Lower Otter Tail River
TMDL Implementation Plan

February 14, 2007

Prepared by

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Wilkin County
And
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Wq-iw5-02c

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I. Executive Summary

The Otter Tail River is located in west-central Minnesota with the mouth of the river at Breckenridge, Minnesota. The confluence of the Otter Tail River and the Bois de Sioux River at Breckenridge is considered to be the headwaters of the Red River of the North. The Minnesota Pollution Control Agency (MPCA) has listed a stream reach in the Lower Otter Tail River (LOTR) as impaired for exceeding the turbidity standard for aquatic life, which is currently set at 25 Nephelometric Turbidity Units (NTU). The 2004 303(d) list identifies the impaired reach as the "Otter Tail River, Breckenridge Lake to Bois de Sioux River", Assessment Unit ID (AUID) 09020103-502. This 8.2 mile segment of the Otter Tail River is the last reach downstream before the confluence with the Bois de Sioux River and will be referred to as the Lower Otter Tail River (LOTR) in this report.

The LOTR sub-watershed contains approximately 52,000 acres. It is the smallest sub-watershed in the Otter Tail River basin. Land use in the LOTR sub-watershed is dominated by intensive agricultural cropping (90 percent). An extensive system of drainage ditches has been constructed in this area to promote rapid surface drainage.

The upstream and downstream boundaries for the LOTR are easily distinguishable and serve to provide a smaller watershed for implementation practices. The upstream boundary utilized for this report for the LOTR is the dam of Orwell Reservoir, a USACE flood control impoundment located just southwest of Fergus Falls, Minnesota on the Otter Tail River. The downstream boundary of the LOTR is the confluence of the Otter Tail River with the Bois de Sioux River at Breckenridge.
The samples used to list the LOTR for the turbidity impairment were collected from1992-1994. For this TMDL study, additional work that was done by the U.S. Geological Survey (USGS) from 2001-2003 confirmed the turbidity impairment in the river.

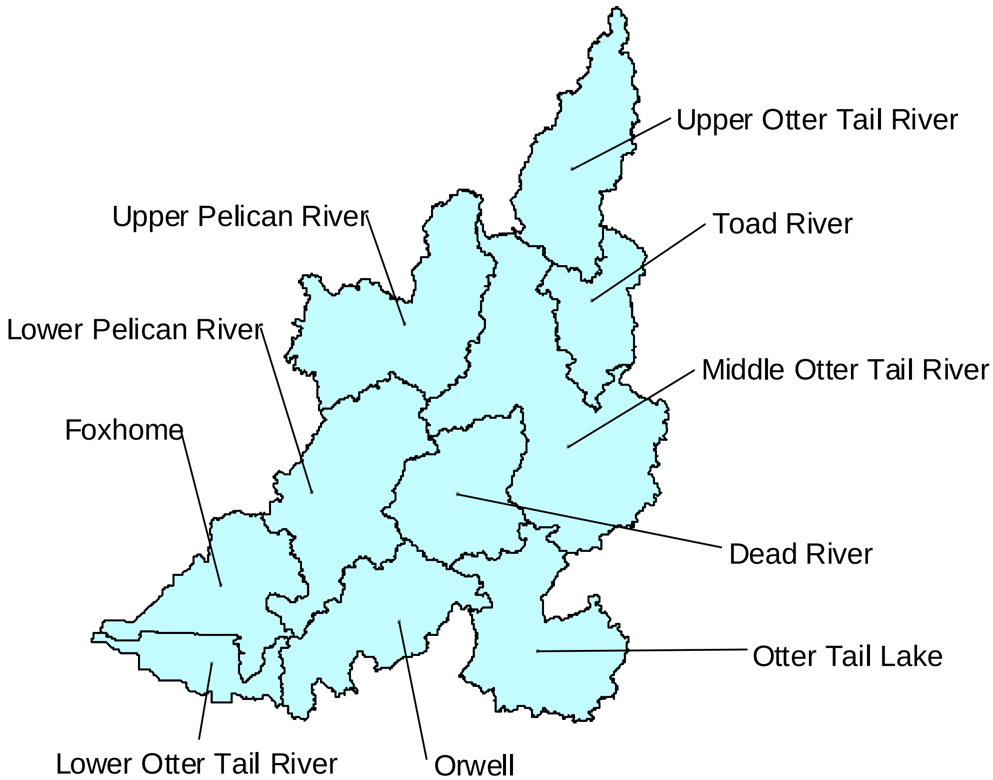
Turbidity is a dimensionless unit and cannot be converted into loads. To use the 25 NTU turbidity standards in a load allocation scenario, a relationship between turbidity and the suspended sediment concentration (SSC) was developed. Using paired turbidity and SSC measurements in the study area, along with regression analysis, a 58.9 mg/l SSC was used for the equivalent 25 NTU estimated measurement.

