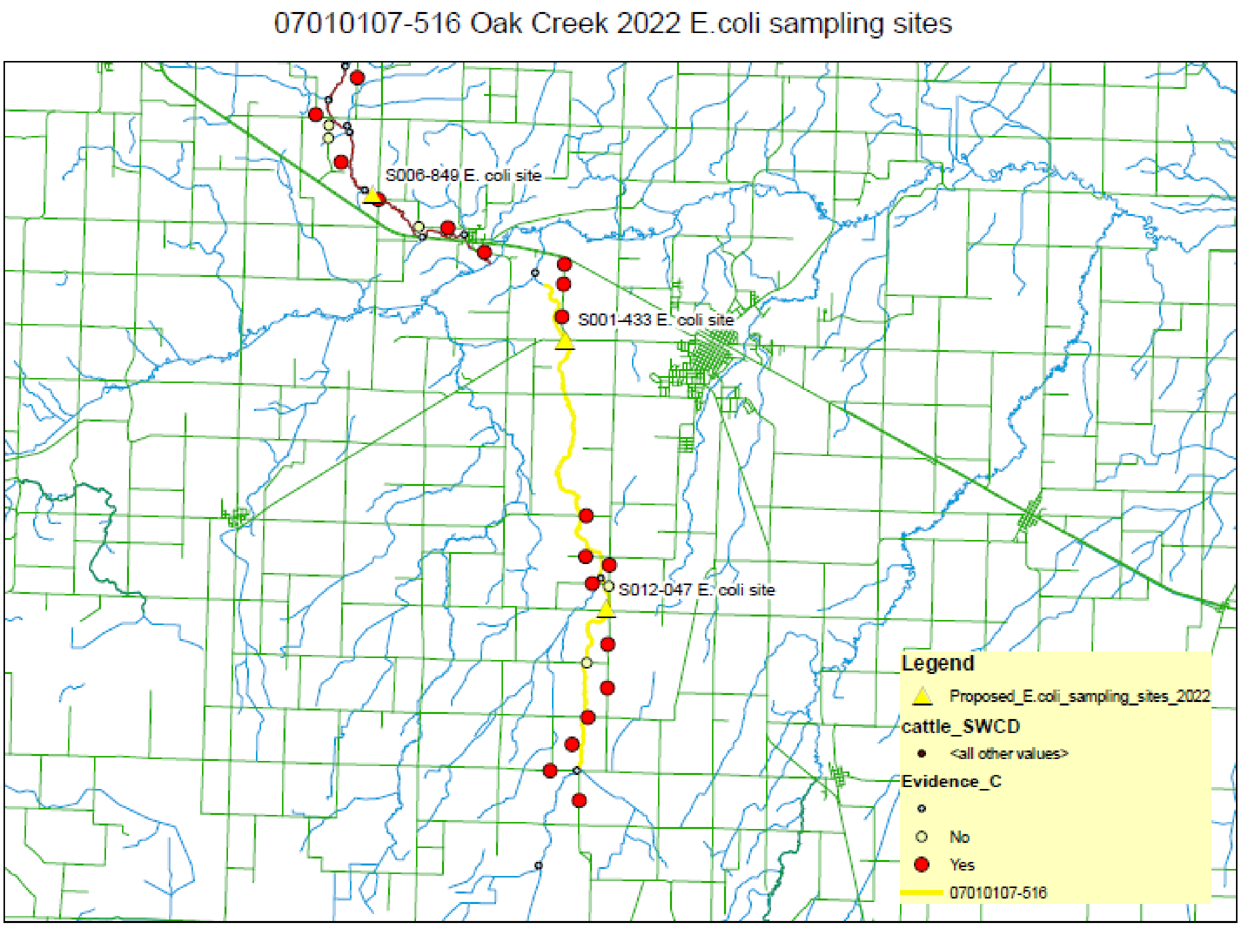


Figure 6. Planned *E. coli* monitoring sites and cattle pastures along Oak Creek



Other practices

There are opportunities, throughout the watershed, to implement land management practices such as forest stewardship and soil health practices. These practices when targeted in areas with the highest erosion potential can significantly reduce erosion, sedimentation, and phosphorus delivery to surface waters. Irrigation management practices compliment nutrient management plans and provide additional protection to groundwater resources in areas with higher infiltration rates.

