Lac qui Parle-Yellow Bank Rivers Fecal Coliform Bacteria, Turbidity and Low Dissolved Oxygen TMDL Implementation Plan

South Branch Lac qui Parle River

Prepared by:
Lac qui Parle-Yellow Bank Watershed District
In Cooperation with the Clean Water Partnership
TEAM Advisory Committee and MPCA

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1. TMDL Implementation Plan Executive Summary

This implementation plan was written by staff of Lac qui Parle-Yellow Bank Watershed District (LqP-YB WD) with assistance from Lac qui Parle-Yellow Bank TEAM (Together Everyone Achieves More) members and guidance from the Minnesota Pollution Control Agency (MPCA). This implementation plan is based on the Lac qui Parle-Yellow Bank Bacteria, Turbidity, and Low Dissolved Oxygen TMDL Assessment Report (TMDL report) which was approved by the United States Environmental Protection Agency (EPA) on May 8, 2013.

The TMDL report addresses 19 impairments on eight reaches of the Lac qui Parle River and three reaches of the Yellow Bank River and is summarized in Table 1.

Table 1: Primary Contributing Sources by Impairment

Impairment	Number of Impaired Reaches	Primary Contributing Sources
Bacteria	11	Over-grazed riparian pasture and noncompliant septic systems (including "straight pipe" septic system) during dry conditions, and surface applied manure, over-grazed pastures, and feedlots without runoff controls during wet conditions.
Turbidity	7	Runoff-driven mechanisms, such as delivery of sediment to river from upstream areas and/or bank instability under higher flow conditions following significant storm events during spring and summer months.
Dissolved Oxygen	1	Low-oxygen discharge from headwater and nonpoint source detritus loading resulting in excessive sediment oxygen demand.

A summary of the TMDL report can be found in Section 2 and the entire report can be accessed at http://www.pca.state.mn.us/nwqh9b8.

The priority management areas for implementation will be the upper reaches of the Lac qui Parle and Yellow Bank Rivers. It is expected that addressing the upper reaches of the system will have a significant effect on addressing exceedances in the lower reaches of the river systems. Section 3 discusses the priority management areas and concerns in greater detail.

There are several implementation measures that address turbidity and fecal coliform bacteria. Our stakeholder groups discussed and voted on the following management practices: riparian buffers/filter strips, septic system upgrades, small dams and impoundments, streambank management practices, and pasture management as primary implementation measures. In 2015, a GIS terrain analysis of the watershed will be available to aid in proper selection and placement of best management practices (BMP) that will enhance water quality. Total implementation plan project costs are estimated to be $17 to 18 million. Implementation of practices identified as priority will be completed within a ten-year period. A major part of evaluating this implementation plan will occur through the statewide approach to major watershed that is overseen by the MPCA. The Lac qui Parle – Yellow Bank watersheds are scheduled to begin this process in 2015.

2. TMDL Report Summary

2.1 Stakeholder Involvement

The MPCA began a partnership with the Lac qui Parle-Yellow Bank Watershed District to develop a TMDL study for the impaired reaches of the Lac qui Parle and Yellow Bank Rivers. Beginning in November 2009, stakeholder meetings were held and a stakeholder discussion group was developed to provide input on the development of the TMDL study and implementation plan. The stakeholder group is composed of landowners, local, state and federal agency staff and the general public. Various informational meetings were held during the Lac qui Parle Yellow Bank TMDL study and implementation plan development for the impaired reaches of the Lac qui Parle and Yellow Bank Rivers.

2.2 Watershed Characteristics

The headwaters for the Lac qui Parle River and the Yellow Bank River are located in Deuel and Grant counties in South Dakota respectively. The Lac qui Parle River drains portions of Lincoln, Yellow Medicine and Lac qui Parle counties in Minnesota. The West Branch and South Branch of the Lac qui Parle River join east of Dawson, Minnesota to form the main stem of the Lac qui Parle River. Coming off the Coteau des Praires, a high glacial landform occupying southwestern Minnesota, southeastern South Dakota and northwestern Iowa, there is a 1,070-foot drop in elevation in the first 60 river miles. The Lac qui Parle River discharges ultimately to the Minnesota River just above Lac qui Parle dam and the County Highway 33 river crossing. There is 69.7% of the watershed located in Minnesota. The Yellow Bank River watershed is located in northwestern Lac qui Parle County (north of the Lac qui Parle River watershed). The North Fork and the South Fork of the Yellow Bank River join in Yellow Bank Township Section 25 to form the main stem of the Yellow Bank River. The main stem Yellow Bank River ultimately discharges to the Minnesota River east of Odessa, Minnesota. There is only 13.4 % of the watershed located in Minnesota.

Both watersheds are primarily rural with corn and soybeans being the primary crop production and swine and cattle being the primary livestock production. The urban communities in the Lac qui Parle watershed consist of Boyd, Canby, Dawson, Hendricks, Madison and Marietta in Minnesota; the Yellow Bank watershed consists of two very small communities, Nassau and Rosen in Minnesota. The 2010 census data showed population of 11,848 an approximate 8% reduction in population from 2000 to 2010 and is about 97% Caucasian.

The portion of both watersheds within Minnesota lies in the Northern Glaciated Plains (NGP) ecoregion, characterized by rolling terrain, fertile soils, and extensive cultivation for row crops. The watersheds are predominantly comprised of two agroecoregions, the Coteau and the Dryer Blue Earth Till. The Coteau agroecoregion is located primarily in the upper reaches of the Lac qui Parle River watershed and is characterized by landscapes with long northeastern facing slopes of moderate steepness (2-6%). The soils are predominantly loamy and well-drained, though much of the Coteau des Prairies has a high water erosion potential due mainly to moderately steep slopes. The Dryer Blue Earth Till covers the middle and lower reaches of the Lac qui Parle watershed and most of the Yellow Bank River watershed.

Most of the land has relatively flat slopes (0-6%). Soils are predominantly loamy, with landscapes having a complex mixture of well and poorly drained soils. Drainage in depressional areas is poor where drainage tile is not used. Depressions in agricultural fields are commonly tile drained. Water erosion potential is moderate in most areas. Based on 40 years of precipitation values available from Minnesota State Climatologist for Madison, MN near the center of the watershed, the average annual precipitation is 23.1 inches.

2.3 Impairments

2.3.1 Description of Impairments

The TMDL report addresses 19 impairments on eight reaches of the Lac qui Parle River and three reaches of the Yellow Bank River. Eleven impairments are for fecal coliform bacteria, seven impairments are for turbidity, and one impairment is for low dissolved oxygen (Table 2).

Table 2: Bacteria, Turbidity, and Low Dissolved Oxygen Impairments in the Lac qui Parle River and Yellow Bank River Watersheds

Reach	Yr Listed	Assessment Unit ID	Affected Use	Pollutant or stressor	Target start//completion
Florida Creek, MN/SD Border to W. Br. Lac qui Parle River	06	07020003-521	Aquatic recreation	Fecal coliform	2012//2016
			Aquatic life	Turbidity	2014//2018
Lazarus Creek, Canby Creek to Lac qui Parle River	06	07020003-508	Aquatic recreation	Fecal coliform	2012//2016
			Aquatic life	Turbidity	2014//2018
W. Br. Lac qui Parle River, Unnamed Creek to Unnamed Ditch	06	07020003-512	Aquatic recreation	Fecal coliform	2012//2016
W. Br. Lac qui Parle River, Lost Creek to Florida Creek	06	07020003-516	Aquatic recreation	Fecal coliform	2012//2016
	10		Aquatic life	Turbidity	2009//2011
Lac q ui Parle River , Headwaters to Lazarus Creek	06	07020003-505	Aquatic recreation	Fecal coliform	2012//2016
			Aquatic life	Turbidity	2014//2018
Lac qui Parle River, Lazarus Creek to W. Br. Lac qui Parle River	06	07020003-506	Aquatic recreation	Fecal coliform	2012//2016
			Aquatic life	Turbidity	2014//2018
Lac qui Parle River, W. Br Lac qui Parle River to Ten Mile Creek	94	07020003-501	Aquatic life	Low oxygen	2004//2008
			Aquatic recreation	Fecal coliform	2012//2016
	06		Aquatic life	Turbidity	2014//2018
Ten Mile Creek, Headwaters to Lac qui Parle River	06	07020003-511	Aquatic recreation	Fecal coliform	2009//2011
N. Fk. Yellow Bank River, MN/SD Border to Yellow Bank River	06	07020001-510	Aquatic recreation	Fecal coliform	2017//2021
S. Fk. Yellow Bank River, MN/SD Border to N. Fk. Yellow Bank River	06	07020001-526	Aquatic recreation	Fecal coliform	2017//2021
Yellow Bank River, N. Fk. Yellow Bank River to Minnesota River	06	07020001-525	Aquatic recreation	Fecal coliform	2006//2008
	10		Aquatic life	Turbidity	2009//2011

Fecal Coliform Bacteria and *Escherichia coli* (*E. coli*)

Fecal coliform bacteria are an indicator organism, meaning that not all the species of bacteria of this category are harmful, but they are usually associated with harmful organisms transmitted by fecal contamination. They are found in the intestines of warm-blooded animals, including humans and livestock. The presence of fecal bacteria in water suggests the presence of fecal matter and associated bacteria (i.e. some strains of *E. coli*), viruses, and protozoa (i.e. Giardia and *Cryptosporidium*) that are pathogenic to humans when ingested (USEPA 2001). The decision to list the reaches identified was originally based on a fecal coliform standard in effect prior to the most recent rule revision in 2008. Bacteria impaired reaches of the Lac qui Parle and Yellow Bank River watersheds are shown in gold and reaches with both bacteria and turbidity impairments are shown in red on the map in Figure 1.

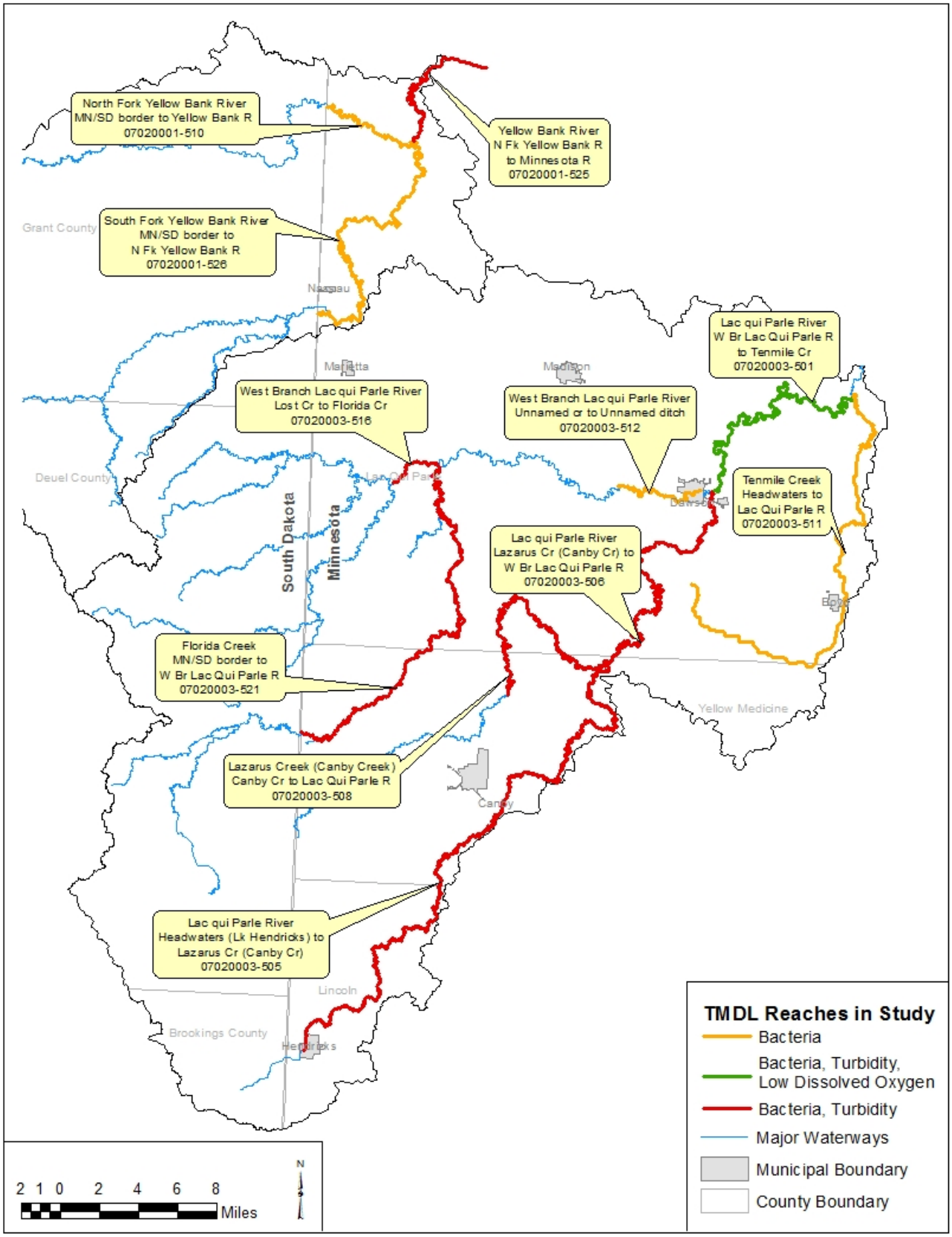
Turbidity

Turbidity in water is caused by suspended sediment, organic material, dissolved salts, and stains that scatter light in the water column, making the water appear dirty and cloudy. Excess turbidity can degrade aesthetic qualities of water bodies, increase the cost of treatment for drinking water or food processing uses, and harm aquatic life. Adverse ecological impacts caused by excessive turbidity include hampering the ability of aquatic organisms to visually locate food, negative effects on gill function, and smothering of spawning beds and benthic organism habitat. Turbidity impaired reaches of the Lac qui Parle and Yellow Bank watershed are shown in red on the map in Figure 1.