The USGS estimated that the annual sediment load was 40,400 tons at the sampling site in Breckenridge. Utilizing the flow and load duration curve information, this TMDL will be presented as a tiered solution. This means that there will be a goal for sediment reduction during high flow, a different goal for sediment reduction during moist conditions (sometimes referred to as moderate flows), and no reduction needed for flow conditions that are considered mid-range flows, dry conditions, or low flow.

Wilkin County and the Wilkin Soil and Water Conservation District (SWCD) have elected to implement activities to reduce erosion, sedimentation, and turbidity using a phased approach. Clean Water Legacy (CWL) Act funds will be used in conjunction with existing state and federal conservation programs to install conservation practices that reduce erosion, sediment, and turbidity. All of these programs will be targeted in

high priority areas of the watershed where they will have the most beneficial impact on the impaired reach of the LOTR itself. CWL activities will terminate June 2009 when the current Legacy Act Funding runs out. Other existing state and federal programs will be promoted on an on-going basis. Phase II of the implementation plan will run through 2017, after a re-evaluation of project activities and gains through the first Phase of the implementation plan is completed in 2010.

Figure # 1: The Otter Tail River Watershed



II. Problem Identification

Sediment is a significant water quality problem in the Red River Basin (RRB). Excessive sediment limits all the beneficial uses of streams in the RRB: agriculture, aquatic life, and drinking water supplies.

Suspended sediment is considered a pollutant and in excessive amounts can affect water quality and designated uses of water. Accelerated sedimentation can affect the growth and development of fisheries by reducing spawning areas and food sources, by adding fill in rearing ponds, and by reducing habitat complexity (bed forms). In addition to affecting aquatic life, accelerated sedimentation can result in aggradations, increase the stream channel width/depth ratio and cause bank erosion and failure. Sediment can adversely affect drinking water supplies by causing taste and odor problems, foul treatment systems, and fill reservoirs resulting in loss of storage capacity.

In 1994, the USGS analyzed instantaneous sediment-loading rates at four sites between the Orwell Dam in Otter Tail County and Breckenridge Lake. There are about 10 small tributaries to the LOTR in this reach. The USGS results showed that suspended sediment concentrations increased downstream of Orwell Dam and that most sediment was deposited during relatively high flow periods in June and July.

The LOTR is located in glacial lake bed, with glaciofluvial and morainal topography. Nearly all of the streams flow through glacial deposits or glacial lake-bed sedimentary deposits, and exhibit channel meanders, cut banks, and point bars, and often fairly turbid waters. The "Valley" portion is cultivated cropland, and soil erosion from cropland also contributes to the sediment load in streams. It is widely accepted that sediment sources in streams in such settings are comprised of sediment that originates both from eroded soil and from erosion of stream-bank sediments..

Suspended-sediment concentrations are often related to stream flow. Higher stream velocities, which correspond to higher stream flows, are potentially more erosive and can carry greater sediment loads than slower-moving water. Also, soil erosion contributes sediment to overland runoff, and higher stream flows result from overland runoff compared to base flow. Often, both stream flow and suspended-sediment data for a site are approximately log-normally distributed. Thus, log-transformed concentration and stream flow data are typically used in data analysis.

Often the sediment concentrations exhibit hysteresis with respect to stream flow. That is, the concentrations of sediment are higher during periods of rising stage and lower during periods of falling stage during a single runoff event. Colby *(1963)* notes that "Peak concentration of fine material early in the runoff is consistent with the idea that loose soil particles at the beginning of a storm will be eroded by the first directional runoff of an appreciable amount." (typically, water quality sampling in many Minnesota watershed projects involves a single sample in a runoff event so there isn't sufficient data to determine hysteretic effects).

Land use in the LOTR sub-watershed is dominated by intensive agricultural cropping (90 percent). The main crops grown in this area are spring wheat, soybeans, sugar beets, corn, barley and sunflowers. Areas of deciduous trees (three percent) and grasslands (two percent) are located near the river. However, less than five percent of the sub-watershed is enrolled in agriculture conservation programs. The remaining area is comprised of open water (two percent), wetlands (one percent) and urban and farmsteads (two percent).