Element d. technical and financial assistance

The cost to implement this plan fully is estimated at approximately $1,700,000. Costs by practices and activities are itemized in Table 8. This estimate includes implementation of BMPs, staff time, education and outreach, studies, inventories, and monitoring.

The implementation of this plan will be funded by local funding, state and federal grants, and support from private organizations. Section 319 grant funding will serve as the foundation for implementing this plan. Additional funding includes local SWCD operational funding, State Clean Water Funds through BWSR, and USDA NRCS EQIP funding. Landowners will contribute funds for grant match requirements. Private organization and foundation funding opportunities will also be pursued.

Staff time and technical assistance

A Watershed Coordinator is needed to coordinate the technical work of the watershed, be the main contact for citizen involvement, organize outreach campaigns and events, and maintain records and reports for the project. Technical assistance funding is needed to develop and design project plans, prepare cost-estimates, oversee projects, and conduct post project inspections as required.

This will be a 1.0 FTE position.

Partnerships

The Leaf, Wing, Redeye Watershed Local Comprehensive Water Management Plan (LWR1W1P) was developed through a Memorandum of Agreement (MOA) between the East Otter Tail Soil and Water Conservation District (SWCD), Otter Tail County, Wadena SWCD, Wadena County, and Becker SWCD. The MOA solidified the partners commitment to work together to identify and manage priority resource concerns in the watershed.

The LWR1W1P is locally led and brings landowners, local LGUs, state, and federal partners together to develop and implement the plan. Community engagement is key because the majority of our work is done on private land. Local LGUs work closely with state partners to ensure the plan is consistent with state laws. State and federal partners also provide valuable technical and financial assistance to support plan goals.

Local LGU staff (SWCD and county) work together to implement plan goals, create special projects, develop budgets, apply for grants, and organize meetings with the partners. LGU staff are the “boots on the ground” and work directly with landowners to implement best management practices and help them secure financial assistance for projects.

Through the discussion of policies and practices, current activities, and ongoing research, project stakeholders have developed and will continue to refine, principles to guide the implementation of load reduction plan. Strategies will be adjusted to ensure that activities are being focused where the greatest improvement may be made, while utilizing available funding judiciously. Practices will be designed to implement a well-rounded, comprehensive approach to meeting the water quality standards.

Table 12 describes the partnerships and entities that will support the implementation of this NKE.

Table 12. Partnerships in the BOC Watershed

Partner	Role
Otter Tail County Board	Policy Committee
Wadena County Board	Policy Committee
Becker SWCD Board	Policy Committee
East Otter Tail SWCD Board	Policy Committee
Wadena SWCD Board	Policy Committee
Becker SWCD Staff Todd SWCD Staff Wadena SWCD Staff	Outreach, Project Development, Project Management, Tech Assistance & Engineering, Inventory/Mapping, Inspections,
EOT SWCD Staff	Administration/Coordination, Outreach, Project Development, Project Management, Tech Assistance & Engineering, Inventory/Mapping, Inspections,
Otter Tail County Staff Wadena County Staff	Outreach, Project Development, Project Management, Tech Assistance & Engineering, Inventory/Mapping, Inspections,
Minnesota Board of Water and Soil Resources	Technical Advisory Committee, Technical and Financial Support
Minnesota Department of Natural Resources	Technical Advisory Committee, Technical and Financial Support
Minnesota Pollution Control Agency	Technical Advisory Committee, Technical and Financial Support
Minnesota Department of Agriculture	Technical Advisory Committee, Technical and Financial Support
Minnesota Department of Health	Technical Advisory Committee, Technical and Financial Support
Natural Resource Conservation Service	Technical Advisory Committee, Technical and Financial Support
Local stakeholders, lake groups, agricultural producers, and residents	Citizen Advisory Committee, provide input and implement projects

Element e. education and outreach

There are several strategies to provide education and outreach for this project as highlighted in the Table 8. This is a critical tool for successful implementation for BMPs. Providing landowners with the information they need to make wise management decisions for their property is key to restoring the quality of these waters.

Agricultural areas

Education and outreach efforts will consist of several small group meetings with landowners in priority areas of the project area. These meetings will be invite-only and targeted towards landowners who can make the most significant water quality improvements. Each meeting will include an information component, to help participants understand the resource concerns, a summary of practices, available technical/engineering services, programs and financial assistance.

Ongoing efforts – Social Media, Radio ads, news releases, direct mailings, general events.

