

**Clearwater River Dissolved Oxygen and Fecal Coliform TMDLs Project
Work Plan and Project Summary**

Project and Budget Period: December 30, 2006 – December 30, 2008

Project Amount: \$100,000

Project Funding Sources:

TMDL: \$100,000

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IMPAIRED REACHES

Reach	HUC Code	Impairment	Listed
Clearwater River; Ruffy Bk to Lost R	09020305-510	Low Oxygen	2002
Clearwater River; Ruffy Bk to Lost R	09020305-510	Fecal Coliform	2002
Lost River, Anderson Lake to Hill R	09020305-507	Fecal Coliform	2002
CD #57, Unnamed Ditch to Clearwater R	09020305-508	Low Oxygen	2002
Poplar River, Spring Lk to Hwy 59	09020305-518	Low Oxygen	2002
Silver Creek, Headwaters to Anderson Lk	09020305-527	Fecal Coliform	2006
Walker Brook, Walker Bk Lk to Clearwater R	09020305-509	Low Oxygen	2002

Project Summary

The Clearwater River Dissolved Oxygen and Fecal Coliform TMDLs Project is a watershed based water quality impairment study in the Red River Basin in Minnesota. Six of these reaches are located in the same area; the seventh segment is located at the upstream headwaters of the Clearwater River system and may be recommended for reclassification as not meeting water quality standards due to natural conditions.

This study will assess the impairment, define sources of pollution and where the impairment is verified, define current loads of pollutants, estimate total daily maximum load of pollutants and propose strategies to achieve the desired load.

The work will be coordinated by the Red Lake Watershed District, a local unit of government based in Thief River Falls, Minnesota. This is a two-year work plan for completion of seven impaired waters studies for the reaches listed above. Draft TMDLs for all seven reaches may not be required if the monitoring data collected as part of this project do not verify the impairment or if the MPCA's assessment and listing process delists or reclassifies one or more of the reaches. Any decision to not complete a draft TMDL is dependent on MPCA approval.

Project Background

The Watershed District has more than 20 years water quality monitoring. These impairments are based on the district's Clearwater River Clean Water Partnership Diagnostic Study of 1994. The district conducted both a diagnostic and an implementation phase in this study. The district is committed to achieving the goals and objectives recommended in the plan.

The six impaired reaches are located within the same geographic setting. Ruffy Brook and Silver Creek run parallel, although Ruffy Brook flows to the Clearwater and Silver Creek contributes to the headwaters of the Lost River. Clearwater River flows west and then south, to its confluence with the Lost River south of Plummer, Minnesota. CD 57 is a small ditch which enters the Clearwater two miles upstream of Plummer.

The Lost River flows almost due west from its headwaters to its confluence with the Clearwater River. The Poplar River flows northwest to the Lost River, west of its confluence with the Hill River.

Nearly 50 miles of the Clearwater River and part of the Lost River were channelized between 1948 and 1958 by the Corps of Engineers in several stages. That project improved the river's hydraulic efficiency, which benefits agricultural interests by reducing flood damages. This work provides the Clearwater River with a channel capacity adequate to handle approximately a 5-year runoff event and included channelization of a reach approximately 38 miles. The work extends upstream from approximately river mile 41 to river mile 78.8. However, the project caused headcutting and bank erosion that has progressed up Ruffy Brook, severely degrading aquatic and riparian habitats.

The Clearwater River in the project area was actively eroding prior to the project. Headcutting was occurring upstream of the USACE channelization project. The cause of this headcutting is not identified. Due to this straightening of the stream, the stream grade had increased in this area and channel banks were eroding around meanders. Channel erosion has increased the sediment supply to the river, and sandbars and sediment deposits were reported in the channelized portion downstream.