Dissolved Oxygen

Dissolved oxygen (DO) is an important water quality parameter for the protection and management of aquatic life. All higher life forms, including fish and aquatic macroinvertebrates, are dependent on minimum levels of oxygen for critical life cycle functions such as growth, maintenance, and reproduction. Problems with oxygen depletion in river systems are often the result of excessive loadings of carbonaceous biochemical oxygen demand (CBOD) and nitrogenous biochemical oxygen demand (NBOD), particularly in combination with high temperatures and low flow conditions. The breakdown of organic compounds in the water column and/or sediment consumes water column DO. Loading of organic matter to streams can come from both natural (plant and leaf debris, in-situ primary production) and anthropogenic (wastewater effluent, agricultural animal feces) sources. The amount of oxygen that a given volume of water can hold is a function of atmospheric pressure, water temperature, and the amount of other substances dissolved in the water. The impaired reach for low dissolved oxygen is shown in green on the map in Figure 1.

Figure 1: Bacteria, Turbidity and Low Dissolved Oxygen Impaired Reaches



2.3.2 Beneficial Use Classifications

The TMDL report addresses exceedances of the Minnesota state standard for bacteria, turbidity and dissolved oxygen in the Lac qui Parle River and Yellow Bank River watersheds. All waters of Minnesota are assigned classes based on their suitability for the following beneficial uses (Minn. Rules Ch. 7050.0140 and 7050.0220):

1. Domestic consumption
2. Aquatic life and recreation
3. Industrial consumption
4. Agriculture and wildlife
5. Aesthetic enjoyment and navigation
6. Other uses
7. Limited resources value

A. Cold water sport fish (trout waters), also protected for drinking water
B. Cool and warm water sport fish, also protected for drinking water
C. Cool and warm water sport fish, indigenous aquatic life, and wetlands, and
D. Limited resource value waters

According to Minn. Rules Ch. 7050.0470, all of the listed reaches above except three are Class 2C and 3C waters. Lazarus Creek is specifically listed as 2B waters. Ten Mile Creek and Yellow Bank River downstream of the confluence with North Fork Yellow Bank River and South Fork Yellow Bank River are not listed in 7050.0470 and therefore classified as 2B, 3C, 4A, 4B, 5, and 6 waters (Minn. Rules Ch. 7050.0430). Table 3 summarizes the beneficial use classifications by assessment unit ID (AUID).

Table 3: Beneficial Use Classifications

Reach	Assessment Unit ID	Class
Florida Creek, MN/SD to W. Branch LqP River	07020003-521	2C and 3C
Lazarus Creek, Canby Creek to LqP River	07020003-508	2B
W. Branch LqP River, Unnamed Creek to Unnamed Ditch	07020003-512	2C and 3C
W. Branch LqP River, Lost Creek to Florida Creek	07020003-516	2C and 3C
LqP River, Headwaters to Lazarus Creek	07020003-505	2C and 3C
LqP River, Lazarus Creek to W. Branch LqP River	07020003-506	2C and 3C
LqP River, W. Branch LqP River to Ten Mile Creek	07020003-501	2C and 3C
Ten Mile Creek, Headwaters to LqP River	07020003-511	2B,3C,4A,4B,5,6
North.Fork YB River, MN/SD Border to Yellow Bank River	07020001-510	2C and3C
South Fork YB River, MN/SD Border to N Fork YB River	07020001-526	2C and 3C
YB River, North Fork YB River to Minnesota River	07020001-525	2B,3C,4A,4B,5,6

All surface waters classified as Class 2 are also protected for industrial, agricultural, aesthetics, navigation, and other uses.

2.4 Source Assessment

2.4.1 Fecal Coliform Bacteria

Bacteria monitoring data within each listed reach were used to assess the degree of impairment for that reach as well as provide information on potential sources of bacteria loading. The LqP-YB WD carried out sampling for bacteria in the TMDL study area in various years over the most recent nine year period (2001-2009). The samples taken were generally grab samples collected between April and October of each year. Prior to 2006, bacteria samples were analyzed for fecal coliform. After 2006, samples were analyzed for *E. coli*.

To assess the degree of impairment within each of the listed reaches, monthly geometric means were calculated for April through October. The formula used to calculate the percentage reductions is as follows:

$$\frac{\text{(Monthly geometric mean for specific site - } \textit{E. coli} \text{ Standard)}}{\text{Monthly geometric mean for specific site}} * 100 = \text{Percentage Reduction}$$

The following conclusions were drawn from the information:

- The data from the last 9 years show that there are violations of the *E. coli* standard for one or more months for each of the reaches listed. Nine of the eleven listed reaches show exceedances of the standard in at least three months.
- In the listed reaches of both the Lac qui Parle River and Yellow Bank River systems, the exceedances of the standard appear to be more frequent and severe in the upper reaches. The percent reductions needed to reach the standard are consequently much higher for those upper reaches. It is possible that addressing exceedances in the upper reaches of the system may have a significant beneficial effect on addressing exceedances in the lower reaches of the same system.
- Seasonal geometric means for each of the listed reaches show that a substantial majority of the exceedances of the standard (nine of thirteen) occur during the summer. The upper most reach of the Lac qui Parle River (Headwaters to Lazarus Creek) and the listed reach of Lazarus Creek appear to be especially prone to exceedances.

A Load Duration analysis was used to integrate flow and the bacteria standard to provide loading capacities and allocations across the full range of flows. The median load within each of the five flow regimes (very high-high-mid-low-very low) were used to represent the total monthly loading capacity for that flow regime then converted to a daily load in billions of organisms per day by dividing the monthly loading capacity by 30.6 (the average number of days in a month over the April-October period.) The following conclusions were drawn:

- Data show frequent exceedance during low flow conditions which are particularly numerous on the Lac qui Parle River above Lazarus Creek, Lazarus Creek itself, and North and South Forks of the Yellow Bank. Most of the samples that were collected during low flow regimes showed exceedances of the standard. This suggests septic systems, overgrazed pastures with direct access to streams, and/or wildlife are probable sources.

- Numerous exceedances also occur at mid-, high, and very high flow regimes, though their occurrence is lower as a percentage of the samples taken. This reflects the probable role of summer precipitation events generating runoff episodes that cause delivery of bacterial loads to receiving waters. Possible sources for exceedances at these flow regimes include runoff from feedlots without runoff controls and fields that may have received surface application of manure just prior to the runoff event.
- Exceedances of the bacteria standard generally seem to be most severe at upstream sites and decrease in severity the further downstream the station. This may support focusing working in a generally upstream-to-downstream progression during implementation.

The major assumptions that bacteria source accounting analysis was based were reviewed by persons with local knowledge of agricultural and manure-handling practices as presented in the TMDL report. Estimated delivery potential by season, flow condition, and source for the impaired reaches were compared. Delivery potential suggests the following:

- Over-grazed riparian pasture and noncompliant septic systems (including "straight pipe" systems) have a high likelihood of being major contributors of bacteria loading during dry conditions in all seasons. This is because they can contribute bacteria load to receiving waters when other sources do not due to low or no runoff.
- Surface applied manure, over-grazed pastures and feedlots without runoff controls appear likely to be the biggest contributors of bacteria loading during wet conditions across all seasons. Loads from these sources are generally transported entirely or in large part by runoff.

2.4.2 Turbidity

Turbidity and total suspended solids (TSS) monitoring data within each listed reach were used to assess the degree of impairment for each reach and provide information on potential sources of TSS loading. All data collected throughout the last 10 years were used in the analyses. The same stream flow records developed for the bacteria impairments were used for the turbidity impairment analysis.

Since turbidity is a measure of light scatter and adsorption, turbidity cannot be expressed as a mass load that is required in TMDLs. Consistent with MPCA Turbidity Protocol, TSS was evaluated for use as a surrogate for turbidity. TSS is a measurement of the amount of sediment and organic matter suspended in water and is often used for loading allocations and capacities. To determine the TSS equivalent to the 25 nephelometric turbidity units (NTU) turbidity standard for the TMDL study, paired lab turbidity and TSS samples were used that were taken at seven sites within each of the turbidity impaired reaches of the Lac qui Parle and Yellow Bank rivers project area. A relationship was developed between turbidity and TSS with a bias correction applied. The result was a TSS surrogate of 45 milligrams per liter (mg/L).

The relationship between transparency tube readings and TSS was also evaluated. The relationships were constructed by combining paired data from key Lac qui Parle-Yellow Bank River watershed sampling stations for the period of 2002-2009 and using the same methods as the turbidity-TSS

regression. A 17 cm transparency tube reading was equivalent to the TSS value of 45 mg/L and the Turbidity standard of 25 NTU.
The following conclusions were drawn:

- The data verify that all reaches meet the threshold for listing as impaired based on the most recent 10 year period of data.
- The impaired reaches of Lazarus Creek and the West Branch Lac qui Parle River will require modest reductions (<26%) in turbidity to meet the 25 NTU standard.
- The other five listed reaches will require significant reductions in turbidity of between 50% and 75% to meet the 25 NTU standard.

To link potential sources of TSS with turbidity impairments in the receiving waters, three evaluations were conducted. First was the relationship between individual sample values and the flow regimes and when those samples were collected to try to determine the most likely sources. Next an evaluation of permitted point source discharge monitoring records (DMR). This included industrial and municipal treatment facilities in the watershed. This information provided the following conclusions:

- The information indicates a good distribution of sample data across the full range of flow conditions for all sites.
- The Lac qui Parle River sites all seem to show a distinct pattern of numerous exceedances of the standard at “high” and “very high” flow regimes and relatively few exceedances in the “mid-“, “low”, and “dry” flow regimes. The Yellow Bank River also follows this pattern. This suggest that the exceedances are likely caused by run-off driven mechanisms, such as delivery of sediment to the river from upstream areas and /or bank instability under higher flow conditions. These flows are typically significant storm events during the spring and summer months.
- The data from Florida Creek and Lazarus Creek suggest a modest impairment, but with exceedances of the standard spread across low, mid, and high flow regimes. This suggest a variety of causes, which could include runoff driven processes that deliver pollutants from upland or floodplain areas, channel instability caused by hydraulic overloading resulting in mass wasting of stream banks, channel instability caused by livestock access to the stream, and/or point source inputs such as from straight-pipe septic connections.
- Data for the West Branch Lac qui Parle River (Lost Creek to Florida Creek) suggests only a mild impairment, with sporadic exceedances in low, high, and very high flow regimes. Again, this suggests a variety of causes, which could include runoff driven processes that deliver sediment, bank instability, livestock access to the stream, and/or point source inputs such as from straight-pipe septic connections.

Another method used was an assessment of relative soil loss potential for upland areas. Upland areas can contribute to excess turbidity by way of sheet/rill erosion of soil either overland or by way of surface tile intakes or wind-eroded soil settling into ditches that are then flushed during precipitation events. The approach was modeled after the Revised Universal Soil Loss Equation (RUSLE). The analysis shows mostly low levels of soil loss potential with the exception of areas of mostly row crops on steeper slopes

that appear to be mostly adjacent to stream corridors. Intermittent streams within row cropped areas that lack adequate buffers could be causing excess sediment delivery.

2.4.3 Low Dissolved Oxygen

Dissolved oxygen data within the listed reach were used to assess the degree of impairment as well as provide information of potential sources of low DO. Streamflow within the system was important and when paired with data, it allowed low DO occurrences to be evaluated by flow regime. The information provided insights on potential sources and how they vary during low flows and during run-off driven high flows. Potential sources identified in the TMDL report include biological oxygen demand (BOD) commonly from algal growth from organic matter from plant decay and leaf fall, effluent from wastewater treatment plants, increased temperature from water management and urban runoff, increased nutrients from land-use, removal/loss of riparian canopy, and impoundments. The following conclusions were drawn from available data:

- The degree of impairment within the listed reach appears relatively minor, with no readings below 4 mg/L even though the measurements documenting the violations were for the most part taken before 9:00 a.m. and can therefore be considered daily minimums.
- The two violations of the DO standard in the mid- and high flow regimes occurred near the upper end of the impaired reach and were both very minor in severity.
- The critical condition during which significant violations are most likely to occur is the late summer low flow period.
- DO violations in the West Branch of the Lac qui Parle River (one of the headwaters of the listed reach) are moderately frequent and severe, with three readings below 3 mg/L.
- The majority of the sub-5 mg/L DO readings on the West Branch of the Lac qui Parle River take place during low flow conditions, but four have occurred in the mid-range flow regime and two in the high flow regime as well.
- The low DO waters of the West Branch of the Lac qui Parle River could significantly affect DO downstream in the listed reach, especially at the upper end of that reach.

2.4.4 Accounting for South Dakota in Allocations

Many of the impaired reaches discussed in this implementation plan have watersheds that extend into South Dakota. The effect of flows from South Dakota in developing the TMDL report was important to take into account. This is because the calculations of loading capacity and the allocations themselves are heavily dependent on flows within each listed reach, and a portion of the flow within each of the reaches is contributed by South Dakota. Allocating the entire loading capacity to Minnesota would leave none for sources in South Dakota and would likely compromise the validity of the TMDL report. It is important to note that the states of South Dakota and Minnesota apply different water quality standards to reaches of the same streams that lie in each state.

Both states classify the inter-state streams addressed in this plan to support indirect contact recreation as a beneficial use. However, Minnesota applies the same bacteria standard to water bodies classified for indirect contact recreation as it does for those classified for direct contact recreation. South Dakota,

applies a less stringent bacteria standard to waters classified to support indirect contact recreation. Table 4 summarizes the differences in the bacteria standard that each state applies to streams that cross the inter-state boundary and are affected by this TMDL Implementation plan.

Table 4: Comparison of South Dakota and Minnesota Water Quality Standards for Bacteria

Parameter	Applicable South Dakota Standard	Applicable Minnesota Standard
Fecal coliform bacteria	≤ 1000 organisms/100 ml	≤ 200 organisms/100 ml
E. coli bacteria	≤ 630 cfu/100 ml	≤ 126 cfu/100 ml

Minnesota applies a turbidity standard of 25 NTU to the listed reaches classified for indirect contact recreation and South Dakota applies a uniform TSS standard of 90 mg/L to water classified to support indirect contact recreation. Table 5 summarizes the differences in the standard that each state applies to streams that cross the inter-state boundary and are affected with this TMDL Implementation plan.