The turbidity impairment appears to be directly correlated with the increased flows in the critical spring flow event (snow pack melt) and the more severe large storm events (rainfall resulting in stream flows greater than 544 cfs at Breckenridge). The project team theorized that the sediment load was influenced by wind erosion, lack of crop cover during storm events and overland flows.

III. Sources of Sediment and Turbidity

Project monitoring confirmed that the LOTR does not meet the state standard of 25 NTU for turbidity. Nearly two-thirds of the samples collected at the 11th Street Bridge in Breckenridge exceeded the water quality standard.

Water quality monitoring results were analyzed using a new model S_LOADEST, which emphasizes annual loading. Local resource managers reviewed land use and sources of erosion; sources of turbidity were hypothesized to be:

1. Wind erosion from adjacent cropped land.
2. Water erosion from adjacent cropped land.
3. Stream bank erosion from the channel.
4. Influence of the Breckenridge impoundment.

Because turbidity is a dimensionless unit it cannot be converted into loads. To use the 25 NTU turbidity standard in a load allocation scenario, a relationship between turbidity and the SSC was developed.

IV. Load Reduction Goal

It has been determined that a 17 percent reduction in annual sediment load is necessary to be in compliance with the 25 NTU state standard. This reduction goal is based on annual load estimates from S_LOADEST at site four plus a ten percent MOS, and 58.9 mg/L SSC as the equivalent to 25 NTU. To achieve a 17 percent reduction in annual loads, the load duration curve analysis can be used as a tool to identify the flow regimes that Best Management Practices (BMPs) need to target. The flow regimes that need to be targeted are moist conditions and high flows. For these two flow regimes, reductions in load need to occur during a rise in the hydrograph when bank and channel erosion and “first flush” events are most likely occurring.

V. Waste Load Allocation

No point sources for turbidity were found to be present for the LOTR, which includes the impaired reach from Breckenridge Lake to the confluence with the Bois de Sioux River in Breckenridge. There are no National Pollutant Discharge Elimination System (NPDES) permits issued for the river in this area. Therefore, the Waste Load Allocation (WLA) for this TMDL calculation is zero.

VI. Load Allocations

The turbidity impairment in the LOTR is a result of increased sediment loads during, or immediately after, high flows and large storm events. The excess sediment, causing the turbidity standard exceedence, is from fine grained sediments contributed from a variety of non-point sources. There are generally four ways that the sediment is being delivered to the river from the landscape:

- Wind erosion - this is a critical issue for this watershed, especially with what is deposited in the ditches in the winter and early spring and then runs off with the snowmelt or rain events.
- Sheet and Rill erosion - this is erosion caused by the larger or more intense storm events that are capable of carrying the sediment all the way from the flat landscape to the river in a single event or multiple events.
- Ditch and Gully-type erosion - this is the erosion at the confluence of the field ditches and the receiving tributary.
- Stream bank erosion - this is the erosion from the river channel itself that is associated with peak flows.