The Ruffy Brook Aquatic Ecosystem Restoration project was been planned by the USACE to fix some of the problems created by the channelization, but is awaiting availability of funds. Also, a stream bank stabilization and revitalization project was recently completed by the Red Lake Watershed District to stabilize the Clearwater River in the reach immediately upstream from the Corps channel project that was actively eroding degrading (downcutting).

Wild rice operations located along the Clearwater River between Clearwater Lake dam and the city of Plummer are impacting stream flows. Water withdrawal for wild rice production reduces stream flows each year as water is taken from the Clearwater River and used to flood rice fields. Appropriations for wild rice irrigation have the potential to reduce stream flow in Clearwater River by 57.5 cubic feet per second. Minnesota DNR has developed a water allocation plan for wild rice growers on the Clearwater River which resulted in a protected in-stream flow of 36 cfs at the USGS gage at Plummer. Median flow at Plummer is less than 200 cfs.

Scope of Work

The project sponsor will use the MPCA's protocols for dissolved oxygen and fecal coliform for impaired waters in defining and performing this work plan. The project sponsor will also consult Stressor Identification Guidance Document, published by the U.S. Environmental Protection Agency in December 2000 (EPA/822/B-00/025).

Project Organization

First step will be to convene a coordinating committee to advise the Watershed District on specific tasks for this project. This committee will include local, regional and state resource managers with appropriate expertise, and stakeholders who may be affected by the project. Stakeholders that will be solicited to participate on the committee include: riparian landowners including wild rice farmers; Red Lake Nation of Ojibway; the cities of Bagley, Clearbrook, Fosston, Gonvick and Plummer, Brooks, and Oklee, Clearwater, Polk and Pennington counties, MPCA, MDNR, US ACE, NRCS.

As with other impaired waters studies in the Red River Basin, after the committee is convened, the first task is to verify the impairments; and, if the impairment is verified, to:

- Assess conditions and define sources;
- Define current loads;
- Estimate desired loads;
- Suggest strategies to achieve loads.

If the impairment is not verified: recommend for delisting. Following is a summary of key tasks and responsibilities.

1. Verify the impairment

Impairment verification will be conducted by additional water quality monitoring, and where feasible, modeling and assessment. Red Lake Watershed District will deploy In Situ continuous monitoring sondes to verify the low oxygen impairments. Up to five additional continuous monitoring sondes will be purchased to complete the study in a timely manner. The coordinating committee will review monitoring and modeling findings and make recommendations to the Red Lake Watershed District about the impairment. A report on impairment will be prepared for each reach and will be presented to stakeholders and to the MPCA.

Continuous monitoring stations are recommended for the Clearwater River, one on CD57, and two on the Poplar (Poplar Lake outlet and Hwy 59) should be sufficient. Periodic spot testing at other sites would be added as needed, or sondes would be moved as needed.

Continuous monitoring for dissolved oxygen will identify the critical conditions for the low oxygen reaches, collecting early morning data at low flow and/or during warm conditions or during high sediment is very important. Using a sonde over a 24 hour period or many 24 hour periods will include early morning data. In considering low oxygen impaired reaches for delisting, lack of early morning data is usually the reason for not coming to a conclusion about

whether or not the reach is meeting standards. It is important to determine the daily minimums for oxygen in the reach. The monitoring should provide an unbiased representation of the relevant time period, whether that is critical conditions or some other time period.

The fecal coliform impairments will be verified through the analysis of the parameter *E. coli* according to the following specifications.

<u>Parameter</u>	<u>Sample Quantity</u>	<u>Sample Container</u>	<u>Preservative</u>	<u>Holding Time</u>	<u>Analytical Method</u>
<u><i>E. coli</i> Coliform</u>	<u>100 mL</u>	<u>Plastic</u>	<u>Ascorbic acid, Cool to 4°C</u>	<u>24 H*</u>	<u>EPA 9223B (Colilert Quanti-Tray)</u>

2. Define sources

Extensive information about conditions affecting water quality exists for the Red Lake Watershed District. A literature search and existing studies will be reviewed to identify potential pollution sources. The coordinating committee will review monitoring and modeling findings and make recommendations to the Red Lake Watershed District about the impairment. A report on sources will be prepared for each reach and will be presented to stakeholders and to the MPCA.