In addition to coordinated small group meetings EOT and Wadena SWCD staff will utilize various outreach methods to target producers in the project area. Methods may include social media, radio ads, news releases, newsletters, direct mailings, photos, videos, poster boards, attending grower/partner meetings, and other special events.

SSTS owners

Properly functioning septic systems are important to ensure good water quality and are an important strategy outlined in the implementation table. Outreach to septic systems owners will be done biannually through targeted mailings and workshops. The long-term goal is to have SSTS owners informed on the importance of proper septic system maintenance and how to manage the SSTS and keep it functioning properly. The project partners will support the ongoing efforts of the County Land and Resource Management/Zoning Offices as they implement their local SSTS programs.

The planned implementation for this watershed will take place over the next ten years (2022-2032). Specific timelines for each activity are captured in x. It is expected that the activities described in the previous tables will meet the reductions needed to meet water quality standards in 10 years.

Element f. reasonable schedule

The schedule for this watershed plan is designated in 2-year increments described in Table 8. When implemented as planned, the activities and BMPs described will reach the estimated reductions needed to meet water quality standards in 10 years.

Element g. milestones

The planned milestones for this watershed are designated in 2-year increments and will take place over the next 10 years (2022-2032). Specific milestones for each activity are captured in Table 8. The accomplishment of these milestones will be used to evaluate the implementation of this plan.

Element h. assessment criteria

The assessment criteria for this watershed are designated in 2-year increments and the unit of measure is described in Table 8. The assessment criteria and achievement of milestone goals will be used to measure the accomplishment of this NKE plan.

Element i. monitoring

Pollutant monitoring for the BOC will be conducted every year to determine the effectiveness of the BMPs implemented and the success of this plan in achieving the water standard for *E. coli* in the streams.

Monitoring plan

The first three years of monitoring will serve as baseline data in combination with existing data, locations and parameters summarized in Table 13. Fourth year and following monitoring will be used to evaluate the streams for a change in water quality. *E. coli* monitoring will be conducted at four sites (two on each stream). Five samples will be collected in each month, April through October, to correspond with the application period of the standard. General chemistry monitoring will be conducted at the two assessment sites annually. Parameters that will be measured include TSS, TP, chloride, hardness, *E. coli*, Secchi tube, specific conductivity, temperature, pH, and DO. Measurements and samples will be collected twice per month during April through October. Photos are taken upstream and downstream at each location when sampling is performed. Recreational suitability, physical appearance, and stream stage is documented at each visit.

Table 13. Summary of water quality monitoring

Site	Bluff Creek	Oak Creek	Total number of samples per year
Water quality standard assessment sites	S006-849	S001-433	
Longitudinal *E. coli* sites	S012-036	S012-047	
E. coli sample frequency (April-October)	5 samples per month	5 samples per month	210
General chemistry sample frequency (April-October)	2 samples per month	2 samples per month	28

The monitoring sites are shown in Figure 5 and Figure 6 along with the locations of cattle and pasture areas. Total cost for ten years of monitoring will be about $140,000. The water quality data will be reviewed annually to identify significant changes that could represent increased or decreased loads associated with extreme conditions that would warrant a change in implementation approach. Evaluating the water quality for improvements associated with BMP implementation will be done using multiple years of data looking at pre- and post-implementation conditions to account for weather and other environmental variability. Microbial source tracking analyses will be used to confirm the sources of *E. coli* in the streams.

SWAG grant 2022-23

Water quality monitoring of the two assessment monitoring sites is being done by the East Otter Tail and Wadena SWCDs through a MPCA Surface Water Assessment Grant (SWAG) in 2022 and 2023. SWAG monitoring involves two samples per month. Samples are collected May through September. The SWAG monitoring is conducted following MPCA procedures for the HUC8 watershed monitoring program.

Bluff Creek 07010107-515

The SWCD identified 16 potential pasture and feedlot areas during May 2021 inventory (Table 14). Collecting *E. coli* at S012-036 would be helpful in figuring out where the *E. coli* is coming from in upper watershed. Sites are listed from upstream to downstream. Two sampling sites collected 10 times over 2 years.

Table 14. 2022-23 SWAG sample sites for Bluff Creek

EQUIS ID	Longitude	Latitude	Location Description	Notes
S012-036	-95.270486	46.52741	Bluff Creek: Headwaters to Leaf R	
S006-849*	-95.29829	46.47874	Bluff Creek: Headwaters to Leaf R	*E. coli* was elevated in 2011 and 2012. Need to establish additional station possibly upstream. There are a lot of cattle in the headwaters of this watershed.