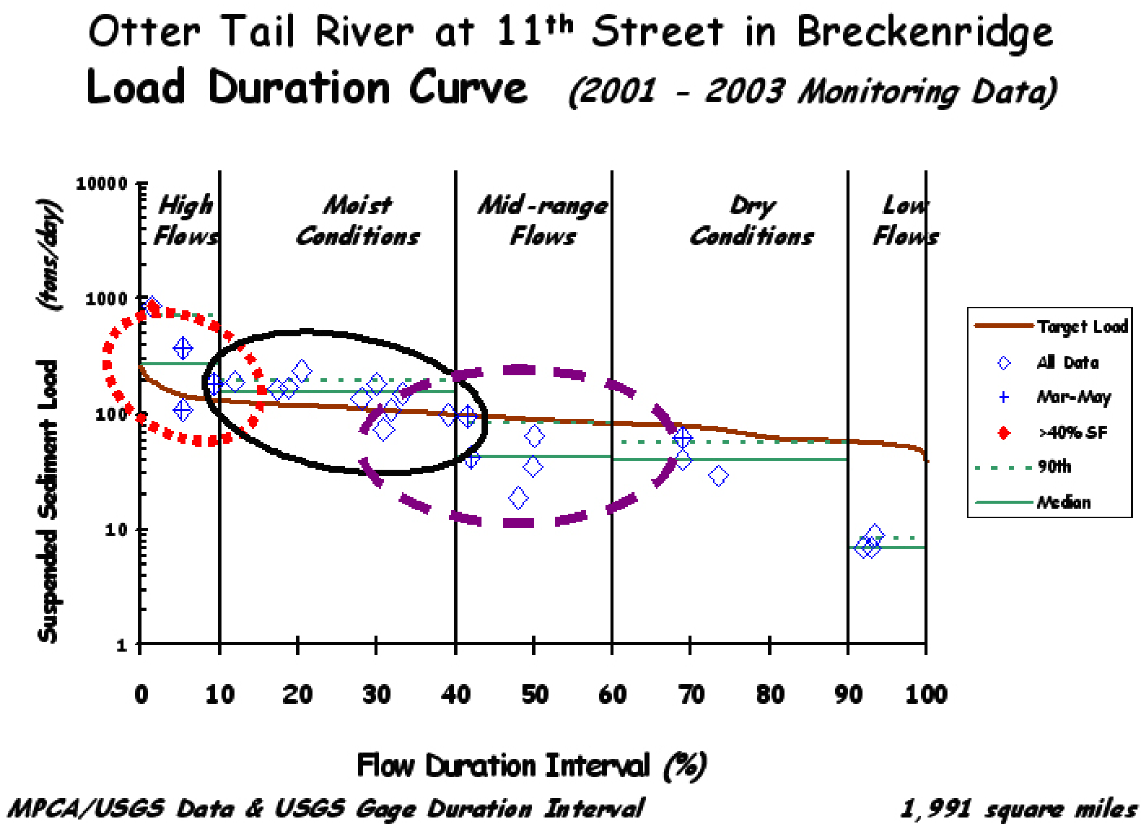
The USGS work estimates that a 17 percent annual reduction in sediment load is needed for the LOTR to meet the 25 NTU water quality standard for turbidity. The USGS work also found that sediment must be reduced 76 percent at the highest 10 percent of flows and 28 percent at flows from 10 to 40 percent of the highest in order to meet state water quality standards. Ultimately, this amounts to a goal of keeping at least 6,800 tons/year of sediment on the landscape that previously was being delivered into the river. These numbers are used merely for illustrative purposes to suggest potential annual reductions for the project area. The actual load reductions for the LOTR TMDL study were based on average daily load reduction.

Wilkin SWCD provided land use information for the sub-watersheds of the study area. Ninety percent of the sub-watershed's acreage is cultivated cropland. Fewer than two percent – 588 of the 47,283 acres in cropland – are enrolled in the Conservation Reserve Program (CRP), Continuous Conservation Reserve Program (CCRP), or Reinvest in Minnesota (RIM).

Therefore, local managers agreed that the preferred strategy to achieve the load reduction is to target management practices to reduce the loading during the more intense events. Measures need to be taken that prevent sediment carried by the wind from entering ditches and streams, and to dissipate the energy of precipitation during extreme storm events.

It is difficult to effectively model sediment loads from primarily non-point sources of impairment. This is due to ephemeral interactions in the stream, localized versus larger scale rain events, changing soil, vegetation, and geology, and a lack of a clear understanding of the re-suspension of bed materials at both normal and high flows. However, it is possible to group the potential sources by categories that will allow for smaller allocations, and will make it possible to set some goals and judge the effectiveness of implementation practices. Delivery/yield coefficients have been adjusted to reflect the conditions in the LOTR watershed considering the very flat topography and the very high percentage of row-crop agriculture (90 percent or more).

Figure # 2: Using the Load Duration Curve to Discuss Contributing Erosion Zones



VII. Implementation Schedule a "Phased Approach"

Mitigating the turbidity impairment for the LOTR will consist of two phases. Phase I will begin with the commencement of the Implementation Plan and run through June of 2009. The specific practices and anticipated load reductions discussed in this plan will be funded through a $480,000.00 grant made available through the CWL and leveraged with existing programs such as the USDA's Environmental Quality Incentive Program, the Conservation Reserve Program, the CRP, RIM, and other relevant Federal, State, and Local program funds that may be available. Technical assistance and resources for all activities will be provided by Wilkin County, NRCS, DNR, and SWCD staff.

It is estimated that a sediment reduction of 2,645 tons per year will be achieved during phase I. This constitutes approximately 39% of the overall goal.

Phase II on this implantation plan will commence in July of 2009 and run through the year 2017. The initial activities for Phase II will entail a detailed assessment of the success of the implementation activities employed during Phase I. This evaluation will include an examination of water quality data and sediment reduction effectiveness. The evaluation will lead to an "adaptive management" scenario where the goal and targets for the plan will be re-evaluated and adjusted to address current conditions or goals within the plan that may not have been effectively achieved during Phase I. Activities will also include an examination of new sources of funding and new technologies that may prove to be effective in further reducing erosion with the sub-watershed.