Table 5: Comparison of South Dakota and Minnesota Water Quality Standards for Turbidity/TSS

Parameter	**Applicable South Dakota Standard**	**Applicable Minnesota Standard**
Turbidity/Total Suspended (TSS)	≤ 90 mg/L TSS (no turbidity standard)	< 25 NTU 1 (< 45 mg/L TSS) 2

1 Nephelometric Turbidity Units

2 TSS concentration surrogate for 25 NTU based on analysis of paired turbidity/TSS data from turbidity impaired reaches in the Minnesota portion of the Lac qui Parle/Yellow Bank River system

If South Dakota does not meet Minnesota bacteria standards for streamflows discharged across the border, exceedances of Minnesota's bacteria standards in Minnesota are likely even if Minnesota sources are complying with the allocations set by the TMDL report. However, at the time this Implementation Plan was being written, South Dakota drafted a TMDL report for *E. coli* bacteria in the North and South Fork Yellow Bank River. Their draft TMDL report was developed using Minnesota state standards for *E. coli* bacteria (SD DENR, 2012). It is expected that if a turbidity TMDL report were developed, it would be completed in a similar manner. This approach offers additional assurance that both states will meet the bacteria water quality standards.

2.5 Measurable Water Quality Goals

2.5.1 Fecal Coliform Bacteria Measurable Water Quality Goals

The fecal coliform standard contained in the previous Minn. Rules Ch. 7050.0222 subpart 5, "Fecal Coliform Water Quality Standard for Class 2B waters", stated that fecal coliform concentrations shall "not exceed 200 organisms per 100 milliliters as a geometric mean of not less than five samples in any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 2000 organisms per 100 milliliters. The standard applies only between April 1 and October 31." This numerical standard is the chronic standard.

With the revisions of Minnesota's water quality rules in 2008, the state has changed to an *E. coli* standard because *E. coli* is a superior indicator of potential illness (MPCA 2007). Further, the costs for lab

analysis to detect *E. coli* can be substantially less than for fecal coliform. The 2008 state chronic standard for *E. coli* of 126 colony-forming units (cfu) /100 milliliters (ml) was adopted and is considered reasonably equivalent to the chronic fecal coliform standard of 200 organisms/100 ml from a public health protection standpoint. Further, the SONAR (Statement of Need and Reasonableness) section that supports the rationale for the change in the standard contains a log plot of paired fecal coliform and *E. coli* data that was cited as being a reasonable basis to convert fecal coliform concentrations into *E. coli* concentrations (MPCA 2007). The relationship has an R-squared valued of 0.6887 and the equation generated by the regression is $y = 1.7993x^{0.8057}$ where y is the *E. coli* concentration and x is the fecal coliform concentration. The fecal coliform data in this study was converted to *E. coli* data using this equation. Using the equation in section 2.4.1, Table 6 shows the approximate percent reduction of *E. coli* in each reach to meet the standard each month.

Table 6: Approximate percent reduction in *E. coli* to achieve the standard by month and reach.

AUID	Reach	April	May	June	July	August	Sept.	Oct.
07020003-521	Florida Creek, MN/SD to W. Branch LqP River	ND	None	None	77%[1]	47%	23%	None[1]
07020003-508	Lazarus Creek, Canby Creek to LqP River	59%[1]	None	34%	58%	38%	38%	ND
07020003-512	W. Branch LqP River, Unnamed Creek to Unnamed Ditch	7%	None	None	41%	24%	None	None[1]
07020003-516	W. Branch LqP River, Lost Creek to Florida Creek	ND	None	9%	84%[1]	56%	None	None[1]
07020003-505	LqP River, Headwaters to Lazarus Creek	73%	None	21%	63%	66%	60%	ND
07020003-506	LqP River, Lazarus Creek to W. Branch LqP River	None	None	54%	23%	25%	None	66%[1]
07020003-501	LqP River, W. Branch LqP River to Ten Mile Creek	None	None	None	2%	None	None	None[1]
07020003-511	Ten Mile Creek, Headwaters to LqP River	None[1]	None	30%	30%	11%	None	23%
07020001-510	North.Fork YB River, MN/SD Border to Yellow Bank River	ND	None	32%	29%	11%	None	None[1]
07020001-526	South Fork YB River, MN/SD Border to N Fork YB River	ND	None	61%	75%[1]	43%	None[1]	None[1]
07020001-525	YB River, North Fork YB River to Minnesota River	None	None	44%	None	None	None	None[1]

Notes: [1]= Less than 5 data points for monthly geometric mean ND =No Data

2.5.2 Turbidity Measurable Water Quality Goals

The turbidity standard found in Minn. R. 7050.0222 subpart 4 for 2B water is 25 nephalometric turbidity units (NTUs). The water body is added to the impaired waters list when greater than ten percent of the data points collected within the previous 10 year period exceed the 25 NTU standard (or equivalent values for total suspended solids or transparency tube data). Table 7 shows the estimated percent reduction of turbidity to achieve the standard in each reach.

Table 7: Estimated percent reduction needed for turbidity to achieve the standard by reach.

AUID	Reach Description	Total Number of samples (N)	90th Percentile NTU Value	Approximate % Reduction to Meet 25 NTU Standard
07020003-521	Florida Creek- SD border to W. Br. Lac qui Parle River	35	60	58%
07020003-508	Lazarus Creek – Canby Cr. to Lac qui Parle River	41	34	26%
07020003-516	W. Branch Lac qui Parle River – Lost Cr. to Florida Cr.	43	26	4%
07020003-505	Lac qui Parle River- Headwaters to Lazarus Cr.	78	85	71%
07020003-506	Lac qui Parle River – Lazarus Cr. to W. Br. Lac qui Parle River	78	54	54%
07020003-501	Lac qui Parle River – W. Branch to Ten Mile Cr.	87	72	65%
07020001-525	Yellow Bank River – North Fork Yellow Bank River to Minnesota River	134	62	60%

The reduction percentage is only intended as a rough approximation as it does not account for flow. It serves to provide a starting point using site specific water quality data for assessing the magnitude of the effort needed in the respective watersheds to achieve the standard.

2.5.3 Dissolved Oxygen Measurable Water Quality Goals

Based on its 2C classification, the 5 mg/L of DO is the daily minimum standard for the Lac qui Parle River from the confluence of West Branch Lac qui Parle River and South Branch Lac qui Parle River to Ten Mile Creek. This is the only reach within the study area that has so far been listed as impaired for low dissolved oxygen. With revisions to the assessment guidance manual for 2010, a stream is considered impaired if:

1. more than 10 percent of the "suitable" (i.e. taken before 9:00 a.m.) May through September measurements, or more than 10 percent of the total May through September measurements, or more than 10 percent of the October through April measurements violate the standard, and
2. there are at least three violations (MPCA 2009). In addition, there should be at least 20 independent observations.

The standard for dissolved oxygen given Minn. Rules pt. 7050.0220, subpart 5a, accommodates diurnal fluctuation. This TMDL requires Sediment Oxygen Demand (SOD) load reductions of 28 percent for the listed reach (Lac qui Parle River) and 67 percent for the 1.5 miles upstream of the impaired reach on West Branch Lac qui Parle River. SOD load reductions can be achieved by reducing sources of particulate organic matter, as well as reducing wetted perimeter as part of a channel form scenario.

According to Vermont Agency of Natural Resources Department of Environmental (2010), "Phosphorus entering our lakes and streams acts as a fertilizer, feeding plant and algae growth. In fact, one pound of phosphorus can produce up to 500 pounds of algae." Reductions in phosphorus are expected to reduce periphyton and associated detritus.

2.6 Wasteload and Load Allocations

2.6.1 Overview of TMDL Allocations

The total maximum daily loads are reported as Total Daily Loading Capacity. The Total Daily Loading Capacity was calculated across state boundaries and then divided into South Dakota and Minnesota portions. The Loading Capacity for Minnesota consists of three main components; a Margin of Safety (MOS), a wasteload allocation (WLA) for point sources, and a load allocation (LA) for nonpoint sources. The MOS is subtracted from the loading capacity first, next the WLA is subtracted, and finally, all of the remaining load capacity is generally assigned to the LA.

TMDL = ∑Wasteload Allocation (WLA; Point Sources)
+ ∑ Load Allocation (LA; nonpoint sources)
+ Margin of Safety (MOS)

The Total Daily Loading Capacity tables for each impaired reach can be found in the TMDL report on the internet at http://www.pca.state.mn.us/nwqh9b8.

3. Identification of Priority Management Areas

3.1 Fecal Coliform Bacteria Priority Management Areas

The TMDL report conclusions recommend prioritizing the upper reaches of the Lac qui Parle and Yellow Bank River systems in Minnesota (Fig. 2) as they appear to have the most frequent and severe exceedances of standards. Most exceedances occur during low to very low flows in the upper reaches. It is possible that addressing the exceedances in the upper reaches of the system may have a significant beneficial effect on addressing exceedances in the lower reaches of the same system. The upper most reach of the Lac qui Parle River (Headwaters to Lazarus Creek) and the listed reach of Lazarus Creek are especially prone to exceedances for bacteria. The North and South Forks of the Yellow Bank will also be a priority area.

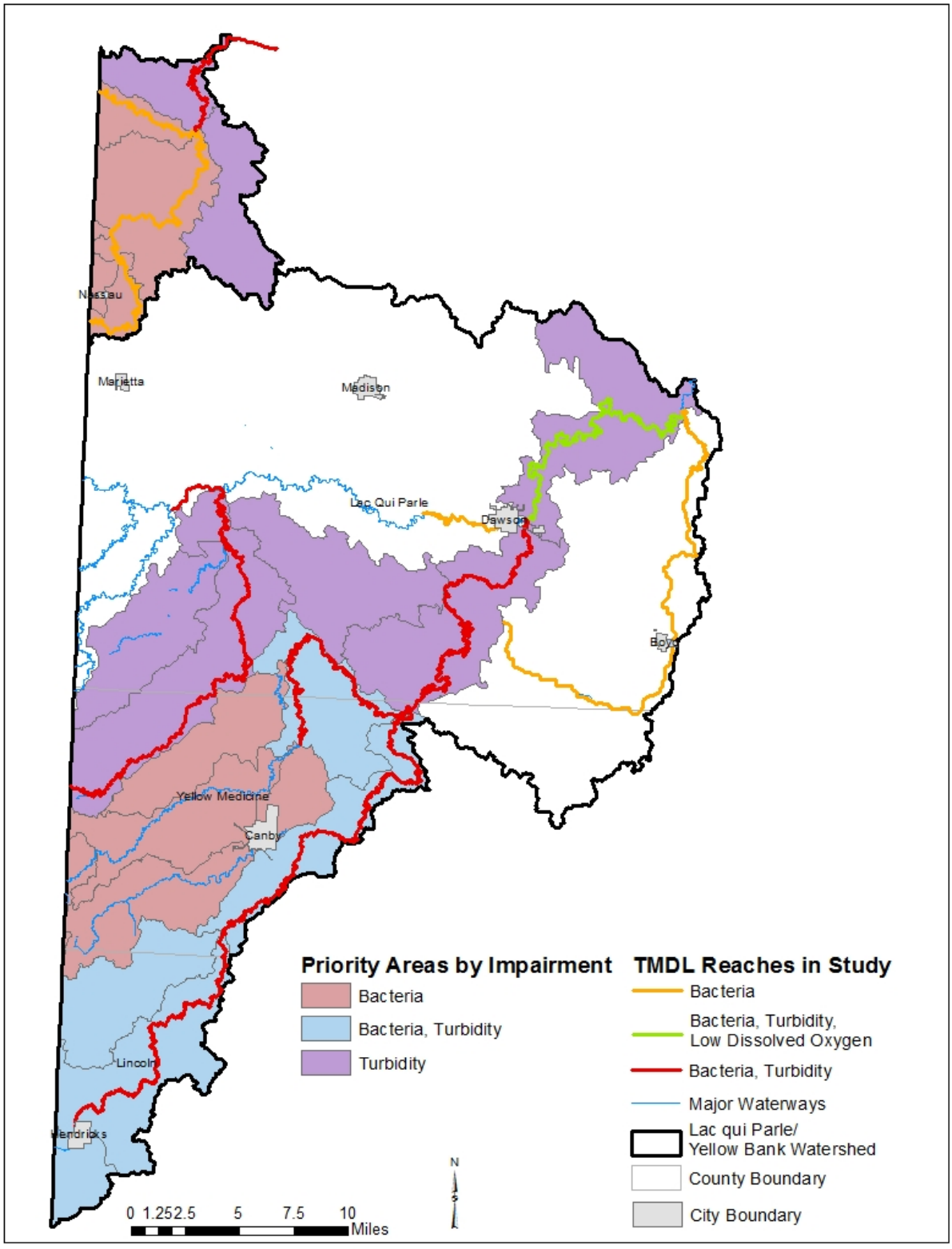
3.2 Turbidity Priority Management Areas

The TMDL report conclusions recommend prioritizing the reaches of the Lac qui Parle River from the Headwaters to Lazarus Creek, from Lazarus Creek to West Branch Lac qui Parle River and from West Branch to Ten Mile Creek and Florida Creek from the headwaters to West Branch Lac qui Parle River (Fig. 2). The Yellow Bank River reach is also a priority area.

3.3 Dissolved Oxygen Priority Management Area

The TMDL report did not establish a clear cause and effect relationship between sources and the DO impairment. However, focusing on the priority areas to reduce bacteria and total suspended solids is expected to have a beneficial effect on the low dissolved oxygen impairment.