*Collected by SWAG 2022-2023

Oak Creek 07010107-516

The SWCD Identified 13 potential pasture and feedlot areas in subwatershed in May 2021 (Table 15). Upstream site. There is no *E. coli* data available so proposing to collect two years of data to see what levels are up here. Sites are listed from upstream to downstream. Two sampling sites collected 10 times over 2 years.

Table 15. 2022-23 SWAG sample sites for Bluff Creek

EQUIS ID	Longitude	Latitude	Location Description	Notes
S012-047	-95.17743	46.36934	Oak Creek: Unnamed ditch to T134 R36W S3, north line	
S001-433*	-95.1963	46.44145	Oak Creek: Unnamed ditch to T134 R36W S3, north line	2009-2012 data show high *E. coli*. Farthest downstream site.

*Collected by SWAG 2022-2023

Longitudinal sampling in 2022-23

The MPCA will conduct longitudinal sampling at seven sites along the streams to further delineate loading sources. Timing and types of samples are summarized in Table 16.

Table 16. Parameters sampled in 2022-23 MPCA longitudinal grant

2022 sampling by MPCA (7 sites x 5 events= 35 samples) ($21/sample =$735/yr)

Non SWAG sites	May	June	July	August	September
E. coli	X	X	X	X	X
Secchi Tube	x	x	x	x	x
Specific cond	x	x	x	x	x
Temp	x	x	x	x	x
pH	x	x	x	x	x
DO	x	x	x	x	x
Photo US	x	x	x	x	x
Photo DS	x	x	x	x	x

References

Houston Engineering, Inc (2020). *Leaf-Wing-Redeye Watershed One Watershed One Plan.*

Emmons and Oliver Resources (EOR). (2016). *Redeye River Watershed Pollutant Reduction Project (Total Maximum Daily Load Study) For Bacteria.*

Minnesota Pollution Control Agency (MPCA). (2014). *Redeye River Watershed Monitoring and Assessment Report*

Appendix A STEPL practices and assumptions

The STEPL was used to estimate P and *E. coli* loads and reductions for the watershed. The loads estimated in STEPL were comparable with the loading that was estimated using HSPF-SAM for the development of the draft TMDLs in the watershed.

The reductions for BMPs identified in the ten-year milestone table were summed and entered as combined efficiency practices in STEPL. Reduction efficiencies for *E. coli* were assumed from MPCA (2011) and Wright Water Engineers, Inc. (2010) and added to the "BMPList" worksheet in STEPL. The practices and assumed reduction efficiencies are shown in Table 17. The treatment efficiencies for the BMPs that are not in the original list of BMPs and reduction efficiencies (BMPList) in STEPL were assigned based on the similarity of the treatment processes with selected BMPList practices.

Table 17. STEPL BMP efficiencies

Landuse	BMP & Efficiency	N	P	Sediment	*E. coli*
Cropland					
Cropland	0 No BMP	0	0	0	0
Cropland	Alternative Tile Intake	0.253	0.308	0.4	0.3
Cropland	Biomass and Forage Planting	0.204	0.15	0.2	0.5
Cropland	Bioreactor	0.453	0.3	ND	0.9
Cropland	Buffer - Forest (100ft wide)	0.478	0.465	0.586	0.9
Cropland	Buffer - Grass (35ft wide)	0.338	0.435	0.533	0.65
Cropland	Combined BMPs-Calculated	0	0	0	0
Cropland	Conservation Cover	0.204	0.15	0.2	0.5
Cropland	Conservation Tillage 1 (30-59% Residue)	0.15	0.356	0.403	0.3
Cropland	Conservation Tillage 2 (equal or more than 60% Residue)	0.25	0.687	0.77	0.65
Cropland	Contour Farming	0.279	0.398	0.341	ND
Cropland	Controlled Drainage	0.388	0.35	ND	ND
Cropland	Cover Crop 1 (Group A Commodity) (High Till only for Sediment)	0.008	ND	ND	ND
Cropland	Cover Crop 2 (Group A Traditional Normal Planting Time) (High Till only for TP and Sediment)	0.196	0.07	0.1	ND
Cropland	Cover Crop 3 (Group A Traditional Early Planting Time) (High Till only for TP and Sediment)	0.204	0.15	0.2	0.5
Cropland	Critical Area Planting	0.898	0.808	0.95	0.9
Cropland	Detention Basin	0.253	0.308	0.4	0.3
Cropland	Diversions	0.898	0.808	0.95	0.9
Cropland	Drainage Water Management	0.253	0.308	0.4	0.3
Cropland	Field Borders	0.253	0.308	0.4	0.3
Cropland	Filter Strips	0.253	0.308	0.4	0.3
Cropland	Filtration Practices	0.253	0.308	0.4	0.3
Cropland	Grade Stabilization Structures	0.253	0.308	0.4	0.3
Cropland	Grassed Waterways	0.253	0.308	0.4	0.3
Cropland	Impoundment	0.898	0.808	0.95	0.9
Cropland	Land Retirement	0.898	0.808	0.95	0.9