The initial steps in project implementation will focus on what is determined to be the major contributors to erosion, sedimentation, and turbidity within the watershed that will have the most immediate impact on the LOTR. Those projects that provide the most enduring benefits will be focused on initially, therefore, most of the funding received from the grant will be invested in structural measures. Remaining funding will support staff in marketing other non-structural practices such as tillage, buffers, and windbreaks. Those priority activities will include:

a. Stream jetties at critical location of the impaired reach of the LOTR as determined by DNR and SWCD staff to address stream bank issues.
b. The establishment of buffer strips along the LOTR.
c. The establishment of BMPs, such as sediment control structures on larger drains that discharge directly into the LOTR.

The remaining practices identified within this plan will be implemented during Phase I as opportunities present themselves to county and SWCD staff. A previously mentioned new implementation schedule will be developed upon completion of Phase I.

Phase I of the implementation project will include an interim assessment of project goals to be reported on a semi-annual basis. This will include a discussion of the achievement of various project milestones based on number of contacts initiated, contracts signed, projects initiated, a financial accounting of project dollar and cost share dollars spent, and an estimate of tons of erosion of sediment reduced per practice installed. Visual documentation of project activities will also be documented. The semi-annual report will also document problems encountered and any adjustments made in the project approach due to unanticipated circumstances.

The “adaptive management” approach will be utilized to provide a critical assessment tool for project managers to make adjustments in the remaining years of the project. The criteria used in doing so will include a report addressing the cumulative project accomplishment of Phase I of the project as reported in the semi-annual progress reports. Also, included will be a visual assessment of the individual practices and projects installed, observations in terms of sediment and erosion reduction, and observations or documentation of water quality improvements in the impaired reach. Other than general observations of water quality improvements, specific water quality data may be lacking at this time due to the time necessary for some of the agricultural best management practices to mature. At a minimum transparency tubes should be used where possible. It is anticipated that full scale water quality monitoring will begin in earnest during Phase II of the project.

Adaptive management for Phase II, will enable the local areas of concern that were not addressed in phase one because of program limitations, or new priorities that have arisen since the inception of the implementation plan. A new work plan for the remainder of the implementation program will be drafted after this re-assessment of project goal achievement.

VIII. Implementation Practices

Each of the conservation practices identified in this implementation plan were selected because they reduce erosion and sedimentation. The practices selected will reduce erosion sources as identified in the TMDL report (wind, water, stream bank etc). Another reason for their selection is because cost-sharing programs will be available to fund the installation of the practices

According to the TMDL report, higher sediment loading occurs during mid-range flows, moist conditions, and high flows. Based on this knowledge, conservation practices will target the river, county drainage ditches and areas within 1000 feet of the river,

Conservation practices that will be applied on or in the river include: stream barbs a.k.a. deflectors, and jetties.

Stream barbs are installed in areas where stream bank erosion is occurring. When installed the barbs re-direct the energy of the stream back into the channel, reducing further stream bank erosion.
Jetties will also be installed in areas where down cutting in the channel is a problem. The jetties will help to prevent further head-cutting in the stream. There are also plans to install several jetties in county ditches that outlet to the river.

Luther Aadlund, DNR has reviewed a few of the sites and is providing us with technical assistance. The Wilkin County Highway Department will coordinate installation. The SWCD office has surveyed two other sites where barbs and jetties are planned. NRCS is designing these projects this winter. At this time 8 land owners have expressed an interest in having barbs or jetties installed.

There are a few other areas where stream barbs and jetties are planned. In each of these cases, the landowner has contacted our office and expressed a desire to do something to rectify the problem.

Buffer strips will be established adjacent to the river and its tributaries. GIS will be utilized to determine how many miles of the Lower Otter Tail River need buffers. The installation of buffers will help to stabilize the banks and “filter” sediment and other contaminants. The Wilkin SWCD is currently developing a joint letter between the Wilkin County Board of Commissioners and the Wilkin SWCD Board, which will “strongly encourage” landowners to install buffers along all protected waters in the county before 2010, at which time shoreline ordinance enforcement will occur.

Side Inlet Structure will be installed in areas where field ditches outlet into larger ditches. In many instances, head cutting is occurring and gully heads are forming in adjacent cropland areas. The SWCD has used GPS and GIS to identify and locate problem areas in the project area and will assist the Wilkin County Highway Department and Environmental office to locate and install Side Inlet Structures. Funding for the structures will be paid for by CWL funds and by the ditch system.