Figure 2: Priority Areas in Lac qui Parle and Yellow Bank Watersheds



3.4 Local Water Plan Priorities

Each of three counties with in the watershed and the Lac Qui Parle Yellow Watershed District have existing local water plans in place that have been approved by the BWSR and adopted locally. In particular, the three County water plans will be updated in the near future and it is anticipated that the priorities and actions prescribed in the TMDL implementation plan will be incorporated into the development of those county plans. Below are existing priorities in these local plans that tie back to the TMDL report that has been developed for this watershed:

Lac qui Parle-Yellow Bank Watershed Management Plan, 2009-2019, has four overlapping goals. Goal 1 is to protect and enhance surface water quality by reducing sediment loading to water bodies with incentives for vegetative buffer/filter strips, residue management practices, water and sediment control basins and other in field constructed practices, drainage water management, streambank management, and grade stabilization at side inlets. This includes working with local agencies and municipalities to address stormwater discharge and management of public drainage systems. Reducing priority pollutants within the watershed will be completed with a county feedlot inventory, and incentives for livestock waste management and manure management plans. Goal 3 is to ensure an adequate supply of surface and groundwater for drinking water, agriculture, and commercial use by working with East Dakota Water Development District/State of South Dakota to reduce flooding in the headwaters of tributaries flowing into the District, reconstruct and repair dams and other water control structures, and restore wetlands. Work with Area II to implement road retentions projects and larger retention projects to increase water retention, reduce peak flows and thus reduce sediment in priority areas. Goal 5 is to ensure protection of unique water and natural resources by maintaining wildlife habitat. Goal 6 is to provide efficient and effective administration and maintain a public relations program.

The Lac qui Parle County Water Plan, 2003 – 2013, was being updated as this plan was written. The Lac qui Parle County Water Plan has three priority issues that are overlapping. The first priority issue includes water management to protect and improve water quality and quantity through water management. This includes increased water retention in headwater areas of tributaries with promotion of best management practices (BMP) such as retention dams, drainage water management, wetland restorations, and alternative tile intakes. The second priority issue is reducing priority pollutants that will restore, protect and maintain water quality, biodiversity and natural beauty of Lac qui County water resources with reducing impact of activities on surface water quality by conducting a feedlot inventory, assisting with manure management plans, increase SSTS being upgraded with loan programs. The third priority issue of erosion is to protect Lac qui Parle County soil resources by addressing sediment concerns by reducing turbidity and total suspended solids with incentives or cost share for grade stabilization at side inlets, buffer/filter strips, conservation tillage, converting cropland to grasses, rotational grazing, streambank management practices, and urban water runoff practices.

The Yellow Medicine Water County Plan, 2005 – 2014 with 2010 amendment, includes the following: Priority Issue 2 is erosion and sediment control to protect and improve surface and ground water quality by promoting BMP's in high priority areas with incentives and cost share for residue management,

water and sediment control basins, terraces and grass waterways, filter/buffer strips, convert cropland into existing programs such as Conservation Reserve Program (CRP) or Reinvest In Minnesota (RIM), rotational grazing, wetland restorations. Biodiversity in Yellow Medicine County will include promoting the Working Lands Initiative Program in Fortier Township, WRP program, using Light Detection and Ranging (LiDAR) to identify high priority and critical areas and other new technology as it becomes available. Priority Issue 3 is to reduce priority pollutants with nutrient and pesticide management, upgrading SSTS, assisting livestock producers with livestock management practices and manure management practices. Priority Issue 4 is surface water, drainage management and flooding by addressing runoff volume with wetland restorations, converting cropland in flood prone land into land retirement programs such CRP, RIM, and WRP, working with Area II and East Dakota Water Development District for large water storage opportunities, promote alternative tile intakes, and repair small dams/ponds, management of drainage systems to move water and for ecological benefits including grade stabilization at side inlets and water control structures.

The Lincoln County Water Plan, 2004 – 2014 with 2009 amendment, has two overlapping priorities. The first priority concern is erosion and sediment control on agricultural land primarily through gully erosion and concentrated flow in priority areas to preserve Lincoln County soil and water resources. This will be accomplished by implementing BMP's such terraces, water and sediment control basins, grass waterways, conservation tillage, and increase acres of filter/buffer strips, replacing open tile intakes, increase wildlife habitat, implement WRP/RIM program, and provide education to landowners on BMP's. The second priority concern of surface water runoff and drainage addresses runoff volume and water quality through drainage management that will apply watershed-based principles in managing drainage systems and wetlands and repair small dams in the county by working with Area II and Minnesota Department of Natural Resources (DNR) on road and bridge projects, enroll landowners in Continuous CRP for filter/buffer strips and educate landowners and operators on drainage programs and issues.

4. Nonpoint Source Management Measures Alternatives and Analysis

4.1 Evaluation of Management Practices

The following are potential practices for nonpoint source pollution that may help with one or more impairments as shown in Table 8. The information provided below is from *The Agricultural BMP Handbook for Minnesota*.

Vegetative Management Practices

Vegetative management practices include those focusing on the establishment and protection of crop and non-crop vegetation to minimize sediment mobilization from agricultural lands and decrease sediment transport to receiving waters. The recommended cropping practices are designed to slow the speed of runoff over bare soil and to capture sediment.

Riparian Buffers Strips: Riparian buffer strips includes the establishment of grasses and trees to minimize bacteria and sediment as it is being transported to designated public waters. Those interested

in riparian buffer strips will be encouraged to sign up through the Continuous CRP and priority areas will be offered a one-time incentive to make the practice cost effective for landowners. A harvestable buffer strip may be an alternative to Continuous CRP. This option would include the first cutting after July 15th, and a 6 inch growth left at the end of the growing season. Establish and restore permanent conservation easements on riparian buffers (minimum 50 feet) adjacent to public waters, excluding wetlands, to keep water on the land in order to decrease sediment, pollutant and nutrient transport, reduce hydrologic impacts to surface waters and increase infiltration. Buffers may be extended for wildlife habitat purposes (200 feet). Also frequently/occasionally flooded areas out to (350 feet) may be eligible for clean water floodplain areas. Sediment trapping efficiency ranges from 53 to 98 percent.

Filter Strips: Filter strips are an area of vegetation planted between fields and surface waters to reduce sediment, organics nutrients, pesticides, and other contaminants in runoff. Filter strips reduce runoff, sediments, and contaminants by settling of sediment, infiltration and filtration. The vegetation strips should be at least 16.5 feet along public drain ditches and at least 50 feet in shoreland areas adjacent to designated public waters. Upland contributing area and percent of slope should also be taken into consideration to control at least 50% of overland flow entering the filter strip. Pollutant load reductions for sediment are 76 to 91 percent, total phosphorus (TP) reductions of 38 to 96 percent and Total Nitrogen (TN) reduction of 27 percent. Proper identification of locations that provide the most benefit is a critical aspect. In 2015, a Geographical Information System (GIS) terrain analysis of the watershed will be completed by the University of Minnesota Water Resource Center to identify priority riparian areas. This analysis includes the use of LiDAR data, Stream Power Index, Critical Source Areas, Specific Areas, Compound Topographic Index, and Environmental Benefit Index.

Pasture Management: Pasture management involves proper use and treatment of pastures so that the life of desirable forage species is prolonged, and the quality and quantity of forage is increased. Improving the quality of forage on pastures protects soil and minimizes runoff. TP can be reduced by 67%, TN reduced by 66% and sediment by 59%.

Rotational Grazing: Rotational grazing is a management-intensive system of raising livestock on subdivided pastures called paddocks. Livestock are regularly rotated to fresh paddocks to prevent overgrazing and optimize grass growth. Grazing is started when forage is about 8 inches tall and stopped once it is grazed down to about 4 inches tall. In a Chippewa River Study, there was a 49% reduction in sediment, 62% reduction in TN and 7% reduction in TP.

Feedlot Runoff Reductions

MINNFARM is a tool used by County Feedlot Officers to calculate feedlot runoff and help determine reduction practices.

Manure Management Plans: Manure management plans will require producers to record and report actual application results. Manure management plans for facilities with 500 and more animal units will be kept on file with county Environmental Officers or MPCA. All feedlots, regardless of size are

encouraged to practice careful manure management and to have a manure management plan on file with the county Environmental Officer.

Livestock Waste Management: Livestock waste management refers primarily to storage facilities, but it also includes practices such as buffer strips and livestock exclusion fencing, where appropriate. The impact of feedlot runoff on surface waters is dependent on the feedlot size and location, although feedlot distance from surface water can contribute pollution if runoff becomes channelized and/or reaches a ditch or tile. In general, if a feedlot is large and close to a lake or stream, the impact is significant. If the feedlot is small and a long distance from a surface water body, the impact would most likely be minimal. The following practices were discussed:

- move fences/change lot area
- eliminate open tile intakes and/or feedlot runoff to the intake
- install clean water diversions and rain gutters
- maintain buffer areas
- construct a solids settling area(s)
- prevent manure accumulations
- manage feed storage
- manage watering devices
- total runoff control and storage
- roofs
- runoff containment with irrigation onto cropland/grassland
- vegetated infiltration area
- tile-drained vegetated infiltration area with secondary vegetated filter strip
- sunny day release on to vegetated infiltration area or filter strip
- feedlot relocation

These practices can achieve a 30% to 77% reduction of suspended solids and phosphorus.

Cropland Changes

Cropland changes include practices that increase/preserve residue, fertilizer management, and changes to current land uses.

Alternative Tile Inlets: Open tile inlets are believed to be a direct pathway for bacteria, sediment and nutrients to reach surface water. The open tile intake is replaced with either a rock inlet or a dense tile pattern that filters the water as it drains. Gravel/rock inlets have a trapping efficiency of 70-95% during temporary ponding and dense pattern tile sediment trapping efficiency approximately 100% in most soil types. In some cases, subsurface drainage is a management tool that reduces the potential for erosion and phosphorus enrichment of surface waters from agricultural activities.

Residue Management: Residue management is the practice of leaving last year's crop residue on the soil surface by limiting tillage. Tillage practices (conservation tillage) leave at least 30% of the soil surface covered with crop residue which is appropriate to attain sufficient residue management. Three

of the techniques used to meet the 30% residue coverage rate are No-till, mulch till and ridge till. Conservation tillage is effective for controlling soil erosion and helps control loss of nutrients that are attached to soil particles. Conservation tillage can reduce soil loss up to 90% when compared to conventional tillage although chemical loss reductions are likely lower.

Nutrient and Fertilizer Management: Nutrient management is a system used by farmers to manage the amount, form, placement, and timing of the application of nutrients (whether it is manure, commercial fertilizer, or other form of nutrients) to plants. The purpose is to supply plant nutrients for optimum forage and crop yields, to minimize nonpoint pollution source and contamination of groundwater, and to maintain and/or improve the condition of soil. The 4Rs of nutrient management are the Right Source, Right Rate, Right Time and Right Place for plan nutrient application.

Wetland Restoration: Wetland restoration or development can be achieved through use of small structures such as dikes to add water or regulate water levels in an existing wetland. Filling a surface drain or removing a subsurface drain is another technique used to restore wetlands. Wetlands are efficient sediment traps preventing soil particles and attached dissolved nutrients from runoff during the growing season and serve an important storage function in the watershed to help reduce peak streamflow. Water quality is enhanced in wetlands by the collection and filtration of sediment, nutrients, pesticides and bacteria in runoff or subsurface drainage. Downstream flooding may be reduced through storage of water, particularly frequent floods less than 10 year flood discharge. Wetland restorations will be encouraged to enroll in Reinvest In Minnesota (RIM), the Wetland Reserve Program (WRP) or Continuous CRP. In 2015, a GIS terrain analysis of the watershed will be completed by the University of Minnesota Water Resource Center to identify wetland areas. This analysis includes the use of LiDAR data, Stream Power Index, Critical Source Areas, Specific Areas, Compound Topographic Index, and Environmental Benefit Index. Natural Resources Research Institute (NRRI) in Duluth has also developed an online wetland prioritization tool focused on water quality and habitat improvements. The tool operates statewide using several integrated GIS layers including a new stressor algorithm layer and a statewide restorable wetland layer. This new online tool is intended to assist project managers in assessing regional to local scale watershed wetland restoration project prioritization needs. Prioritization outputs are generated using three primary data layers: a) Watershed stress; b) potential restoration viability; and c) watershed benefits.

Cover Crops/Perennial Crops on Critical Floodplain Acres: Cover Crops as a BMP refers to the use of grasses, legumes or forbs planted to provide seasonal soil cover on cropland when the soil would otherwise be bare. Cover crops commonly used are rye, oats, barley, and alfalfa. Water quality benefits come from three processes. The first is the physical cover the crop provides to the soil by reducing erosion from raindrop impact; second, cover crops have potential to take up nutrients that could be lost and third is increasing soil infiltration.

Structural Practices

Structural practices include practices that are designed and constructed to alter the flow of water in fields, gullies and in-stream. In 2015, a GIS terrain analysis of the watershed will be completed by the

University of Minnesota Water Resource Center to identify priority areas. This analysis includes the use of LiDAR data, Stream Power Index, Critical Source Areas, Specific Areas, Compound Topographic Index, and Environmental Benefit Index.

Drainage Water Management: Drainage water management is a practice used to control or manipulate the ground water elevation in a tile drained field. Drainage water management is similar to traditional tile drainage except that tile outflow is intercepted by a water control structure that effectively controls the elevation of the water table in a field. The structures are lowered in early spring and in the fall so that drainage is allowed before harvest. Drainage water management may be implemented as part of a new system or as part of a system retrofit. Water quality benefits attributed to drainage water management result primarily from reduction in water yield volume. Drainage water management may reduce subsurface drainage rates by as much as 15 to 50% compared to conventional drainage.

Water and Sediment Control Basins: Water and sediment control basins are earthen embankments constructed across the slope of a field or minor waterway to temporarily detain then release water through a piped outlet or infiltration. Drainage areas controlled by these structures should be less than 50 acres. In many cases, a series of basins are needed to properly control erosion and to be compatible with farm machinery. This practice is very effective at preventing gully erosion, trapping sediment, and reducing downstream peak flows. Sediment trapping efficiencies range from 97 to 99%.

Grassed Waterways: Grassed waterways are a natural or constructed channel, usually broad and shallow, that is planted with grass to protect soil from erosion from concentrated storm flow. Runoff water flows across the grass rather than eroding soil and forming a gully. Water quality is benefited by preventing gully erosion, filtering, and reducing peak discharges. Studies have shown approximate sediment reduction from 30 to 70% depending on length of grass waterway.

Terraces: A terrace is an earthen embankment that is constructed across a slope to level the slope, intercept runoff and reduce soil erosion. Terraces can be designed to channel excess water into grass waterways or direct it underground to drainage tile and a stable outlet. They are generally built in a series parallel to one another, with each terrace collecting excess water from the area above. Terraces are usually built in locations where gully erosion would form and can reshape the land to make it more farmable. Sediment can be reduced approximately 80 to 95 percent.