Landuse	BMP & Efficiency	N	P	Sediment	*E. coli*
Cropland	Manure/Nutrient Management	0.154	0.45	ND	0.9
Cropland	Nutrient Management 1 (Determined Rate)	0.154	0.45	ND	0.5
Cropland	Nutrient Management 2 (Determined Rate Plus Additional Considerations)	0.247	0.56	ND	0.9
Cropland	Residue/Tillage Management	0.15	0.356	0.403	0.3
Cropland	Saturated Buffer	0.338	0.435	0.533	0.65
Cropland	Side water inlets	0.253	0.308	0.4	0.3
Cropland	Streambank Erosion Practices	0.253	0.308	0.4	0.3
Cropland	Streambank Stabilization and Fencing	0.75	0.75	0.75	0.3
Cropland	Terrace	0.253	0.308	0.4	0.3
Cropland	Two-Stage Ditch	0.12	0.28	ND	0.3
Cropland	WASCOB (Water and Sediment Control Basin	0.253	0.308	0.4	0.3
Cropland	Water Control Structures	0.253	0.308	0.4	0.3
Cropland	Wetland Restoration	0.898	0.808	0.95	0.9
Pastureland					
Pastureland	0 No BMP	0	0	0	0
Pastureland	30m Buffer with Optimal Grazing	0.364	0.653	ND	0.65
Pastureland	Alternative Water Supply	0.133	0.115	0.187	0.65
Pastureland	Cattle Exclusions	0.203	0.304	0.62	0.65
Pastureland	Combined BMPs-Calculated	0	0	0	0
Pastureland	Critical Area Planting	0.175	0.2	0.42	ND
Pastureland	Fencing and Watering Projects	0.203	0.304	0.62	0.65
Pastureland	Forest Buffer (minimum 35 feet wide)	0.452	0.4	0.533	ND
Pastureland	Grass Buffer (minimum 35 feet wide)	0.868	0.766	0.648	ND
Pastureland	Grazing Land Management (rotational grazing with fenced areas)	0.43	0.263	ND	0.65
Pastureland	Heavy Use Area Protection	0.183	0.193	0.333	ND
Pastureland	Litter Storage and Management	0.14	0.14	0	ND
Pastureland	Livestock Exclusion Fencing	0.203	0.304	0.62	0.65
Pastureland	Multiple Practices	0.246	0.205	0.221	ND
Pastureland	Pasture and Hayland Planting (also called Forage Planting)	0.181	0.15	ND	ND
Pastureland	Prescribed Grazing	0.408	0.227	0.333	0.65
Pastureland	Rotational Grazing	0.43	0.263	0.333	0.65
Pastureland	Streambank Protection w/o Fencing	0.15	0.22	0.575	0.3
Pastureland	Streambank Stabilization and Fencing	0.75	0.75	0.75	0.65
Pastureland	Use Exclusion	0.39	0.04	0.589	0.9
Pastureland	Winter Feeding Facility	0.35	0.4	0.4	ND
Forest					
Forest	0 No BMP	0	0	0	0
Forest	Combined BMPs-Calculated	0	0	0	0
Forest	Road dry seeding	ND	ND	0.41	ND
Forest	Road grass and legume seeding	ND	ND	0.71	ND