Bio-Fiber Rolls will be installed at the outlet of small scraper ditches with small drainage areas. These rolls are very inexpensive. Their effectiveness will be evaluated in reducing sedimentation under those conditions. If their use is proven effective they may be installed in areas where it doesn't make sense to install a side inlet structure.

No-Till, Minimum Till and Field Windbreaks will help reduce field erosion. Programs are currently available to assist landowners in implementing such practices. The Wilkin SWCD will take advantage of the available funding to encourage more people to adopt these practices. The target goals identified in the implementation plan are based on annual averages.

Table # 1: Implementation Goals Through June 2009

Practice (A)
Goal: Establish 750 acres of no-till in the project area.

Practice (B)
Goal: Establish 2,250 acres of minimum tillage in the project area.

Practice C
Goal: Establish 15 miles of field and farmstead windbreaks in the project area.

Practice (D)
Goal: Establish 190 acres of buffer strips along 47 miles of the Otter Tail River and its tributaries.

Practice (E)
Goal: Install bio-fiber rolls in 10 field ditches to evaluate their effectiveness in controlling sedimentation.

Practice (F)
Goal: Establish 27 stream jetties to protect 3,200 feet of critically eroding stream banks.

Practice (G)
Goal: Install sediment control structures at the outlets of 4 county ditch systems to stabilize the outlets and reduce sediment transport to the Otter Tail River.

Practice (H)
Goal: Install 21 side inlet structures to prevent ephemeral/gully erosion and to reduce sediment transport to receiving drainage ditches

Activity (A)
Goal: Develop education brochures and fact sheets to explain impairment, practices, cost-share and incentives. Estimate that 4,000 brochures and or letters will be sent.

Table # 2: Estimated Annual Sediment Load to the LOTR from the LOTR Sub-watershed by Erosion Type

Source	Acres	Ton/acre/yr	Yield	Tons/year
Background				3,400 (a)
Sheet/Rill Erosion	47,283	1	10%	4,728 (b)
Wind Erosion (high)	7,605	18	2%	2,738 (c)
Wind Erosion (moderate)	39,678	8	1%	3,174 (d)
Ditch/Gully Erosion	4,980	4	25%	4,980 (e)
Stream bank			100%	15,620 (f)
Totals	99,5646	31		37,640

a – Estimate based on USGS monitoring of the Otter Tail River immediately downstream of Orwell Reservoir
b – Estimate based on Wilkin SWCD information and yield information from the Thief/Red Lake River Sedimentation Report
c – Estimate based on Wilkin SWCD information and yield information from the Thief/Red Lake River Sedimentation Report
d – Estimate based on Wilkin SWCD information and yield information from the Thief/Red Lake River Sedimentation Report
e – Estimate based on Wilkin SWCD information and yield information from the Thief/Red Lake River Sedimentation Report
f – Estimate based on information from the Thief/Red Lake River Sedimentation Report and the Wild Rice River Sediment Report (equal to the sum of sheet, wind, and gully)

Table # 3: Anticipated Soil Loss Reductions by Conservations Practices and BMPs Through June 2009

Practice (A)	Soil Loss Before	Soil Loss After	Soil Saved	Acres Treated	Tons Soil Saved	Practice Life	xYield %	xxtons/yr
No-till (wind)	8 tons/ac/yr	2 tons/ac/yr	6 tons	750	*4,500 tons/yr	1 yr	2%	90 tons
No-till (water)	2 tons/ac/yr	1 ton/ac/yr	1 ton	750	*750 tons/yr	1 yr	10%	75 tons
Practice (B)								
Minimum Till (wind)	8 tons/ac/yr	3 tons/ac/yr	5 tons	2,250	*11,250 tons/yr	1 yr	2%	225 tons
Minimum Till (water)	2 tons/ac/yr	1 ton/ac/yr	1 ton	2,250	*2,250 tons/yr	1 yr	10%	225 tons
Practice C								
Windbreaks	8 tons/ac/yr	2 tons/ac/yr	6 tons	730 acres	*4,380 tons/yr	40 yrs	2%	88 tons
Practice (D)								
Buffer Strips (wind)	8 tons/ac/yr	0 tons/ac/yr	8 tons	190	*1,520 tons/yr	10yrs - perm	2%	30 tons
Buffer Strips (water)	2 tons/ac/yr	0 ton/ac/yr	2 ton	190	*380 tons/yr	10yrs - perm	10%	38 tons
Practice (E)								
Bio-fiber rolls	3 tons	0 tons	3 tons	10 ditches	***30 tons/yr	1-3 yrs	10%	3 tons
Practice (F)								
Stream jetties								
(soil saved/jetty)			* 32 tons/yr	27 jetties	**865 tons/yr	25 yrs	100%	865 tons
Practice (G)								
seed control structures			300tons	4	***3,600 tons/yr	25 yrs	25%	900 tons
Practice (H)								
side inlets	5 tons	0 tons	* 21 tons/yr	20 structures	**420 tons/yr	25 yrs	25%	105 tons
(soil saved/structure)								
Total	44 ton/ac/yr	9 tons/ac/yr	3.5 tons		**26,350 tons/yr**			**2,645 tons/yr**