Diversions: A diversion is an earthen channel constructed across a slope to collect water and prevent damage to an area below. Diversions act much like a terrace, but their purpose is to direct or divert runoff water from an area. A diversion is often built at the base of a slope to divert runoff away from bottomlands. These structures may also be used to divert runoff from a feedlot or to collect and direct water to a pond. Sediment can be reduced 80 to 95 percent.

Grade Control Structure: A grade control structure includes pipe outlets or drop spillways to allow water to drop to a lower elevation while protecting the soil from gully erosion, scouring and head cutting in natural or artificial channels. While they are expensive to design and construct, grade control

structures can be a very necessary component of an overall drainage management plan. They are often used at the outlet of a grassed waterway to stabilize the waterway outlet. Sediment originating from unstable areas can be reduced by 75 to 90 percent with grade control structures, but they are only effective for localized erosion control.

Grade Stabilization at Side Inlets: Side inlet controls are used to convey water from a field to a drainage ditch. Side inlets serve as surface runoff outlets from agricultural land into drainage ditches and are very common wherever surface drainage ditches are present. Side inlet controls such as culverts and drop pipes can prevent gully erosion, control the rate of flow to ditches, and create sedimentation areas to improve water quality.

Grade Stabilization Structures: Grade stabilizations are used to retain and slow waters and lessen water force due to the extreme elevation drops, upwards of 80 feet per mile in this watershed. This will increase water retention and reduce peak flows thus sediment and streambank sloughing will be reduced.

Streambank Stabilization: Streambank stabilization refers to both biological and structural methods of stabilizing streambanks of rivers and streams. The goal is to prevent erosion at key areas and maintaining adequate flow. The following management practices will be considered and designed for specific sites:

- Rock Riprap can be effective if properly installed, but is usually expensive and can create another problem downstream.
- Bioengineering Practices use native plants and natural woody materials that provide an established root zone for bank strength and erosion resistance and are a viable and cost effective alternative to hard armoring practices.
- Hook Rock Veins or "J" hooks of rocks in the stream bed moves water away from the bank back to the center of the channel.
- Grade Control Structure: These structures involve pipe outlets or drop spillways and are used to allow water to drop to a lower elevation while protecting the soil from gully erosion or scouring. Sediment originating from unstable areas can be reduced by 75 to 90 percent with grade control structures, but they are only effective for localized erosion control.
- Any combinations of these practices may be used.

Riparian Streambank Management: Riparian streambank management improvements include both the stream channel and adjacent land. Streambank tree plantings will release nutrients as twigs and leaves decompose. Tree canopies also cool the water in the stream which can affect the composition of the fish species in the stream, which is a rater of biological reactions, and the amount of dissolved oxygen the water can hold.

Preserving the natural vegetation along stream corridors can effectively reduce water quality degradation associated with human disturbances. The root structure of the vegetation in a buffer enhances infiltration of runoff and subsequent trapping of non-point source pollutants.

Urban Stormwater Runoff

Retention Ponds: Install a retention pond for parking lot runoff and building runoff from commercial businesses and new urban development residential areas. This will allow the runoff water to filter out the sediment and contaminants before reaching the storm drains and entering into a watercourse. It also assists in slowing the water down, eliminating flooding problems.

Clean Up Pet Waste: Pet waste carries disease-causing bacteria. It should be thrown in the trash, flushed down the toilet, or buried.

Direct Downspouts to Lawns: Runoff from roofs that eliminate water also quickly carries pollutants into storm drains. When the water is directed onto a lawn, it irrigates the lawn and provides an opportunity for slowing the water down by soaking into the grass where a natural filtering process takes place.

Sweep Paved Areas to Keep Waste out of Storm Drains: Water in the form of runoff picks up contaminants from paved areas and carries them directly to surface water. By keeping paved areas free of litter and chemicals it is possible to eliminate some of the pollutant loading from runoff.

Leave Grass Clippings on the Lawn: Grass clippings left on the lawn are equal to one fertilizer application per year. When leaves or grass clippings are left on paved surfaces, they get washed into storm drains and are delivered directly to a water source. As they decay nutrients are released, which provide food for unwanted algal growth in rivers, streams, and lakes. Purchase products that are phosphorus free.

Wash Cars on the Lawn or at a Car Wash: To reduce the amount of runoff directly to a storm drain, wash the car on the lawn so the wastewater has an opportunity to slowly filter through soil and vegetation. Dirty water from a commercial car wash goes to a wastewater treatment plant where pollutants are removed.

Construction Site Erosion Control: Erosion control is important for public buildings as well as private buildings. Without erosion control measures, every acre under construction can deliver about a dump truck and a half of sediment into a nearby water source. Construction sites that are over an acre require a National Pollutant Discharge Elimination System (NPDES) permit and have to meet prescribed erosion control measures.

Rain Gardens: Rain gardens are a colorful, perennial planting designed to capture and use the rain water that may otherwise run through the storm sewer systems.

Rain Barrels: Rain Barrels are used to collect rainwater and stores it to be used later for watering lawns and gardens.

Community Cleanups Events and Education: Clean-ups focus on removing organic debris that collects in and around city boulevards, curbs, and storm sewer intake areas. Debris such as ground-up leaves, grass clippings, branches and dirt contain high levels of phosphorus and nitrogen, both nutrients that contribute to the impaired waters.

Other Actions Discussed

Level III Feedlot Inventory: A Level III Inventory of feedlots with the MINNFARM tool run for each feedlot in priority areas will be completed in 2014 by the Lac qui Parle County Environmental Office and Lac qui Parle SWCD. This inventory may result in additional action steps not included in the implementation plan.

Modeling Programs: Develop modeling programs such as the GIS terrain analysis to enhance selection and placement of BMPs for maximum effectiveness. In 2015, a GIS terrain analysis of the watershed will be completed by the University of Minnesota Water Resource Center to identify priority areas. This analysis includes the use of LiDAR data, Stream Power Index, Critical Source Areas, Specific Areas, Compound Topographic Index, and Environmental Benefit Index.

Bubblers or Aerators at Road Crossings: An aerator installed at crossroads to re-aerate the water as it flows downstream. The aeration would simulate the water flowing over a dam or riffle areas. Vandalism could be a concern in rural areas. This practice was discussed but dismissed for a lack of feasibility.

Work with South Dakota: This may not be a traditional management practice but is very important in the Lac qui Parle-Yellow Bank watershed. East Dakota Water Development District (EDWDD) and the Lac qui Parle-Yellow Bank Watershed District have partnered on previous projects and will continue and build on this partnership.

Monitoring to Pinpoint Sources of Impairment: The impaired streams should be intensively monitored for water quality and quantity for bacteria and sediment to further identify the specific sources of these pollutants.

Redesign of Open Ditches: Redesigning open ditches include investigating engineering designs that allow for proper water capacity as well as increasing water quality. One such practice includes a Two-Stage ditch currently being installed in other areas of the state.

Table 8: BMP practices discussed by parameter.

Practice	Bacteria	Turbidity	Low Dissolved Oxygen
Riparian Buffer Strips	X	X	X
Filter Strips	X	X	X
Pasture Management	X	X	X
Rotational Grazing	X	X	X
Manure Management Plans	X		X
Livestock Waste Management	X		X
Alternative Tile Inlets	X	X	X
Residue Management		X	X
Nutrient and Fertilizer Management		X	X
Wetland Restoration		X	X
Cover Crops/Perennial Crops on Critical Acres		X	X
Drainage Water Management		X	X
Water and Sediment Control Basins		X	X
Grassed Waterways		X	X
Terraces		X	X
Diversions		X	X
Grade Control Structure		X	
Grade Stabilization at Side Inlets		X	X
Grade Stabilization Structures		X	
Streambank Stabilization		X	X
Riparian Streambank Management		X	X
Retention Ponds		X	X
Clean Up Pet Waste	X		
Direct Downspouts to Lawns		X	X
Sweep Paved Areas		X	X
Limit Fertilizer and Pesticide Use/Leave Grass Clippings		X	X
Wash Cars on Lawn or at a Car Wash		X	X
Construction Site Erosion Control		X	X
Rain Gardens		X	X
Rain Barrels		X	X
Community Cleanup Events and Education		X	X
Level III Feedlot Inventory	X		X
Modeling Programs	X	X	X
Work with South Dakota	X	X	X

4.2 Selection of Management Practices

Since the impairments of bacteria, turbidity and low DO have several sources and some common delivery pathways, most of the implementation strategies above have multiple water quality benefits in terms of load reductions. The stakeholder group developed at the beginning of the TMDL study was utilized in the selection of management practices and development of the objectives located in Section 6. During the planning meetings, it was agreed that all practices should be done on a voluntary basis. All practices were supported as a whole, but the ones selected were determined to be the most practical and beneficial to the Lac qui Parle-Yellow Bank watershed. The practices were selected based on availability of funding sources, local technical assistance and local acceptance of the practices. The practices selected were individually voted on by stakeholders in attendance and ranked according to their personal preference of the individual practices and rated as a high priority or a low priority (Table 9 and 10). Table 11 summarizes the advantages and disadvantages to the highest ranked priority practices identified by the local stakeholder group.

Table 9: High Priority Management Practices Selected for Each Impairment.

Practice	Bacteria	Turbidity	Dissolved Oxygen
Riparian Buffer Strips	X	X	X
Filter Strips	X	X	X
Pasture Management	X	X	X
Manure Management Plans	X		X
Livestock Waste Management	X		X
Nutrient and Fertilizer Management			X
Wetland Restorations		X	X
Perennial Crops on Critical Areas		X	X
Drainage Water Management		X	
Water and Sediment Control Basins		X	
Grade Stabilization Structures		X	
Riparian Streambank Management		X	X
Urban Storm Water Runoff	X	X	X
Level III Feedlot Inventory	X		
Modeling Programs	X	X	X
Work with South Dakota	X	X	X

Table 10: Low Priority Management Practices Selected for Each Impairment.

Practice	Bacteria	Turbidity	Dissolved Oxygen
Alternative Tile Intake		X	
Residue Management		X	
Grass Waterways		X	
Terraces		X	
Grade Stabilization at Side Inlets		X	X
Monitoring	X	X	X
Redesign of Open Ditches		X	X

Table 11: Management Practices Selected to Address Non-Point Sources

High Priority		
Practice	**Advantage**	**Disadvantage**
Riparian Buffers Strips	The Continuous CRP program can enroll 30 to 120 feet for an average width of sensitive land and square up fields for easier farming.	The rental rates through CRP have not kept up with rates being paid by producers thus makes the program unacceptable to landowners. Landowners do not want to give up productive field acres. The Continuous CRP program requires a 30 foot minimum setback and many landowners feel less is needed to protect the rivers. The length of the contract makes landowners uneasy.
Filter Strips	Continuous CRP program can enroll 30 to 120 feet average width of sensitive land and square up fields for easier farming.	The rental rates through CRP have not kept up with rates being paid by producers thus makes the program unacceptable to landowners. Producers do not want to give up productive field acres. The Continuous CRP program requires a 30 foot minimum setback which many landowners feel less is needed to protect the rivers. The length of the contract can also be a concern.

High Priority		
Practice	**Advantage**	**Disadvantage**
Pasture Management	Effective for reducing bacteria from entering rivers.	Cost of fencing and an alternative water source in riparian pastures.
Manure Management Plans	Manure application would be valued more as a resource. This would enhance planning the application of manure and eliminate in areas that do not need it or that may have been over applied in the past.	More recordkeeping for landowners.
Livestock Waste Management	A variety of practices to control livestock waste runoff from feedlots and pastures of smaller size.	The smaller producer may not have resources available to implement the necessary practices.
Nutrient and Fertilizer Management	Nutrients have an effect upon algal and periphyton growth and subsequent death, decay, and development of SOD; as well as periphyton–developed diurnal swings in dissolved oxygen. Therefore, fertilization management is an important BMP component of the Dissolved Oxygen Implementation Plan.	Landowners do not like to be told what to do on their crop land, they worry crop yields will be reduced and it takes extra time to develop the plans.
Wetland Restorations	Increased surface water storage and wildlife enhancements.	Landowners do not want to give up land where they can produce a crop.
Cover Crops/Perennial Crops on Critical Areas	May provide alternative source of income while protecting the land and water. It can provide wildlife shelter and habitat.	Landowners do not want to lose productive lands.
Drainage Water Management	This practice can benefit water quality and crop production.	The control structures cannot be retrofitted to existing tiles lines in all cases. The unit is more labor intensive to landowner.
Water and Sediment Control Basins	The practice can be placed in fields to accommodate landowners' equipment. They effectively reduce gully erosion and trap sediment by slowing the water down.	Finding an adequate outlet for drainage. May get too steep for farming over or cost prohibitive.
Grade Stabilization Structures	Peak flows are reduced with the impounded water.	Streambanks will experience sustained flows for a longer period of time. These projects are very expensive and complicated to get approved.
Riparian Streambank Management	Practices work to generate energy in the water.	Practices are quite expensive to install.
Urban Storm Water Runoff	Raise awareness of storm drains and how they work (what goes down them) to residents in cities.	Limited space in city to place a holding pond. Cost of construction in reduced city budgets.
Level III Feedlot Inventory	Provide additional information on all feedlots and open lots as it requires an on-site visit.	Cost and time of a Level III inventory.

High Priority		
Practice	**Advantage**	**Disadvantage**
	The visit can also build relationships between county feedlots officers and landowners. This may allow a Feedlot Officer to share information on available programs.	
Modeling Programs	A tool to aide in targeting practices to provide the most benefit in water quality.	Cost of development of programs may be prohibitive. Extensive training maybe needed to use the programs after development.
Working with South Dakota	We currently work with South Dakota and will continue to do so in the future. There is an intensive water sampling program started in 2010 in the Yellow Bank River system. This will provide a better understanding of bacteria entering Minnesota.	The current differences in our water quality standards may hinder progress on reaching our water quality goals. There are also differences in EPA regional offices.
Low Priority		
These management practices were discussed but did not receive enough individual votes for high priority and thus have a lower priority. Alternative tile intakes, residue management, grass waterways, terraces, grade stabilization at side inlets, monitoring to pinpoint sources of impairment, and redesign of open ditches may be considered as options as deemed appropriate per individual case.		