Landuse	BMP & Efficiency	N	P	Sediment	*E. coli*
Forest	Road hydro mulch	ND	ND	0.41	ND
Forest	Road straw mulch	ND	ND	0.41	ND
Forest	Road tree planting	ND	ND	0.5	ND
Forest	Site preparation/hydro mulch/seed/fertilizer	ND	ND	0.71	ND
Forest	Site preparation/hydro mulch/seed/fertilizer/transplants	ND	ND	0.69	ND
Forest	Site preparation/steep slope seeder/transplant	ND	ND	0.81	ND
Forest	Site preparation/straw/crimp seed/fertilizer/transplant	ND	ND	0.95	ND
Forest	Site preparation/straw/crimp/net	ND	ND	0.93	ND
Forest	Site preparation/straw/net/seed/fertilizer/transplant	ND	ND	0.83	ND
Forest	Site preparation/straw/polymer/seed/fertilizer/transplant	ND	ND	0.86	ND
User_Defined					
User_Defined	0 No BMP	0	0	0	0
User_Defined	Combined BMPs-Calculated	0	0	0	0
Feedlots					
Feedlots	0 No BMP	0	0	0	0
Feedlots	Diversion	0.45	0.7	ND	0.9
Feedlots	Filter strip	ND	0.85	ND	0.3
Feedlots	Runoff Mgmt System	ND	0.825	ND	0.5
Feedlots	Solids Separation Basin	0.35	0.31	ND	0.5
Feedlots	Solids Separation Basin w/Infilt Bed	ND	0.8	ND	0.9
Feedlots	Terrace	0.55	0.85	ND	0.9
Feedlots	Waste Mgmt System	0.8	0.9	ND	0.9
Feedlots	Waste Storage Facility	0.65	0.6	ND	0.9
Urban					
Urban	0 No BMP	0	0	0	0
Urban	Alum Treatment	0.6	0.9	0.95	ND
Urban	Bioretention facility	0.63	0.8	ND	0.9
Urban	Bioretention practices	0.63	0.8	0.85	0.95
Urban	Combined BMPs-Calculated	0	0	0	0
Urban	Concrete Grid Pavement	0.9	0.9	0.9	ND
Urban	Dry Detention	0.3	0.26	0.575	ND
Urban	Extended Wet Detention	0.55	0.685	0.86	0.9
Urban	Filter Strip-Agricultural	0.5325	0.6125	0.65	0.3
Urban	Grass Swales	0.1	0.25	0.65	ND
Urban	Infiltration Basin	0.6	0.65	0.75	0.9
Urban	Infiltration Devices	ND	0.83	0.94	ND
Urban	Infiltration Trench	0.55	0.6	0.75	0.9
Urban	Lakeshore restoration	0.43	0.81	0.73	0.3
Urban	LID*/Cistern	0	0	0	0
Urban	LID*/Cistern+Rain Barrel	0	0	0	0

Landuse	BMP & Efficiency	N	P	Sediment	*E. coli*
Urban	LID*/Rain Barrel	0	0	0	0
Urban	LID/Bioretention	0.43	0.81	ND	ND
Urban	LID/Dry Well	0.5	0.5	0.9	ND
Urban	LID/Filter/Buffer Strip	0.3	0.3	0.6	0.9
Urban	LID/Infiltration Swale	0.5	0.65	0.9	ND
Urban	LID/Infiltration Trench	0.5	0.5	0.9	ND
Urban	LID/Vegetated Swale	0.075	0.175	0.475	ND
Urban	LID/Wet Swale	0.4	0.2	0.8	ND
Urban	Limestone filter	0.3	0.5	0.9	0.9
Urban	Oil/Grit Separator	0.05	0.05	0.15	ND
Urban	Porous Pavement	0.85	0.65	0.9	0.9
Urban	Raingardens	0.6	0.65	0.75	0.9
Urban	Sand Filter/Infiltration Basin	0.35	0.5	0.8	ND
Urban	Sand Filters	ND	0.375	0.825	ND
Urban	Settling Basin	ND	0.515	0.815	ND
Urban	Shoreland buffer	0.4	0.425	0.73	0.3
Urban	Silva cell	0.55	0.85	0.95	0.9
Urban	Vegetated Filter Strips	0.4	0.4525	0.73	0.9
Urban	Weekly Street Sweeping	ND	0.06	0.16	ND
Urban	Wet Pond	0.35	0.45	0.6	ND
Urban	Wetland Detention	0.2	0.44	0.775	ND
Urban	WQ Inlet w/Sand Filter	0.35	ND	0.8	ND
Urban	WQ Inlets	0.2	0.09	0.37	ND