Fecal Coliform TMDL Implementation Plan for the High Island Creek and Rush River


High Island Creek Outlet


Rush River Outlet

Submitted by:
High Island Creek Watershed
& Rush River Watershed

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wq-iw7-12c

This fecal coliform implementation plan was jointly written by the High Island Creek Watershed and the Rush River Watershed with support from Technical and Citizen Advisory Committees. This plan is based upon the "Fecal Coliform TMDL Assessment for High Island Creek and Rush River" finalized in November 2008. The Technical and Citizen Advisory Committee members that aided in the creation of this document are:

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Table of Acronyms

BMP: Best Management Practice
BWSR: Board of Water and Soil Resources
CAWT: Commercial Animal Waste Technician
CCMR: Coalition for a Clean Minnesota River
CRP: Conservation Reserve Program
DHIA: Dairy Herd Improvement Association
DNR: Department of Natural Resources
E. coli: Escherichia Coli
EPA: Environmental Protection Agency
EQIP: Environmental Quality Incentives Program
FC: Fecal Coliform
FSA: Farm Service Agency
GIS: Geographic Information Systems
HHW: Household Hazardous Waste
HIC: High Island Creek
HIWD: High Island Watershed District
ITPHS: Imminent Threat to Public Health or Safety
MDA: Minnesota Department of Agriculture
MDNR: Minnesota Department of Natural Resources
MN: Minnesota
MPCA: Minnesota Pollution Control Agency
MSUM: Minnesota State University at Mankato
MVTL: Minnesota Valley Testing Laboratory
NRCS: Natural Resource Conservation Service
RC&D: Resource Conservation and Development
RRW: Rush River Watershed
SSTS: Subsurface Sewage Treatment System
SWCD: Soil and Water Conservation District
TMDL: Total Maximum Daily Load
UM: University of Minnesota
USDA: United States Department of Agriculture
USFWS: United States Fish and Wildlife Service
USGS: United States Geological Survey
WRAC: Water Resources Advisory Committee
WRC: Water Resource Center
WWTP: Waste Water Treatment Plant

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Section 1. FC TMDL Implementation Plan Executive Summary

The High Island Creek and Rush River watersheds are located in the Lower Minnesota Watershed, in south central Minnesota. The watersheds are located across 410,000 acres in portions of McLeod, Nicollet, Renville and Sibley Counties. High Island Creek and Rush River outlet into the Minnesota River near Henderson, Minnesota. As of the 2008 303(d) impaired waters list, five reaches of the High Island Creek and two reaches of the Rush River have been listed as impaired for fecal coliform bacteria.

The Water Resources Center at Minnesota State University, Mankato received funding in 2005 to complete a Total Maximum Daily Load (TMDL) Assessment of fecal coliform bacteria impaired reaches in the High Island Creek and Rush River watersheds. The Environmental Protection Agency (EPA) approved the TMDL assessment on November 14, 2008. The findings and load allocations from the fecal coliform TMDL assessment are summarized in Section 2 of this plan. The full study can be found online at http://www.pca.state.mn.us/publications/wq-iw7-12e.pdf.

Section 3 outlines the participatory process through which two stakeholder committees were created and contributed to the plan. The first stakeholder committee meeting was held on February 19, 2009 to create a Citizen Advisory Committee made from watershed resident and members of local organizations, as well as educating attendees on the TMDL process and results of the TMDL study. The second stakeholder committee meeting was held on March 4, 2009 and educated Citizen Advisory Committee members on various implementation practices to address fecal coliform bacteria levels. A separate Technical Committee, made up of state, federal and county members with watershed experience and interests, was composed to assist and provide input for the implementation plan. The Technical and Citizen Advisory Committee members voted on what management measures they believed would be most effective at reducing elevated bacteria levels in High Island Creek and Rush River. Information on the meeting process, information presented and ballot results can be found in Appendix A.