5. Point Source Management Measures Alternatives and Analysis

5.1 Evaluation of Point Source Management Measures

The TMDL report evaluated the permitted point source discharge monitoring records (DMRs) for the past 10 years. The evaluation included industrial and municipal treatment facilities of interest, where they discharge their effluent, and recent information on the quality of their discharges.

5.1.1 Evaluation of Fecal Coliform Bacteria Point Source Management Measures

Subsurface Sewage Treatment Systems (Septic Systems): Septic systems are recognized as an acceptable means for treating wastewater. The system consists of a septic tank and drainfield. Effluent from a septic tank contains solids, phosphorus, nitrogen, chloride, bacteria, viruses, and organic chemicals. For this reason, it is illegal to discharge contents of a septic tank directly to a tile line or other surface water. Pollutants from a properly sited, installed, and maintained septic system will be adequately treated within three feet of unsaturated soil below the drainfield. Soil characteristics are important considerations in the design and installation of septic systems. A poorly functioning septic system is a threat to the water quality of nearby streams, lakes, and groundwater. Water use practices, product use and disposal, and routine maintenance are critical to prevent septic system failure.

Unsewered Communities: An unsewered community is a small community that does not have a waste water treatment facility, but has a concentration of noncompliant subsurface sewage treatment systems. There are five of these communities currently listed by MPCA.

Waste Water Treatment Facilities(WWTF): All permitted dischargers with bacteria discharge limits have limits set at 200 organisms/100 ml for fecal coliform, equivalent to the current *E. coli* standard of 126 cfu/100 ml. DMRs for the most recent 10 years show that exceedances of the discharge limits do occur. However, even where exceedances are shown for Canby and Dawson facilities, they are very infrequent. Compliance of each facility with their current NPDES permit will be sufficient to meet their allocations. Counties and MPCA staff will work with WWTF using MPCA enforcement programs to ensure continued compliance.

5.1.2 Evaluation of Turbidity Point Source Management Measures

All permitted dischargers have TSS discharge limits at or below the TSS surrogate value of 45 mg/L. DMRs for the past 10 years show that occasional exceedances of the discharge limits occur. However, only the discharges from the stabilization ponds serving Canby and to some extent Hendricks show somewhat frequent exceedances of the standard. Compliance of each facility with their current NPDES permit will be sufficient to meet their allocations. Counties and MPCA staff will work with Waste Water Treatment Facilities to ensure continued compliance. Construction and industrial stormwater activities are considered in compliance with provisions of the TMDL if they obtain permits under the NPDES program and properly select, install, and maintain all BMPs required under the permit; or meet local construction stormwater requirements if they are more restrictive than requirements of the State General Permits.

5.1.3 Evaluation of Dissolved Oxygen Point Source Management Measures

The wasteload allocation includes five sub-categories: treatment facilities requiring NPDES permits, livestock facilities requiring NPDES permits, noncompliant septic systems, NPDES permitted industrial stormwater and NPDES permitted construction stormwater. There is a negative population trend in the watershed thus no new treatment facilities requiring NPDES permits are anticipated. There are no entities in the project area subject to Municipal Separate Storm Sewer Systems (MS4) stormwater permit requirements. Construction and industrial stormwater activities are considered in compliance with provisions of the TMDL if they obtain permits under the NPDES program and properly select, install, and maintain all BMPs required under the permit; or meet local construction stormwater requirements if they are more restrictive than requirements of the State General Permits.

5.2 Selection of Point Source Management Measures

Compliance of each facility with their current NPDES permit will be sufficient to meet their allocations for fecal coliform and turbidity. Counties and MPCA staff will work with Waste Water Treatment Facilities to ensure continued compliance. Table 12 summarizes the advantages and disadvantages to the practices identified by the local stakeholder group.

Table 12: Management Practices Selected to Address Point Sources

Practice	Advantages	Disadvantages
Subsurface Sewage Treatment Systems	The loan program has been very well accepted and utilized by landowners. The stakeholder group felt this option be continued as long as it is available. Also available is a BMP loan program through the SWCDs. Upgrading non-compliant septic systems is the most practical and effective means of reducing fecal coliform bacteria from entering the rivers.	Cost to upgrade systems may deter the needed upgrades. There are concerns on rules changing for compliant septic systems in a year or two after the investment is made especially with change of program managers. This can be a low priority to homeowners if their system currently works and does not back up in their basement.
Unsewered Communities	Upgrading unsewered communities would upgrade a number of systems at one time.	The cost to upgrade systems may deter the community from upgrading their systems.

6. Identification and Summary of Implementation Objectives and Tasks

All practices in section 4.1 will be considered for funding, however, the practices detailed in section 4.2 will have higher priority for funding.

Objective 1. Implementation of Best Management Practices

Action 1. Subsurface Sewage Treatment System Upgrades

- Upgrade 150 non-conforming septic systems.
- Low interest loan programs through LqP-YB WD, Yellow Medicine County and Lincoln County and Ag BMP loan program through Lac qui Parle, Yellow Medicine and Lincoln SWCDs will be available to assist homeowners with system upgrades expenses.
- Technical assistance will be completed by Lac qui Parle, Yellow Medicine and Lincoln county zoning staff for review of design and installation, certification and keeping records.
    - Time Frame: 2013-2022
    - Person(s) Responsible: LqP-YB WD, Yellow Medicine (YM) Water Plan, Lincoln Environmental Office, County SWCDs and zoning, homeowners
    - Total Cost: $1,800,000.00
        - Loan Programs: 150 systems X $12,000.00/system = $1,800,000.00

Action 2. Filter Strips/Riparian Buffer Strips

- Promote the installation of 200 acres per year of filter strips in the priority watersheds of LqP River - Headwaters to Lazarus Creek, Lazarus Creek, North and South Fork Yellow Bank River.
- Provide an incentive of $50.00 per acre, per year when enrolled in a conservation program. Incentive is for thirty feet along the water course.
- Provide an incentive of $75.00 per acre, per year for filter strips 31 feet to 120 feet maximum width.

- Provide an incentive of $50.00 per acre, per year for a harvestable buffer with a watershed contract with a minimum of 5 years and harvest after July 15th and a 6 inch growth left at the end of the growing season.
- Establish and restore permanent conservation easements on riparian buffers (minimum 50 feet) adjacent to public waters, excluding wetlands, to keep water on the land in order to decrease sediment, pollutant and nutrient transport, reduce hydrologic impacts to surface waters and increase infiltration. Buffers may be extended for wildlife habitat purposes (200 feet). Also frequently/occasionally flooded areas out to (350 feet) may be eligible for clean water floodplain areas.
- In-kind contributions will be landowner share of seed and planting estimated at $130.00 per acre.
    - Time Frame: 2013-2022
    - Person(s) Responsible: Lac qui Parle, YM and Lincoln Natural Resources Conservation Service (NRCS), SWCD, LqP-YB WD, landowners
    - Total Cost: $150,000.00
        - Incentives: 200 acres/year X $75.00/acre X 10 years = $150,000.00

Action 3: Livestock Waste Management

- Provide up to 75% cost share to implement runoff control practices on 10 feedlot sites.
- Provide Loan Program for landowner cost share.
- Provide technical assistance to each feedlot site that implements runoff control practices.
- In-kind contributions will be landowner share and technical assistance estimated at 10% to 25% of total project
    - Time Frame: 2015-2022
    - Person(s) Responsible: NRCS, SWCDs, Technical Service Provider, County Environmental Offices, LqP-YB WD, Landowners, Southwest Prairie Technical Service Area
    - Total Cost: $750,000.00
        - Cost Share: 10 sites X $75,000.00/site X 75% = $562,500.00
        - In-Kind: 10 sites X $75,000.00/site X 25% = $187,500.00

Action 4: Pasture Management

- Promote management practices on 15 pastures adjacent to impaired water courses.
- Provide producers with an incentive of $5.00 per foot for fencing, $20.00 per acre for rotational grazing plans (3 year max.), alternative water source for exclusion to rivers up to 75% cost share and $80 for interseeding pastures when the landowner has an Environmental Quality Incentive Program (EQIP) pasture management plan.
- In-kind costs are landowner share of installation costs.
    - Time Frame: 2015-2022
    - Person(s) Responsible: NRCS, LqP-YB WD, landowner,
    - Total Cost: $391,500.00

- Cost Share: 20 acres/pasture X 200 ft./acre X $5.00/ft X 15 pastures = $300,000.00

  $20.00/acre/year X 40 acres/pasture X 3 years X 15 pastures = $36,000.00

  15 pastures X $500.00 = $7,500.00

  $80.00/acre X 40 acres/pasture X 15 pastures = $48,000.00

Action 5: Manure Management Plans

- Assist in the development of 25 manure management plans
- Provide feedlot operators with animal units of 0-299 an incentive of $300.00 per year (up to 3 years) to develop and maintain a manure and nutrient management plan. Producers are required to work with a certified crop consultant, agronomist, UM staff or NRCS when developing the plan. The operator will be encouraged to continue to use the plan after the third year.
- In-kind costs are landowner time of application and reporting
  - Time Frame: 2015-2022
  - Person(s) Responsible: County Environmental Office, landowner, Technical Service Provider, NRCS
  - Total Cost: $30,000.00
    - Grants: 25 plans X $300/year/plan x 3 years = $22,500
    - Inkind: Landowners' time: $7,500

Action 6. Wetland Restorations

- Promote 10 wetland restorations through the WRP-RIM program.
- Provide an incentive of $450 to restore in-field wetlands.
- In-kind contributions will be landowner share of restoration.
  - Time Frame:2015-2022
  - Person(s) Responsible: LqP-YB WD, SWCDs, DNR, Landowner, US Fish and Wildlife Service
  - Total Cost: $4,500.00
    - 10 restorations X $450.00 = $4,500.00

Action 7. Cover/Perennial Crops on Floodplains

- Promote the establishment of cover/perennial crops on floodplains adjacent to impaired water courses. They can include grasses, trees and shrubs.
- Provide an incentive of $500 per acre per year (up to 3 years on 1,000 acres) to convert floodplain to perennial crop.
- Provide $100 annually per acre (1,000 acres) for cover crops in fall/winter seeding or sod cover (such as winter wheat) that may be harvested.
- In-kind contributions will be landowner share of seed and planting
  - Time Frame: 2015-2022

- Person(s) Responsible: LqP-YB WD, Landowners
- Total Cost: $2,500,000.00
  - Incentive: $500.00/acre/year X 1,000 acres X 3 years = $1,500,000.00
    $100/acre/year X 1,000 acres X 10 years = $1,000,000.00

Action 8. In Field Construction Practices

- Promote 200 erosion control management practices such as water and sediment basins, terraces, diversions, grass waterways, and grade stabilization at side inlets.
- Provide up to 75% cost share for practices. Encourage using other programs such EQIP, CRP, CSP and State Cost Share.
- In-kind contributions will be landowner expense of installation and maintenance.
  - Time Frame: 2013-2022
  - Person(s) Responsible: NRCS, SWCDs, LqP-YB WD
  - Total Cost: $3,500,000.00
    - Cost Share: Average cost share $13,125.00 x 200 practices = $2,625,000.00
    - Landowner: Average 25% share $4,375 X 200 practices = $875,000.00

Action 9. Grade Stabilization Structures

- Coordinate with Area II and East Dakota Water Development District to identify, build and implement one grade stabilization structure to reduce sediment transport and streambank sloughing.
- Coordinate efforts with Area II to implement 5 road retention technologies, which are small dams, to increase water retention and reduce peak flows to reduce sediment transport and streambank sloughing in priority areas.
- Coordinate with Area II to on small dams to reduce peak flows and increase water retention.
  - Time Frame: 2018-2022
  - Person(s) Responsible: LqP-YB WD, Area II, EDWDD, SWCD's, NRCS, Army Corp of Engineers, DNR, BWSR
  - Total Cost: $5,000,000.00
    - Minnesota Bonding: $3,750,000.00
    - Local Match: 25% share $1,250,000.00

Action 10. Drainage Water Management

- Promote and fund drainage management with 5 landowners focusing first in the watershed of the West Branch Lac qui Parle River.
- Provide an incentive of $25 per acre up to 200 acres per landowner for holding the water between spring planting and fall harvesting.
- Promote Moist Soil Management practices from DNR.
- Use on-site demonstrations for landowners to see how it works and encouraging other landowners to implement.
  - Time Frame: 2015-2019

- Person(s) Responsible: LqP-YB WD, NRCS, DNR, SWCDs, Landowners
- Total Cost: $25,000.00
    - Incentive: $25.00/acre X 200 acres X 5 Landowners = $25,000.00

Action 11: Riparian Streambank Management

- Identify 5 river reaches to use bioengineering practices, stream barbs or j-hooks.
- Provide 75% cost share for five river restorations.
    - Time Frame: 2015-2020
    - Person(s) Responsible: DNR, LqP-YB WD,
    - Total Cost: $120,000.00
        - Grant: 75% average cost share $18,000/practice x 5 practices = $90,000.00
        - In-kind: Local match of 25% average cost share $6,000/practice X 5 practices = $30,000.00

Action 12: Nutrient and Fertilizer Management

- Promote the development of 50 nutrient and fertilizer management plans.
- Provide incentive of $500 to producers participating in EQIP.
- In-kind costs include producers cost of implementing plan and recordkeeping estimated at $500 per plan.
- In-kind NRCS development and approval of plans
    - Time Frame: 2015-2022
    - Person(s) Responsible: NRCS, LqP-YB WD,
    - Total Cost: $70,000
        - Grant: Incentive of $500 per plan x 50 plans = $25,0000.00
        - In-kind: $45,000.00
            - Producers: $500/plan x 50 plans =$25,000.00
            - NRCS: 8 hours x 50 plans x $50 per hour=$20,000.00

Action 13: Replacement of Open Tile Intakes

- Replace 150 open tile intakes with an alternative of rock inlets or dense pattern tile within proximity of feedlots and fields with manure application
- Provide incentive of up to $400 not to exceed 75% cost share for replacement of open tile intakes.
- In-kind costs are landowner share of installation.
    - Time Frame: 2013-2018
    - Person(s) Responsible: LqP-YB WD, SWCDs
    - Total Cost: $75,000.00
        - Cost Share $400/intake X 150 intakes = $60,000.00
        - In-Kind: 25% landowner = $15,000.00

Objective 2. Provide Educational Opportunities that will address the bacteria, turbidity and dissolved oxygen impairments.