Notes: *estimates derived by-eLink pollution reduction estimator; **estimates provided by USDA NRCS engineer; ***best SWCD estimate; x estimated yield % delivered to Otter Tail R.; xxtons of soil kept out of the river based on yield % variables

Table # 4: Budgets Per Practice and Responsible Organizations Through June 2009

Practice (A)	year	acres/ft	incentive/acre	Total Incentives	Funding	Assist/ Planning	Who
No-till	2007	250 acres	$30	$7,500	USDA EQIP	$4,500	SWCD
No-till	2008	500 acres	$30	$15,000	USDA EQIP	$4,500	SWCD
No-till	2009	750 acres	$30	$22,500	USDA EQIP	$4,500	SWCD
Total		**750 acres**		**$45,000**		**$13,500**	

Practice (B)	year	acres/ft	incentive/acre	Total Incentive	Funding	Assist/Planning	Who
Minimum Tillage	2007	750 acres	$15	$11,250	USDA EQIP	$4,500	SWCD
Minimum Tillage	2008	1500 acres	$15	$22,500	USDA EQIP	$4,500	SWCD
Minimum Tillage	2009	2250 acres	$15	$33,750	USDA EQIP	$4,500	SWCD
Total		**2250acres**		**$67,500**		**$13,500**	

Practice C	year	miles	incentive/mile	Total Incentive	Funding	Assist/Planning	Who
Windbreaks	2007	5 miles	$1,000	$5,000	CWL	$4,500	SWCD
Windbreaks	2008	5 miles	$1,000	$5,000	CWL	$4,500	SWCD
Windbreaks	2009	5 miles	$1,000	$5,000	CWL	$4,500	SWCD
Total		**15 miles**		**$15,000**		**$13,500**	

Practice	year	cost/mile	Total Cost	Total Cost-Share	Source	Landowner Cost
Windbreaks	2007	$2,500	$12,500	$11,250	USDA CRP	$1,250
Windbreaks	2008	$2,500	$12,500	$11,250	USDA CRP	$1,250
Windbreaks	2009	$2,500	$12,500	$11,250	USDA CRP	$1,250
Total		**15 miles**	**$37,500**	**$33,750**		**$3,750**

Practice	year	rent/acre	Total acres	Total Years	Total Rent	Source
Windbreaks	2007	$100/acre	10 acres	15 years	$15,000	USDA CRP
Windbreaks	2008	$100/acre	10 acres	15 years	$15,000	USDA CRP
Windbreaks	2009	$100/acres	10 acres	15 years	$15,000	USDA CRP
Total			**30 acres**		**$45,000**	

Practice (D)	year	rent/acre	Total acres	Total Years	Total Rent	Source
Buffer Strips	2007	$110/acre	95 acres	15	$156,750	USDA CRP
Buffer Strips	2008	$110/acre	95 acres	15	$156,750	USDA CRP
Total			**190 acres**		**$313,500**	

Practice	year	cost/acre	Total Cost	Total Cost-Share	Source	Landowner Cost
Buffer Strips	2007	$100/acre	$9,500	$8,550	USDA CRP	$950
Buffer Strips	2008	$100/acre	$9,500	$8,550	USDA CRP	$950
Total		**190 acres**	$19,500	**$17,100**		$1,900

Practice	year	rent/acre	Total acres	Total Years	Total Rent	Source
Buffer Strips	2007	$635/acre	95	30	$60,325	State MN RIM
Buffer Strips	2008	$635/acre	95	30	$60,325	State MN RIM
Total			**190 acres**		**$120,650**	

Practice	year	acres	incentive/acre	Total Incentive	Source	Assist/Planning	Who
Buffer Strips	2007	95	$500	$47,500	CWL	$16,900	NRCS
Buffer Strips	2008	95	$500	$47,500	CWL	$16,900	NRCS
					CWL		
Total		**190 acres**		**$95,000**		**$33,800**	