Sections 4 and 5 of this plan discuss the possible implementation strategies that are available for reducing bacteria levels. Using a ballot based process, the following primary implementation practices were chosen: upgrading non-compliant septic systems, manure management and feedlot runoff controls. Section 6 details the action items that would be taken for the chosen implementation practices, including cost estimates. On-going water quality monitoring will also need to be completed in order to assess the effect of implemented practices on water quality and to determine if load calculations are achieved. Project partners are listed in Section 7, including their roles and responsibilities relating to implementation action items.

Implementation activities identified will be completed within a ten-year period. Section 8 lays out this ten-year timeline for the project in Gantt Chart form. Total implementation plan project costs are estimated to be $8,884,425 which includes $2,900,920 needed in cash, $2,983,505 needed in match and $3,000,000 in SRF loans. Budget details can be found in Section 10. The success of this implementation plan will depend greatly on adaptability of the plan and the ability to receive sufficient funding to complete action items. A summary of how the plan will be adaptive is outlined in Section 9.

This plan was reviewed by the public during a final stakeholder meeting held on June 25, 2009. Upon editing, the High Island Creek and Rush River FC TMDL Implementation Plan was submitted to MPCA on July 1, 2009.

Section 2. TMDL Report Summary

2.1 Project History

The High Island Creek and Rush River Fecal Coliform Bacteria TMDL Study was initiated by the Sibley SWCD with assistance from the Minnesota Pollution Control Agency in November of 2004. Funding for the TMDL Study came from remaining funds upon the completion of the Rush River Assessment Project. The Water Resources Center of Minnesota State University, Mankato completed most of the work including developing load allocation sheets and writing the report. The entire study had a budget of $66,500.

2.2 Watershed Characteristics

High Island Creek Watershed

High Island Creek Watershed (HICW) is a 153,222 acre watershed located across three southern Minnesota counties: Sibley (66% area), McLeod (23%) and Renville (11%). High Island Creek is part of the Lower Minnesota Watershed, a major sub-basin of the Minnesota River Basin. Figure 2.1 displays the location of the watersheds within their respective counties.

The watershed's topography is flat to gently rolling in the western two-thirds and steeply sloped terrain in the eastern one-third. The watershed receives an average of 29 to 30 inches of annual precipitation. Soils range from poorly drained to well drained loamy soils. Approximately 85% of the land use is agricultural, primarily corn and soybeans. See Table 2.1 for more land use details. Based upon a 2002 feedlot inventory, there were 150 feedlots containing 23,186 animal units in the watershed. Livestock included dairy, beef, swine and poultry.

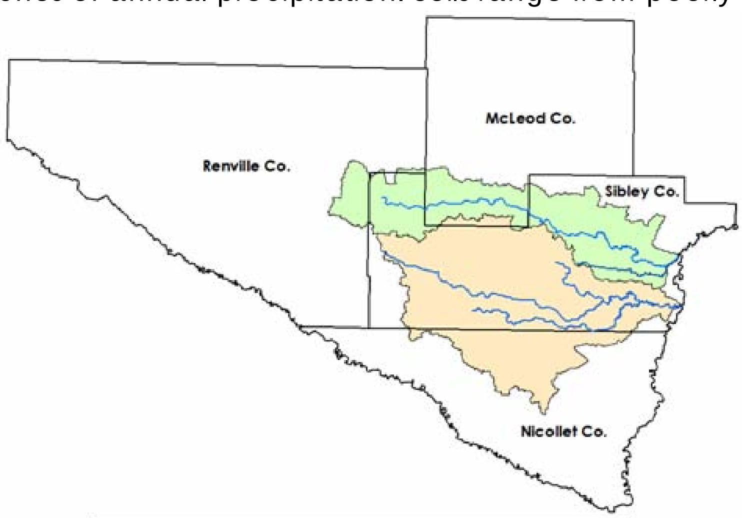

Figure 2.1 County location of both High Island Creek and Rush River Watershed

The human population of HICW is estimated at 5,351, with three small cities: Arlington, New Auburn and a portion of Stewart. Forty-seven percent of the population lives in rural areas. An estimated 2,517 watershed residents utilize individual septic systems for their waste treatment, equating to roughly 1,013 rural septic systems.