3. Estimate Loads and Define Desired Loads

The Red Lake Watershed District will use fecal coliform transport modeling to determine sources of that pollutant. When fecal coliform impairments are verified, then the source of the exceedance will be documented. The coordinating committee will review findings of load definition and make recommendations to the Red Lake Watershed District about the desired loads. A report on loads will be prepared for each reach and will be presented to stakeholders and to the MPCA.

4. Recommend Strategies to Achieve Desired Loads

For reaches with verified impairments, defined loads at polluting and compliant levels, strategies to achieve the desired load will be identified through the coordinating committee. The coordinating committee will review recommended strategies and make recommendations to the Red Lake Watershed District about the desired approach. A report on strategies to reduce load will be prepared for each reach and will be presented to stakeholders and to the MPCA.

Impairments

1. Clearwater River; Ruffy Bk to Lost R 09020305-510 Fecal coliform
2. Clearwater River; Ruffy Bk to Lost R 09020305-510 Low Oxygen

This 58-mile reach was listed in 2002. Hydrological modification, agricultural runoff, and urban stormwater runoff (from small cities) are likely contributors to this impairment.

The original landscape setting for this reach was wet prairie. This reach corresponds to the channelized portion of the Clearwater River. Resource managers believe that channelization has negatively affected water quality and biotic integrity. Addressing issues related to channelization (the river is seeking a new channel) is a priority for the Red Lake Watershed District; this is also part of proposed work with the USACE project.

The study area is in a rural setting in Clearwater County, 225 miles northwest of Minneapolis, Minnesota. Ruffy Brook, a tributary to the Clearwater River, joins the river about 1 mile from the upstream end of a 47.3-mile-long Clearwater River channelization project constructed by the Corps of Engineers in several stages from 1948 to 1958. That project improved the river's hydraulic efficiency, which benefits agricultural interests by reducing flood damages. However, the project has caused headcutting and bank erosion that has progressed up Ruffy Brook, severely degrading aquatic and riparian habitats.

Similar effects are occurring in the Clearwater River itself upstream of the project. The preliminary restoration plan (PRP) evaluated one potential solution – restoration of the brook's floodplain and riparian corridor by realigning a rice paddy dike that obstructs the brook's floodplain and installing a series of grade and bank stabilization structures. In addition, grade control structures would be placed in the river near its confluence with the brook. The feasibility study will consider additional, more comprehensive solutions, such as restoring a functional floodway along a significant reach of the Clearwater River by re-meandering the channel within setback levees.

The fecal coliform impairment must first be verified. The Red Lake Watershed District's 2005 assessment shows only one exceedance (occurring in 1995) out of 31 samples collected by the RLWD in the most recent 10 years. This reach likely remains on the list of impaired waters due to an insufficient number of samples from the critical months of June through August. Red Lake Watershed District started supplemental fecal coliform sampling in 2005 in an effort to meet MPCA data requirements. Through the MPCA's assessment and listing process, this reach has been proposed to be delisted for the 2008 Impaired Waters List.

Any occurrences of low dissolved oxygen on this reach would likely be due to low flows, high sediment concentrations, lack of riparian cover, hot weather, discharges from surface-drained wild rice paddies, or a combination thereof. This reach is one in which the impairment is questionable. The 2004 assessment notes state "consider delisting for dissolved oxygen." The original impairment is likely based upon two samples out of 19 collected for the Clearwater Nonpoint Study (10.5 percent). We have only had one occurrence of DO <5 mg/L since (4.52 on July 26, 2000). Red Lake Watershed District proposes deploying an In-Situ sonde. The critical months would be July, August, and September. There haven't been any dissolved oxygen exceedances lately.