Action 1. Radio Programs

- Weekly radio program with conservation topics and programs discussed such as: Filter Strips, manure management plans for water quality, replacing sewer systems, wetland restorations, drainage management, ag wetland banking program, invasive aquatic species etc.
    - Time Frame: Annually April through October
    - Person(s) Responsible: LqP-YB WD, SWCD, NRCS, Environmental Office
    - Total Cost: $5,200.00
        - 26 weekly programs/year X 10 years X $20.00/program = $5,200.00

Action 2. Offer Manure Management Workshops

- Hold 5 manure management workshops for producers, area agronomists, and crop consultants.
    - Time Frame: Every other year starting in 2014
    - Person(s) Responsible: Environmental Office, University of Minnesota Extension, NRCS, SWCD's
    - Total Cost: $5,625.00
        - Grant: Direct Expenses (mailing, newspaper/radio ads, room rental, speakers) 5 meetings X $250.00 = $1,250.00
        - In-Kind: Office Staff Organizing Meetings (25 hours X $35.00)$875.00 X 5 meetings = $4,375.00

Action 3. Direct Mailing to Landowners

- To increase awareness of programs such as replacing sewer systems, filter strip estimates, and incentives offered for management practices once a year.
- Targeted mailing to small feedlot owners that address smaller solutions to runoff such as diverting water, clean winter housing, fencing away from water, seasonal manure application and proper pasture management.
- Provide education on winter manure spreading and stockpiling
- Rotate topics for letters every 2 to 3 years
    - Time Frame: 2013-2022
    - Person(s) Responsible: LqP-YB WD, SWCD's
    - Total Cost: $26,500.00
        - Direct Expenses: 3,000 letters X .65 postage, paper, envelopes X 10 years = $19,500.00
        - In-kind: Office Staff producing mailings 20 hours X $35.00 X 10 times = $7,000.00

Action 4. Level III Feedlot Inventory

- Complete a Level III Feedlot inventory of all livestock operations. Priority areas will be selected along bacteria impaired reaches.
- Prioritize feedlots as inventory is completed
    - Time Frame: 2013-2014
    - Person(s) Responsible: LqP, YM and Lincoln Environmental Offices
    - Total Cost: $60,000.00
        - Environmental Offices: $500.00/Feedlot x 120 Feedlots = $60,000.00

Action 5. Open Tile Intake Inventory

- Mail survey to landowners in priority areas requesting number and location of intakes and provide cost share for replacing intakes.
- Offer $10.00 incentive for returned form
    - Time Frame: 2016-2018
    - Person(s) Responsible: CWP
    - Total Cost: $40,000.00
        - Grant: $10.00/returned survey X $1.00 postage, paper, envelope, return postage, return envelope X 3,000 letters = $33,000.00
        - In-Kind: Administration $7,000.00

Action 6. Urban Storm Water Runoff

- Provide information to all communities in the watershed about pollutants entering water courses through storm drains.
- Educational brochures should be provided to residents in Dawson, Canby and Hendricks to help address urban storm water concerns. The brochures should help citizens understand how they can affect water and cover topics including cleaning up after pets, removing lawn clippings off paved streets, redirecting roof downspouts to lawn from pervious surfaces, sweeping paved areas to keep waste out of storm drains, reduce fertilizer and pesticide use, washing cars on lawn or at car wash, building a rain garden, and using construction site erosion control measures.
- These communities are in the priority management areas for reducing fecal coliform bacteria and sediment from reaching the river. Dawson is in the priority management area for increasing the amount of dissolved oxygen in the river.
- Marking storm drains will raise awareness of urban runoff-drains. Storm drains should be marked in Canby, Dawson and other communities as funds become available.
- Encourage communities to adopt a program to clean storm drains twice a year
    - Time Frame: 2013-2022 Spring and Fall
    - Person(s) Responsible: LqP-YB WD
    - Total Cost: $17,500.00
        - Grant: 2,500 colored brochures x $4.00/brochure = $10,000.00

Storm drain markers and supplies for all communities in the watersheds is $3,500.00.

- In-Kind: $200.00/program X 20 programs = $4,000.00

Action 7. Workshops

- Hold annual workshops providing information promoting water quality and BMPs to improve our natural resources. Topics should include new and innovative practices such as septic systems, drainage water management, and wetland restorations including wetland banking programs and other immerging topics.
  - Time Frame: 2013-2022
  - Person(s) Responsible: LqP-YB WD, SWCDs
  - Total Cost: $10,000.00
    - Grant: $500.00/workshop X 10 workshops = $5,000.00
    - In-Kind: $500.00/workshop X 10 workshops = $5,000.00

Action 8. Working with South Dakota

- Establish a Work Group to meet annually and as needed
- Utilize current group of East Dakota, South Dakota (SD) Department of Environment and Natural Resources, LqP-YB WD, Upper Minnesota WD, MPCA to develop ways to work jointly to address water quality and quantity concerns.
- To normalize water quality standards and classifications between states
- Encourage additional monitoring along MN/SD border
- Work cooperatively on stabilization/retention projects to address water quality/quantity concerns
- Hold Friendship watershed tours
  - Time Frame: 2013-2022
  - Person(s) Responsible: LqP-YB WD, Area II, EDWDD, County Commissioners
  - Total Cost: $47,500.00
    - Grant: 3 Friendship Tours x $2,500.00 = $7,500.00
    - In-Kind: 10 Partners X 8 hours/partner/year X $50.00/hour X 10 years = $40,000.00

Action 9. Social Media

- Develop a Facebook page, Twitter account or most accepted type of media to communicate with stakeholders electronically.
  - Time Frame: 2014-2022
  - Person(s) Responsible: LqP-YB WD
  - Total Cost: $5,400.00
    - In-Kind: 12 hours/year X $50/hour X 9 years = $5,400.00

Objective 3. Monitoring

Action 1. Effectiveness Monitoring

- Dissolved Oxygen/*E. Coli*/Total Suspended Solids/Total Phosphorus Samples
- Collect flow data at 12 sites for rating curves.
- Establish additional sites on MN/SD Border and continue the established monitoring sites.
- Conduct Annual Secchi Tube Surveys
    - Time Frame: 2013-2022
    - Person(s) Responsible: LqP-YB WD
    - Total Cost: $391,000.00
        - Grant: 12 Sites X $65.00 samples X 20 collections X 10 years = $156,000.00
        - Grant: Equipment- $10,000.00
        - Grant: 3 sites United States Geological Survey (USGS) flow sites X $7,500.00/site X 10 years = $225,000.00

Action 2. Citizen Monitoring Program

- Maintain and recruit additional Citizen Monitors to record precipitation and water clarity.
    - Time Frame: 2013-2022
    - Person(s) Responsible: LqP-YB WD, MPCA, Citizen Monitors
    - Total Cost: $20,700.00
        - Grant: $150/year X 10 years = $1,500.00
        - In-Kind: 20 monitors X $12.00/hour X 8 hours/year X 10 years = $19,200.00

Objective 4. Project Evaluation

Action 1. Lac qui Parle-Yellow Bank Watershed TEAM Meetings

- The LqP-YB TEAM will continue to review and evaluate project and program effectiveness through the adaptive management approach. It will be an ongoing process of evaluating and adjusting the strategies and activities to implement BMPs towards achieving the desired water quality goals of the TMDL.
- Review Grant applications, BMP cost share applications, educational workshops, and priority areas.
- Track and report BMP installation.
- In-kind will be staff and TEAM committee time.
    - Time frame: 2013-2022
    - Person(s) Responsible: LqP-YB WD, TEAM partners
    - Total Cost: $188,800.00
        - In-Kind: 12 Partners X $40.00/hour X 36 hours/year X 10 years = $172,800.00
        - In-Kind: 2 Staff X $40.00/hour X 20 hours/year X 10 years=16,000.00

Action 2. MPCA Watershed Load Study Monitoring and Major Watershed Study

- Use results from the MPCA Watershed Load Study Monitoring as one method of evaluation and direction of the project. This study collects water samples at the outlet of Yellow Bank River, Lac qui Parle River, West Branch Lac qui Parle River, and South Branch Lac qui Parle River on an annual basis.
- A major watershed study will start in this watershed in 2015 which will include intensive water quality monitoring including water chemistry and biological monitoring. The result of the monitoring effort is a Watershed Restoration and Protection Strategies (WRAPS).
- The LqP – YB River TMDL report and Implementation Plan will be reviewed as the WRAPS is developed.
    - Time Frame: 2013-2022 & 2015-2018
    - Person(s) Responsible: MPCA, LqP-YB WD, TEAM partners, BWSR

Objective 5. Administration

Action 1. Project Coordinator

- A fulltime project coordinator will direct projects activities, seek funding, administer grants and incentive programs. Funds are also needed for computer, telephone, office supplies, training and travel. This position will be in the Lac qui Parle County Courthouse. The position supervises project technician.
- In-kind for payroll, accounts payable, and other grant administration duties will be provided by the Lac qui Parle-Yellow Bank Watershed District.
    - Time Frame: 2013-2022
    - Person(s) Responsible: LqP-YB WD, LqP County
    - Total Cost: $650,000.00
        - Grant: $60,000.00/year X 10 years = $600,000.00
        - Grant: $5,000.00/year X 10 years (Office Supplies, telephone, postage etc.) = $50,000.00

Action 2. Project Technician

- Hire full time technician to collect water quality samples, contact landowners, assist with education workshops.
- Make producer contacts for the implementation of practices.
    - Time Frame: 2015-2020
    - Person(s) Responsible: LqP-YB WD
    - Total Cost: $450,000.00
        - Grant: $45,000.00/year X 10 years = $450,000.00

Action 3. Office and Equipment

- Office Space provided in LqP County Courthouse
- Janitorial Services, Storage Space, internet service, FAX, copier services.
    - Time Frame: 2013-2022
    - Person(s) Responsible: LqP County

- Total Cost: $180,000.00
  - In-Kind: $18,000.00/year X 10 years = $180,000.00

7. Roles and Responsibility of Project Partners

Area II Minnesota River Basin Projects, Inc

Area II will assist in the development of dams and road retentions and will work closely with South Dakota.

East Dakota Water Development District

East Dakota Water Development District (EDWDD) is our South Dakota neighboring watershed district. EDWDD provides in-kind by attending meetings and assisting with developing plans. They will be a key element of the MN/SD Working Group and stabilization/retention projects.

Lac qui Parle County

Lac qui Parle County provides office space, internet connections and paper supplies to assist with the development of work plans, watershed assessment, information and education, data analysis, implementation projects and assessment.

Lac qui Parle Environmental Office

The Lac qui Parle Environmental Office will organize manure management workshops, conduct Level III Feedlot Inventory and work with landowners on feedlot upgrades.

Lac qui Parle County Water Plan

The Lac qui Parle County Water Plan will assist with the development of work plans, information and education including tours and workshops. They are also a TEAM partner.

Lac qui Parle Soil and Water Conservation District

LqP SWCD will provide in-kind staff and equipment to make farmer contacts for BMP implementation, design and layout of BMPs and assist with the information and education program, and use of the SWCD vehicles. They are also a TEAM partner.

Lac qui Parle – Yellow Bank Watershed District

The Watershed District is the Project sponsor and representative. They will serve as the fiscal administrator and will hire the staff to support the project. The Watershed District assists with the development of the work plans, watershed assessment, information/education projects and activities, data analysis, administers the SSTS Loan program in Lac qui Parle county, provides fiscal management and administration. They are also a TEAM partner.

Lincoln County Environmental Office

The Lincoln County Environmental Office provides in-kind to assist with issues of zoning, conduct Level III feedlot inventory, feedlot upgrades, public drainage and administer the SSTS Loan program in Lincoln County.

Lincoln County Water Management Task Force

The Lincoln County Water Plan provides services for development of work plans, watershed assessment, and tours and workshops. They are also a TEAM partner.

Lincoln Soil and Water Conservation District

Lincoln SWCD will provide in-kind staff and equipment to make farmer contacts for BMP implementation, design and layout of BMPs and assist with the information and education program. They are also a TEAM partner.

Minnesota Board of Water and Soil Resources

Board of Water and Soil Resources (BWSR) is a state agency that provides funding for implementing BMPs. They also assist in evaluation with use of the eLINK program. They are also a TEAM partner.

Minnesota Department of Natural Resources – Waters

The Minnesota DNR –Waters assists with wetland restorations, watershed assessment, and developing plans. They are also a TEAM partner.

Minnesota Pollution Control Agency

The Minnesota Pollution Control Agency (MPCA) provides funding and oversight of the 2015-2019 WRAPS project, which also serves as evaluation for this implementation plan, as well as permitting, compliance, and enforcement activities for regulated facilities and activities. The MPCA also provide funding opportunities through the Clean Water Partnership program and the Federal 319 program. They are also a TEAM partner.

Natural Resources Conservation Service

The NRCS offices within the counties in the Lac qui Parle – Yellow Bank Watershed, along with the state NRCS office provide technical services for installation of Best Management Practices. They are also a TEAM partner.

Yellow Medicine County Water Management Task Force

The Yellow Medicine County provide in-kind services for development of work and administers SSTS loan program in Yellow Medicine County, and the development of plans. They are also a TEAM partner.

Yellow Medicine Soil and Water Conservation District

Yellow Medicine SWCD will provide in-kind staff and equipment to make farmer contacts for BMP implementation, design and layout of BMPs and assist with the information and education program. They are also a TEAM partner.