Rush River Watershed

The Rush River Watershed (RRW) is a rural watershed that drains 257,775 acres in Sibley, Nicollet and McLeod counties. Rush River has three tributaries: the north, middle and south branches of the Rush River. RRW is part of the Lower Minnesota River Watershed, a major sub-basin of the Minnesota River Basin. As the largest of the Lower Minnesota River sub-watersheds, the RRW comprises 22% of the total land area. The combined stream length of the north, middle, south and main stem is 50 miles, with an additional 500 miles of public open ditches. Artificial drainage has increased stream length by 400 to 500% of the original stream. In addition, there are several thousand miles of public and private tile and an estimated 7,000 open tile intakes.

The western three fourths of the Rush River Watershed, is flat to gently rolling. The three branches of Rush River converge in the eastern ¼ of the watershed, where the watershed becomes steeply sloped. As table 2.1 states, the Rush River Watershed's primary land use is agricultural, with 90% of the watershed acreage utilized for producing crops such as corn, soybeans, small grain and forage. There are 429 feedlots with 86,329 animal units in the watershed.

Four cities are located in the watershed: Gaylord, Winthrop and Gibbon in Sibley County and Lafayette in Nicollet County. The population of the watershed is estimated at approximately 9,010 (44.7% rural). Fifty-five percent or an estimated 4,027 residents utilize a subsurface sewage treatment system (SSTS).

Table 2.1 – High Island Creek and Rush River Watersheds Land Use and Cover

	High Island Creek Watershed		Rush River Watershed	
Land Use and Cover	Acres	Percent	Acres	Percent
Conservation	1,686	1.1%	1,821	0.7%
Cultivated Lands	129,197	84.3%	232,337	90.1%
Grasslands	7,178	4.7%	4,050	1.6%
Gravel/Pits/Rock/Sand	13	0.0%	32	0.0%
Urban/Rural Development	3,242	2.1%	5,804	2.3%
Water	2,560	1.7%	1,899	0.7%
Wetlands	1,996	1.3%	2,561	1.0%
Woodlands	7,351	4.8%	9,272	3.6%
Totals	**153,223**	**100.0%**	**257,776**	**100.0%**

Temperature

Air temperatures reach peak levels during July/August and then gradually decline. Monitoring data indicates that temperature does have an association with bacterial concentrations in surface waters. Bacteria concentrations in very cold stream water during early spring are often below surface water standards for fecal coliform bacteria.

As the season progresses and water temperatures increase, fecal coliform concentrations generally increase as well.

Precipitation

The watersheds average 29 to 30 inches of precipitation annually. The monitoring season months of April through October represent 80% of the annual average precipitation with totals of 23 to 24 inches. In a typical year, the western portions of the watersheds receive less precipitation than the east. The following table presents the average monthly precipitation values for three locations in or near HICW and RRW.

Table 2.2 – Precipitation Data for Cities in HIRR Watersheds

	Average Daily Monthly Precipitation (Inches)												
Site Location	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Gaylord (RR Watershed)	0.76	0.72	1.60	2.54	3.43	4.66	3.87	4.16	3.14	2.03	1.92	0.86	29.69
Stewart (HIC Watershed)	0.89	0.73	1.67	2.51	3.16	4.26	4.10	4.06	2.83	1.94	1.9	0.91	28.95
St. Peter (near RR Watershed)	0.93	0.69	1.76	2.42	3.51	4.95	4.09	4.26	2.82	2.18	1.62	1.03	30.25

2.3 Fecal Coliform Impairments

Preliminary monitoring of fecal coliform bacteria was conducted in the late 1990's by the MPCA and Sibley County to determine levels of contamination in both watersheds. The monitoring data revealed elevated fecal coliform concentrations across the watersheds and the need for thorough diagnostic watershed studies. This led to the High Island Assessment Project (2000-2003) and Rush River Assessment Project (2003-2004). These studies involved monitoring at several stream locations for sediment, nutrients and fecal coliform bacteria. Bacterial monitoring of these watersheds continued in 2005 as part of the HI/RR Fecal Coliform TMDL Assessment Study. Prior to these projects, little water quality data existed for these two watersheds. Below, Table 2.3 displays the impaired stream reaches located within the two watersheds. In the likely event that additional reaches within the watersheds are identified as impaired for fecal coliform in the future, the same practices that are identified in this plan can be implemented to target these areas.