DNR's 2005 stream survey describes this reach and associated water quality impacts (p. 24): This reach is a long, low gradient, channelized stream segment with low sinuosity that lies in the glacial lake plain. Stream buffers are narrow and consist primarily of grasses; very little wooded corridor exists. Adjacent lands are mostly used for agriculture including row crops, pasture and wild rice production. Major factors impacting this reach include: hydrologic alteration and

agricultural impacts. Agricultural impacts that originate in this reach are associated with wild rice production including, but not limited to: reduced stream flow from water withdrawal and reduced water quality from released paddy water. There are many lateral ditches (50 or more – close to one per mile on both sides of the river) entering the river in this section. Impacts of these connections include hydrologic alterations, stream channel destabilization and increased sedimentation.

2. CD #57; Unnamed Ditch to Clearwater R 09020305-508 Low Oxygen

This site is .37 miles long. This reach lies in the glacial lake plain and has a relatively flat gradient (especially compared to the next section downstream); it enters the Clearwater River near the end of its channelized reach. Stream buffers are generally wooded; there are areas with little or no effective buffer. Row cropping is prominent in lands adjacent to stream buffers. Major factors impacting this reach include: hydrologic alterations, and agricultural impacts. History of discharge issues with Plummer WWTP.

The impairment may be due to the fact that it is a ditch (no shade from a riparian cover, periods of low flow, warm temps, high sediment, etc.). The listing data is from the 1993-4 Clean Water Partnership project. The related sampling site is S002-730, located, above Plummer, where CD57 meets the Clearwater R at CD126, 2 mi NE of Plummer. Fourteen samples were taken over the two-year period (12 in 1992, twice in 1993). Three samples were less than the state standard for dissolved oxygen of 5 mg/L. Six samples of the 14 samples exceeded 200 colonies per 100 milliliters of water for fecal coliform bacteria.

DNR Fisheries, Bemidji, conducted a stream survey on the Red Lake River considering aquatic habitat suitability. A site near this confluence was rated “poor” for biotic integrity.

First step is a discussion about delisting; if we reject delisting, we may develop a new monitoring regime.

4. Poplar River; Spring Lk to Hwy 59 09020305-518 Low Oxygen

Most of the low DO levels recorded at the RLWD monitoring site on this reach of the Poplar River (downstream end) occurred during winter monitoring (low flow under ice). There was one occurrence in the month of September that could have been due to low flow, high temps, and possibly some soil-related oxygen depletion (as in the Walker Brook watershed). It seems as though there may be different conditions in the upper part of this reach (Spring Lake through Fosston - only 1 sample <5 mg/L) vs. the lower part. Operation and maintenance of wastewater treatment plants at Fosston and McIntosh may be of concern in this reach.

Field work was conducted in July 2006 to assess what dissolved oxygen levels are like in low-flow, high temp conditions in the Poplar River and the Clearwater River.

The Poplar River watershed was very interesting. It seems to be pretty complex. Oxygen levels vary throughout the watershed and seem to be influenced by local factors in some areas. The oxygen levels would go from good to very low and then back up to a good level from site to site.

These measurements were taken under some of the worst conditions possible for DO concentrations, so therefore, represent a decent snapshot of where problems exist and where low oxygen problems may not exist. The range of oxygen levels (where there was water) went from 0.5 mg/L to 7.8 mg/L.

Oxygen levels at the outlets of both Poplar and Spring Lakes were within water quality standards. This suggests that the upper end of the impairment may end at Poplar Lake instead of Spring Lake; answering this question requires additional monitoring.

There is a fish passage problem, however, at the outlet of Spring Lake that may be negatively affecting aquatic life as much as low DO. There was a drop between the bottom of the culvert at the outlet and the water surface on the downstream end. The stream was PACKED with fish that are unable to get back into the lake.