Practice E)	year	#ditches	cost/ditch	Total Cost Share	Sauce	Landowner Cost
Bio-fiber rolls	2007	10	$165	$1,250	CWL	$400
Bio-fiber rolls	2008	10	$165	$1,250	CWL	$400
Bio-fiber rolls	2009	10	$165	$1,250	CWL	$400
Total		**10**		**$3,750**		**$1,200**

Practice	year	#ditches	Incentive/ditch	Total Incentive	Source	tech assit/planning	who
Bio-fiber rolls	2007	10	$167	$1,670	CWL	$2,000	*
Bio-fiber rolls	2008	10	$167	$1,670	CWL	$2,000	*
Bio-fiber rolls	2009	10	$167	$1,670	CWL	$2,000	*
Total		**10**		**$5,000**		$6,000	

*** $3,000 to swcd and $3,000 to county environmental**

Practice (F)	year	#jetties	cost/jetty	Total Cost Share	Source	Landowner Cost
Stream Jetties	2007	9	$2,500	$16,875	CWL	$5,625
Stream Jetties	2008	9	$2,500	$16,875	CWL	$5,625
Stream Jetties	2009	9	$2,500	$16,875	CWL	$5,625
Total		**27**		**$50,625**		**$19,000**

Practice	year	loans	source	tech assist/planning	who
Stream Jetties	2007	$6,333	MDA loans	$3,375	SWCD
Stream Jetties	2008	$6,333	MDA loans	$3,375	SWCD
Stream Jetties	2009	$6,333	MDA loans	$3,375	SWCD
Total		**$19,000**		**$10,125**	

Practice (G)	year	# outlets	Cost/outlets	Total Cost Share	Source	County Cost
Sediment Control Structures						
Co. Ditches	2007-09	4	$67,500	$200,000	CWL	$70,000
Total		**4**		**$200,000**		**$70,000**

Practice (H)	year	# inlets	cost/inlet	Total Cost Share	Source	Landowner Cost
Side inlets	2007	7	$1,000	$5,250	CWL	$1,750
Side inlets	2008	7	$1,000	$5,250	CWL	$1,750
Side inlets	2009	7	$1,000	$5,250	CWL	$1,750
Total		**21**		**$15,750**		**$5,250**

Practice	year	# inlets	tech assit/plan	who
Side inlets	2007	7	$3,700	swcd/environmental
Side inlets	2008	7	$3,700	swcd/environmental
Side inlets	2009	7	$3,700	swcd/environmental
Total		**21**	**$11,000**	

Activity (A)	year	mailings	cost/mailings	cost/brochures	Total$mail/broch	Source
Develop Educational						
Brochure/mailings	2007-2009	4000	$4,000	$1,000	$5,000	CWL
Total		**4,000**			**$5,000**	

XVI. Annual Project Evaluation

An annual assessment of project progress will be made by local staff to assess effectiveness and the timely nature of BMP implementation. This evaluation will be made based on a set of criteria that include actual project completion, visual assessment of project sites, amount of acres buffered, retired, acres of altered tillage practices, and water quality data. Revisions will be made if it is determined that efforts have been less successful than anticipated.

XV. Monitoring Activities

A monitoring plan will be developed for the impaired reach. The MPCA will continue bi-monthly condition and storm event monitoring for turbidity at the established monitoring station located at 11th Street in Breckenridge. Periodic monitoring by MPCA staff will occur on other locations along the Otter Tail River. Local staff will perform regular visual inspection on the installed practices and project and also take turbidity tube measures after storm events in select locations on tributaries and ditches that flow to the river. Local staff will also provide a pictorial record of critical erosion sites and project installations and activities. Flow stations will be established as appropriate on major tributaries and drainages to periodically calculate turbidity and loading to the LOTR.

XVI. Information, Education, and Out-Reach

The Wilkin SWCD and Wilkin County Environmental Office will prepare brochures about the implementation program and BMPs and circulate them to all land owners and operators within the project area. SWCD staff will make individual contacts with land owners and operators within the project area to discuss programs and conservation opportunities. Local staff will prepare an annual report for public consumption and also provide periodic project updates in their SWCD newsletter and at local water planning meetings. An annual presentation on project progress will be made to the County Board, the County SWCD Board, and the Red River Basin Water Quality Team. Periodically field days will be scheduled to provide demonstration of successful projects within the Lower Otter Tail River Watershed.