Table 2.3 - Impaired Stream Reaches for both High Island Creek and Rush River

Stream Name	Description	Parameter	Year Listed	MPCA River Assessment ID
Buffalo Creek	Unnamed creek to High Island	Fecal Coliform	2006	07020012-578
Buffalo Creek (Co. Ditch 59)	Ditch 5 to Unnamed creek	Fecal Coliform	2006	07020012-598
High Island Creek	Unnamed creek to MN River	Fecal Coliform	2006	07020012-589
High Island Creek	Judicial Ditch 15 to Bakers Lake	Fecal Coliform	2002	07020012-653
High Island Creek	Bakers Lake to Unnamed creek	Fecal Coliform	2002	07020012-654
High Island Ditch 2	Unnamed creek to High Island	Fecal Coliform	2008	07020012-588
Rush River	South Branch Rush River to MN River	Fecal Coliform	2002	07020012-521
Rush River, South Branch	Unnamed ditch to Rush River	Fecal Coliform	2008	07020012-553

2.4 Fecal Coliform Source Assessment

The source assessment portion of the TMDL report was derived from various sources. There are four sources of fecal coliform bacteria: humans, wildlife, pets and livestock. To determine the human contribution of fecal coliform bacteria, the 2000 US census data was compiled for the watershed, then separated between rural and community residents. Wildlife density estimates were obtained from the Minnesota Department of Natural Resources – Wildlife Section. The pet population estimate was attained from the American Veterinary Medical Association. Livestock estimates were attained from county feedlot inventories. The amount of fecal coliform bacteria produced daily by each animal type was obtained from a variety of sources, which are all recommended in the Environmental Protection Agency's (EPA) guidance document *Protocol for Developing Pathogen TMDLs*.

Table 2.4 - HICW and RRW Livestock Statistics (2004)

Animal Type	High Island Creek Watershed		Rush River Watershed	
	Animal Units	% Total	Animal Units	% Total
Dairy	6,150	24.75%	11,789	15.00%
Beef	7,112	28.62%	10,817	13.76%
Swine	10,636	42.80%	42,182	53.67%
Chicken	15	0.06%	8,907	11.33%
Turkey	327	1.32%	2,628	3.34%
Horse, Sheep, Duck, etc	608	2.45%	2,273	2.89%
Total Animal Units	24,848		78,596	
Total Feedlots	261		502	

The total fecal coliform produced by each source type was categorized by application type/method. For humans, this meant calculating the number of people that had adequately treated and inadequately treated wastewater for both rural and urban populations. For livestock, assumptions were derived from the Generic Environmental Impact Statement on Animal Agriculture, prepared by the Minnesota Environmental Quality Board. Manure application and pasture accounted for 71% and 26%, respectively of fecal coliform bacteria application. Delivery assumptions were defined to account for the fecal coliform bacteria getting to the water body. Table 2.5 shows the final step in the source assessment that accounts for the fecal coliform bacteria contributors.

2.5 Fecal Coliform Bacteria Measurable Water Quality Goals

The quality of Class 2B surface waters shall be such as to permit the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life, and their habitats. These waters shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable.

A chronic and acute standard exists for fecal coliform concentrations in Class 2B waters. The chronic standard is set at a monthly geometric mean of 200 organisms per 100 milliliters based on at least five samples. Any monthly geometric mean exceeding 200 org/100 ml is considered a violation of the water quality standard. The acute standard dictates that no more than 10% of all samples taken during a calendar month exceed 2000 org/100 ml. Violation of either the chronic or acute standard can result in an impairment designation on the 303(d) list. The chronic and acute standards apply only between April 1 and October 31. Future monitoring will utilize the E. coli chronic and acute water quality standards of 126 org/100 ml and 1260 org/100 ml respectively. The chronic fecal coliform bacteria standard of 200 org/100 ml is roughly equivalent to 126 org/100 ml for E. coli. Therefore, to adapt the fecal coliform TMDL allocations based on future E. coli standards would require a multiplication factor of 0.63.