The DO in the Poplar River dropped from 6.7 mg/L upstream of the Fosston lagoons to 1.71 mg/L downstream of the Fosston lagoon area. The oxygen increased, however, from upstream to downstream of the McIntosh WWTP area, probably due to increased flow. With the exception of only a couple of sites, though, nearly all of the reach from Poplar Lake to Hwy 59 (DO was >5 mg/L downstream of Hwy 59) did not meet the DO standard.

5. Silver Creek, Headwaters to Anderson Lk 09020305-527 Fecal Coliform

Silver Creek is a tributary to the Lost River. It rises in wetlands west of Bagley, flows north to Clearbrook, turns west just north of Gonvick where it empties into Anderson Lake, which is the headwaters to Lost River. It is about 15 miles long. This watershed is participating in a buffer study.

We will want to consider the contribution from Clear Brook. Some very high fecal coliform concentrations were found in samples collected during storm water study at the downstream end of the City of Clearbrook. One sample was too high to count, but was redone – 20,000 was final number.

Red Lake Watershed District, Red River Basin Commission, Clearwater SWCD and water plan coordinators are attempting to install riparian buffers along 75 percent of the subwatershed's surface waters. Also, at the completion of the Clearbrook Stormwater Study, plans will be in place for a stormwater retention pond within the City of Clearbrook. The success of these projects could influence the impaired waters project.

6. Lost River; Silver Cr to Hill R 09020305-507 Fecal Coliform

This impairment could be related to the fecal coliform impairment on Silver Creek or could have similar causes. Looking at data from the last ten years, it appears that there is no impairment (although there are exceedances). The impairment is obviously based upon 1992 data where there were a lot of very high fecal coliform concentrations. In the early 1990s, there were some comments from sampling visits to the monitoring site at the Oklee USGS gauge on the Lost River like "unknown influent from culvert", "appears to be sewer seepage from bank", "strong

H2S smell present", "gray discharge from culvert in City Park", and "flow along road ditch has grayish color." Any improvements made to address wastewater treatment needs in Oklee may have had a positive effect on water quality at this site (or may have just moved the discharge point downstream of the monitoring site).

A record of fecal coliform concentrations leaving Anderson Lake (the Lost River's confluence with Silver Creek – which also has a fecal coliform impairment) will be important determining possible sources of fecal coliform in this reach. If there aren't exceedances at the outlet of this lake, then the sources of the exceedances on the Lost River may be due to agriculture, urban wastewater and runoff, and wildlife along the listed reach.

7. Walker Brook – reclassification

The case for reclassification for the impaired reach of Walker Brook was presented to MPCA staff in April 2006. The reach remained on the draft 2008 Impaired Waters List as originally listed. A decision about how to move forward with addressing the impaired reach of Walker Brook is pending.

Sampling Sites

(Sites may change throughout the term of the work plan as conditions or knowledge change.)

Reach	Sampling Sites and Type	Number	Location/ Responsible Party
Clearwater River; Ruffy Bk to Lost R; (one lake and one discharger site on Ruffy Brook)	Stream	9 – soo2-121; soo3-174; soo2-916 (94 CWP);	Red Lake Band of Ojibwe (2); USGS (1); Red Lake WD
	USGS Discharge	1 - 050708000	@ Plummer
	Biological	2 -	Ruffy Brook confluence
	NPDES	2 – SOO2-917;	At Plummer
Lost River, Silver Creek to Hill R	Stream	6	
	Biological	1	
CD #57, Unnamed Ditch to Clearwater R;	Stream	1 – soo2-730	1992-3 CWP study; no current monitoring (?)
Poplar River, Spring Lk to Lost R (Hwy 59 enters the Clearwater downstream of Lost River confluence)	Stream	SOO2-117	RLWD
	USGS Discharge	NO	
	Biological	93 RD 424 – 05RD003	Old and recent
	NPDES	NO	
Silver Creek, Headwaters to Anderson Lk (headwaters to Lost River)	Stream	6 – SOO-713; SOO-712; SOO-710; SOO-750; SOO-708	
	USGS Discharge	05078180	@ Clearbrook
	Biological	NO	
	NPDES	MN0020541-SD-3	Gonvick
Walker Brook (previously listed, recommended for reclassification in 2006, pending)	See reclassification document		