8. Milestone Schedule

Table 13: Milestone Schedule by Objectives and Actions

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Objective 1: Implementation of BMPs										
SSTS Upgrades	X	X	X	X	X	X	X	X	X	X
Filter Strips/Riparian Buffer Strips	X	X	X	X	X	X	X	X	X	X
Livestock Waste Management			X	X	X	X	X	X	X	X
Pasture Mgmt Plans			X	X	X	X	X	X	X	X
Manure Mgmt Plans			X	X	X	X	X	X	X	X
Wetland Restorations			X	X	X	X	X	X	X	X
Cover/Perennial Crops			X	X	X	X	X	X	X	X
In-Field Construction	X	X	X	X	X	X	X	X	X	X
Grade Stabilization Structures						X	X	X	X	X
Drainage Water Mgmt			X	X	X	X	X			
Streambank Management				X	X	X	X	X	X	X
Nutrient and Fertilizer Mgmt			X	X	X	X	X	X	X	X
Open Tile Intakes	X	X	X	X	X	X				
Objective 2:Education and Outreach										
Radio Programs	X	X	X	X	X	X	X	X	X	X
Manure Mgmt Class		X		X		X		X		X
Direct Mailings	X	X	X	X	X	X	X	X	X	X
Level III Feedlot Inv.	X	X								
Open Tile Intake Inv.				X	X	X				
Urban Storm Water Runoff	X	X	X	X	X	X	X	X	X	X
Workshops	X	X	X	X	X	X	X	X	X	X
SD Work Group	X	X	X	X	X	X	X	X	X	X
Social Media		X	X	X	X	X	X	X	X	X
Objective 3: Monitoring										
E.Coli/TSS Samples			X	X	X	X	X	X	X	X
Secchi Tube Survey	X	X	X	X	X	X	X	X	X	X
Citizen Monitors	X	X	X	X	X	X	X	X	X	X
Objective 4: Project Evaluation										
TEAM Meetings	X	X	X	X	X	X	X	X	X	X
MPCA Load Study	X	X	X	X	X	X	X	X	X	X
Major Watershed Study			X	X	X	X				
Objective 5: Administration										
Project Coordinator	X	X	X	X	X	X	X	X	X	X
Project Technician			X	X	X	X	X	X	X	X
Office/Supplies/Equip.	X	X	X	X	X	X	X	X	X	X

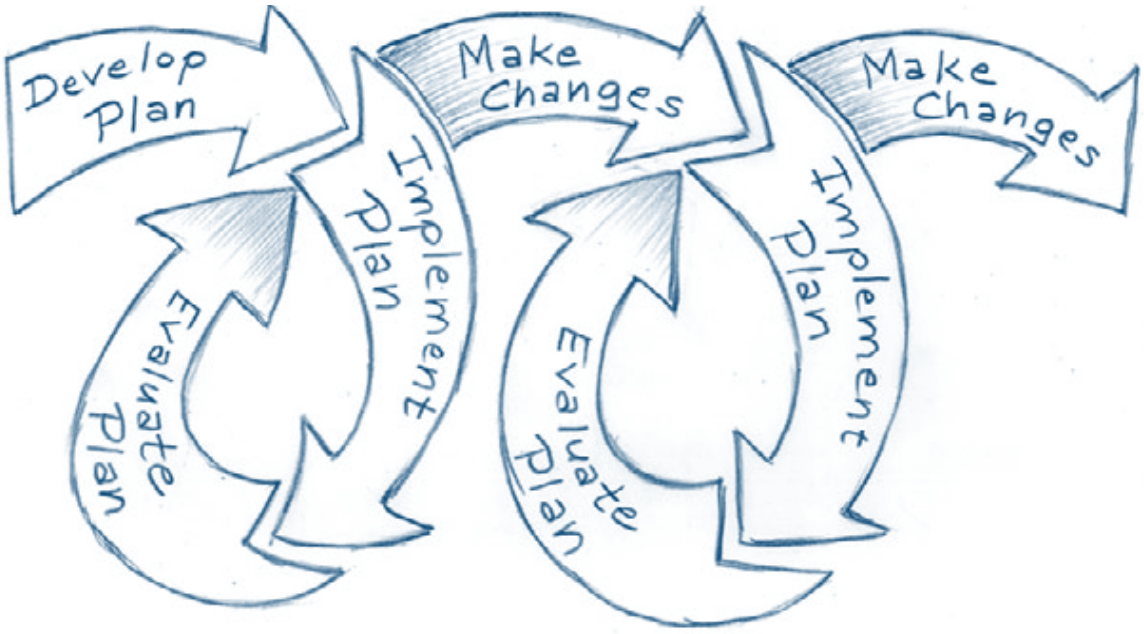
Table 14: Milestone Schedule by Impaired Reach

Reach	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Florida Creek MN/SD Border to W. Br. Lac qui Parle River 07020003-521	X	X	X	X	X	X	X	X	X	X
Lazarus Creek Canby Creek to Lac qui Parle River 07020003-508	X	X	X	X	X	X	X	X	X	X
W. Br. Lac qui Parle River Unnamed Creek to Unnamed Ditch 07020003-512					X	X	X	X	X	X
W. Br. Lac qui Parle River Lost Creek to Florida Creek 07020003-516					X	X	X	X	X	X
Lac qui Parle River Headwaters to Lazarus Creek 07020003-505	X	X	X	X	X	X	X	X	X	X
Lac qui Parle River Lazarus Creek to W. Br. Lac qui Parle River 07020003-506	X	X	X	X	X	X	X	X	X	X
Lac qui Parle River W. Br Lac qui Parle River to Ten Mile Creek 07020003-501	X	X	X	X	X	X	X	X	X	X
Ten Mile Creek Headwaters to Lac qui Parle River 07020003-511					X	X	X	X	X	X
N. Fk. Yellow Bank River MN/SD Border to Yellow Bank River 07020001-510	X	X	X	X	X	X	X	X	X	X
S. Fk. Yellow Bank River MN/SD Border to N. Fk. Yellow Bank River 07020001-526	X	X	X	X	X	X	X	X	X	X
Yellow Bank River N. Fk. Yellow Bank River to Minnesota River 07020001-525			X	X	X	X	X	X	X	X

9. Adaptive Management

Adaptive management will occur throughout the implementation phase as new water quality data and information becomes available. As figure 3 shows, it will be an ongoing process of evaluating and adjusting the strategies and activities to implement BMPs towards achieving the desired water quality goals of the TMDL. Changes in action, incentives or practices will be determined on monitoring and landowner response to programs. Intensive Watershed monitoring is scheduled to begin in 2015 with MPCA's Watershed Approach that is on a ten-year rotation. The TMDL report and Implementation Plan will be reviewed as the MPCA is conducting the Watershed Approach. The results of the intensive watershed monitoring will be used to evaluate the implementation plan. Adaptions to the implementation plan will be incorporated into the WRAPS document as a result of the Watershed Approach. Additional information can be found on the MPCA's website at http://www.pca.state.mn.us/irypf30.

Figure 3: Adaptive Management Process



10. Budget

Lac qui Parle-Yellow Bank Bacteria, Turbidity, Dissolved Oxygen TMDL						
Implementation Budget 2013-2022						
Objective 1 -Implementation of BMPs						
Cost Category	Unit Cost	Quantity	Cash/Grant	In-Kind	Loan	Total
SSTS Upgrades	$ 12,000.00	150			$ 1,800,000.00	$ 1,800,000.00
Filter strips/Riparian Buffer Strips	$ 75.00	2000	$ 150,000.00			$ 150,000.00
Livestok Waste Management	$ 75,000.00	10	$ 562,500.00	$ 187,500.00		$ 750,000.00
Pasture Management	$ 26,100.00	15	$ 391,500.00			$ 391,500.00
Manure Management Plans	$ 1,200.00	25	$ 22,500.00	$ 7,500.00		$ 30,000.00
Wetland Restorations	$ 450.00	10	$ 4,500.00			$ 4,500.00
Cover/Perennial Crops	$ 2,500.00	1000	$ 2,500,000.00			$ 2,500,000.00
In-Field Construction Practices	$ 17,500.00	200	$ 2,625,000.00	$ 875,000.00		$ 3,500,000.00
Grade Stabilization Structures	$ 5,000,000.00	1	$ 3,750,000.00	$ 1,250,000.00		$ 5,000,000.00
Drainage Water Management	$ 5,000.00	5	$ 25,000.00			$ 25,000.00
Riparian Streambank Mgmt	$ 24,000.00	5	$ 90,000.00	$ 30,000.00		$ 120,000.00
Nutrient/Fertilizer Mgmt	$ 1,400.00	50	$ 25,000.00	$ 45,000.00		$ 70,000.00
Replace Open Tile Intakes	$ 500.00	150	$ 60,000.00	$ 15,000.00		$ 75,000.00
Subtotal of OBJECTIVE 1			**$ 10,206,000.00**	**$ 2,410,000.00**	**$ 1,800,000.00**	**$ 14,416,000.00**
Objective 2 - Educational Opportunities						
Cost Category	Unit cost	Quantity	Cash/Grant	In-Kind	Loan	Total
Radio Programs	$ 20.00	260	$ 5,200.00			$ 5,200.00
Manure Mgmt Workshops	$ 1,125.00	5	$ 1,250.00	$ 4,375.00		$ 5,625.00
Direct Mail	$ 2,650.00	10	$ 19,500.00	$ 7,000.00		$ 26,500.00
Level III Feedlot Inv.	$ 500.00	120	$ 60,000.00			$ 60,000.00
Open Tile Intake Inv.	$ 40,000.00	1	$ 33,000.00	$ 7,000.00		$ 40,000.00
Urban Storm Water Runoff			$ 13,500.00	$ 4,000.00		$ 17,500.00
Workshops	$ 1,000.00	10	$ 5,000.00	$ 5,000.00		$ 10,000.00
SD Work Group			$ 7,500.00	$ 40,000.00		$ 47,500.00
Social Media	$ 50.00	108		$ 5,400.00		$ 5,400.00
Subtotal of Objective 2			**$ 144,950.00**	**$ 72,775.00**	**$ -**	**$ 217,725.00**
Objective 3 - Water Quality Monitoring						
Cost Category	Unit Cost	Quantity	Cash/Grant	In-Kind	Loan	Total
USGS & DNR Monitoring Station 7,500	$ 7,500.00	30	$ 225,000.00			$ 225,000.00
Equipment	$ 10,000.00	1	$ 10,000.00			$ 10,000.00
Sample Analysis & Rating Curve	$ 65.00	2400	$ 156,000.00			$ 156,000.00
Citizen Monitoring Network	$ 2,070.00	10	$ 1,500.00	$ 19,200.00		$ 20,700.00
Subtotal of Objective 3			**$ 392,500.00**	**$ 19,200.00**	**$ -**	**$ 411,700.00**
Objective 4 - Evaluation						
Cost Category	Unit Cost	Quantity	Cash	In-Kind	Loan	Total
Stakeholder/TEAM mtgs	$ 40.00	4320		$ 172,800.00		$ 172,800.00
Tracking & Reporting BMP Installation	$ 40.00	400		$ 16,000.00		$ 16,000.00
Subtotal of Objective 4			**$ -**	**$ 188,800.00**	**$ -**	**$ 188,800.00**
Objective 5 - Fiscal Management and Administration						
Cost Category	Unit Cost	Quantity	Cash	In-Kind	Loan	Total
Salary-Coordinator	$ 65,000.00	10 years	$ 650,000.00			$ 650,000.00
Salary-Technician	$ 45,000.00	10 years	$ 450,000.00			$ 450,000.00
Office/Equipment	$ 18,000.00	10 years		$ 180,000.00		$ 180,000.00
Subtotal Objective 5			**$ 1,100,000.00**	**$ 180,000.00**	**$ -**	**$ 1,280,000.00**
			Cash	In-Kind	Loan	Total
SUBTOTAL Objective 1: BMP Implementation			$ 10,206,000.00	$ 2,410,000.00	$ 1,800,000.00	$ 14,416,000.00
SUBTOTAL Objective 2: Educational Outreach			$ 144,950.00	$ 72,775.00	$ -	$ 217,725.00
SUBTOTAL Objective 3: Water Quality Monitoring			$ 392,500.00	$ 19,200.00	$ -	$ 411,700.00
SUBTOTAL Objective 4: Evaluation			$ -	$ 188,800.00	$ -	$ 188,800.00
SUBTOTAL Objective 5: Fiscal Management & Administration			$ 1,100,000.00	$ 180,000.00	$ -	$ 1,280,000.00
GRAND TOTAL			$ 11,843,450.00	$ 2,870,775.00	$ 1,800,000.00	$ 16,514,225.00

11. Acronyms

AUID	Assessment Unit ID
BMP	Best Management Practices
BOD	Biological Oxygen Demand
CBOD	Carbonaceous BOD
cfu	colony-forming unit
CRP	Conservation Reserve Program
CWP	Clean Water Partnership
DMR	Discharge Monitoring Reports
DNR	Minnesota Department of Natural Resources
DO	Dissolved oxygen
EDWDD	East Dakota Water Development District
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
GIS	Geographical Information System
LqP-YB WD	Lac qui Parle Yellow Bank Watershed District
LA	Load Allocation
LiDAR	Light Detection and Ranging
ml	milliliters
mg/L	milligrams per liter
MOS	Margin of Safety
MPCA	Minnesota Pollution Control Agency
MS4	Minnesota Separate Storm Sewer Systems
NBOD	Nitrogenous Biochemical Oxygen Demand
ND	No Data
NGP	Northern Glaciated Plains
NPDES	National Pollutant Discharge Elimination system
NRCS	Natural Resource Conservation Service
NRRI	Natural Resources Research Institute
NTU	Nephelometric Turbidity Units
RIM	Reinvest in Minnesota
RUSLE	Revised Universal Soil Loss Equation
SD	South Dakota
SOD	Sediment Oxygen Demand
SONAR	Statement of Need and Reasonableness
SWCD	Soil and Water Conservation District
TEAM	Together Everyone Achieves More-Partnering Agencies of CWP
TMDL	Total Maximum Daily Load
TN	`Total Nitrogen

TP	Total Phosphorus
TSS	Total Suspended Solids
USGS	United States Geological Survey
WLA	Wasteload Allocation
WRAPS	Watershed Restoration and Protection Strategies
WRP	Wetland Reserve Program
WWTF	Waste Water Treatment Facility
YM	Yellow Medicine

12. References

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