Table 2.5 – Minnesota Surface Water Standards for Fecal Coliform Bacteria.

Use Class	Standard No. of Organisms Per 100 mL of Water		Applicable Season	Use
	Monthly Geometric Mean*	10% of Samples Maximum**		Body Contact
2A, trout streams and lakes	200	400	April 1 - October 31	Primary
2Bd, 2B, 2C, non-trout (warm) waters	200	2000	April 1 - October 31	Primary
2D, wetlands	200	2000	April 1 - October 31	Primary, if the use is suitable
7, limited resource value waters	1000	2000	May 1 - October 31	Secondary

* Not to be exceeded as the geometric mean of not less than 5 samples in a calendar month.

** Not to be exceeded by 10% of all samples taken in a calendar month, individually.

Source: Guidance Manual for Assessing the Quality of Minnesota Surface Waters: For the Determination of Impairment. 305(b) Report and 303(d) List

Table 2.6 – Stream Monitoring Sites and Impaired Assessment Data (1998-2005 data)

Monitoring Site	Drainage (acres)	Total Smpls	# Smpls >2000	Smpls >2000	Apr. GM	May GM	Jun. GM	Jul. GM	Aug. GM	Sep. GM	Years of Data
Site 1RP - RR Outlet	257,619	95	20	21.1%	216	438	855	937	428	1,018	98,99,03,04,05
Site 2RP - North Branch RR	63,344	72	19	26.4%	230	984	849	689	1,415	2,145	99,03,04,05
Site 3RP - Middle Branch RR	51,610	71	19	26.8%	455	1,315	1,357	1,176	803	2,003	99,03,04,05
Site 4RP - South Branch RR	52,547	72	15	20.8%	231	558	758	716	1,130	3,584	99,03,04,05
Site 5RP - JD1	48,292	60	19	31.7%	161	951	1,519	2,659	448	1,496	03,04,05
Site 2P - Upstream Bakers Lk.	49,823	34	4	11.8%		223	913	963			00,01,02
Site 3P - Outlet Bakers Lake	71,498	31	4	12.9%		85	560	381			00,01,02
Site 5P - HI near Arlington	102,776	80	24	30.0%	146	466	1,213	707	446	7,552	00,01,02,04,05
Ste 6S - CD 2 near Arlington	10,487	25	5	20.0%			957	885	692		99,00,01
Site 8P - Upper Buffalo Creek	9,755	31	9	29.0%		243	2,347	1,034			00,01,02
Site 9P - Lower Buffalo Creek	17,754	79	20	25.3%	100	354	1,938	1,461	263	1,060	00,01,02,04,05
Site 10P - HI Outlet	152,150	126	43	34.1%	218	549	1,996	1,273	180	2,563	98,99,00,01,02,03,04,05

Qualifies for Listing as Impaired Waterbody   Does not Qualify for Listing as Impaired Waterbody

2.6 Loading Capacity Allocations

As flow increases, the capacity for a stream to carry fecal coliform bacteria without exceeding water quality standards increases as well. As a result, loading allocations were derived for five different flow categories ranging from high to low for each reach.