Project Products

This project requests \$100,000 to be used to pay activities associated with this project in 2007 and 2008. Products from this project will be:

1. Water quality data analysis for each reach, verifying the determination of impairment. Assessment of water quality conditions for the impaired waters using data from STORET. Data has been collected by the Red Lake Watershed District, Minnesota Pollution Control Agency and River Watch. River Watch has monitored these sites for 10 years or more; this data will be helpful in answering the question of the data quality. This product will be produced by the staff of the Red Lake Watershed District. All water quality data collected as part of the project will be entered into EPA's STORET database. All monitoring stations will be established in STORET. Project staff will provide the information needed to establish monitoring stations in STORET, and will organize data in a spreadsheet so that it can be entered into STORET. They will work with MPCA project managers and data management staff to organize and submit the data in the appropriate manner. All lab work will be done by a lab certified for the parameter being measured
2. Report of water quality conditions, land uses, sources of pollution and assessment of ability to reduce pollution from each source. Define sources and amounts of pollutant entering the impaired reaches using the SWAT model. Work will be performed by the Energy & Environment Research Center at University of North Dakota, under contract to the Red Lake Watershed District. Products of this task will be:
 - a. Pollutant load estimates for each impaired reach.
 - b. Define total maximum daily load of each pollutants for each reach.
 - c. Best management practices scenarios for achieving water quality target.
3. Strategies to reduce pollution and restore water quality standard for each impaired reach. This work will be developed by team members working together and then reviewed at public meetings in the area. Products will be:
 - a. Definition of margin of safety and reasonable assurance for each impaired reach.
 - b. Report of strategies to restore water quality conditions, and assessment of likelihood to achieve goals.
4. Plan for implementation of the watershed-based pollutant reductions, to be developed by the RLWD with technical support from local governments and the monitoring network.
5. The district will complete a report for each of the seven impaired waters. For those reaches that have been determined to be impaired, the report will be a draft total maximum daily load study.

PROJECT SCHEDULE AND COSTS

TASK	LEAD	SCHEDULE	AMOUNT
Data analysis and interpretation (125 hours @ \$40/hour)	Red Lake Watershed District	1/07- 4/08	\$ 5,000
Estimate pollutant loads for the Clearwater River Watershed; define water quality target; Model pollutant reduction strategies; draft reports	EERC (under contract to RLWD per proposal to MPCA May 2006)	1/07– 8/30/08	\$50,000
Water quality monitoring (250 hours @ \$40/ hour)	Red Lake Watershed District	5/07-11/08	\$10, 000
Monitoring equipment - 5 Hobo Water Level Loggers, 5 Eureka Midge TDO Loggers, and associated installation and maintenance equipment	Equipment purchased by the MPCA in May 2007. MPCA owns the equipment.	1/07 – 5/07	\$10,000
Identify BMPs to reduce pollution and restore water quality standard for each impaired reach (250 hours @ \$40/hour)	Red Lake Watershed District	10/07-2/08	\$10,000
Project outreach, coordination and draft TMDL reports (375 hours @ \$40/hour)	Red Lake Watershed District	12/07 - 12/08	\$15,000
TOTAL			\$100,000

Red Lake Watershed District’s staff will be responsible for all tasks over the project period, for a total of 1,500 hours.

References

Groshens, Thomas P. Red Lake River Watershed 2004: Red River Basin Stream Survey Report, 2005, MN Department of Natural Resources Division of Fish and Wildlife, NW Region, Bemidji, MN

Red Lake Watershed District Annual Report Thief River Falls, MN 2005