Table 2.7 - High Island Creek: Unnamed Creek to Minnesota River Allocations

Drainage Area (square miles): 239 Total WWTF Design Flow (mgd): 0.67	Flow Zone									
	High		Moist		Mid		Dry		Low	
	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily
	values expressed as trillion organisms per month/day									
Total Monthly / Daily Loading Capacity	81.46	27.15	30.09	10.03	11.45	3.82	1.61	0.54	*	*
Wasteload Allocation										
Permitted Wastewater Treatment Facilities	0.15	0.05	0.15	0.05	0.15	0.05	0.15	0.05	*	*
Livestock Facilities Requiring NPDES Permits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
"Straight Pipe" Septic Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Load Allocation	53.44	17.81	16.21	5.40	5.70	1.90	0.32	0.11	*	*
Margin of Safety	27.87	9.29	13.72	4.57	5.59	1.86	1.14	0.38	n/a	n/a
	values expressed as percent of total monthly/daily loading capacity									
Total Monthly / Daily Loading Capacity	100%		100%		100%		100%		*	
Wasteload Allocation										
Permitted Wastewater Treatment Facilities	0.2%		0.5%		1.3%		9.4%		*	
Livestock Facilities Requiring NPDES Permits	0.0%		0.0%		0.0%		0.0%		0.00%	
"Straight Pipe" Septic Systems	0.0%		0.0%		0.0%		0.0%		0.00%	
Load Allocation	65.6%		53.9%		49.8%		19.7%		*	
Margin of Safety	34.2%		45.6%		48.8%		70.9%		n/a	

*Note-WWTF design/discharge flow exceed low flow

Allocation- (Flow contribution from a given source) X (200 org/100ml.)

Table 2.8 - High Island Creek: JD 15 to Unnamed Creek Allocations

Drainage Area (square miles): 130 Total WWTF Design Flow (mgd): 0.00	Flow Zone									
	High		Moist		Mid		Dry		Low	
	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily
	values expressed as trillion organisms per month/day									
Total Monthly / Daily Loading Capacity	44.21	14.74	16.33	5.44	6.21	2.07	0.88	0.29	0.88	0.29
Wasteload Allocation										
Permitted Wastewater Treatment Facilities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Livestock Facilities Requiring NPDES Permits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
"Straight Pipe" Septic Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Load Allocation	29.08	9.69	8.88	2.96	3.18	1.06	0.25	0.08	0.16	0.05
Margin of Safety	15.13	5.04	7.45	2.48	3.04	1.01	0.62	0.21	0.08	0.03
	values expressed as percent of total monthly/daily loading capacity									

	High	Moist	Mid	Dry	Low
Total Monthly / Daily Loading Capacity	100%	100%	100%	100%	100%
Wasteload Allocation					
Permitted Wastewater Treatment Facilities	0.0%	0.0%	0.0%	0.0%	0.0%
Livestock Facilities Requiring NPDES Permits	0.0%	0.0%	0.0%	0.0%	0.0%
"Straight Pipe" Septic Systems	0.0%	0.0%	0.0%	0.0%	0.0%
Load Allocation	65.8%	54.4%	51.2%	29.1%	66.7%
Margin of Safety	34.2%	45.6%	48.8%	70.9%	33.3%

*Note-WWTF design/discharge flow exceed low flow

Allocation- (Flow contribution from a given source) X (200 org./100ml.)

Table 2.9 - Buffalo Creek: Unnamed Creek to High Island Creek Allocations

Drainage Area (square miles): 28 Total WWTF Design Flow (mgd): 0.0	Flow Zone									
	High		Moist		Mid		Dry		Low	
	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily
	values expressed as trillion organisms per month/day									
Total Monthly / Daily Loading Capacity	9.58	3.19	3.54	1.18	1.35	0.45	0.19	0.06	0.03	0.01
Wasteload Allocation										
Permitted Wastewater Treatment Facilities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Livestock Facilities Requiring NPDES Permits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
"Straight Pipe" Septic Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Load Allocation	6.30	2.10	1.92	0.64	0.69	0.23	0.06	0.02	0.03	0.01
Margin of Safety	3.28	1.09	1.61	0.54	0.66	0.22	0.13	0.04	0.02	0.01
	values expressed as percent of total monthly/daily loading capacity									
Total Monthly / Daily Loading Capacity	100%		100%		100%		100%		100%	
Wasteload Allocation										
Permitted Wastewater Treatment Facilities	0.0%		0.0%		0.0%		0.0%		0.0%	
Livestock Facilities Requiring NPDES Permits	0.0%		0.0%		0.0%		0.0%		0.0%	
"Straight Pipe" Septic Systems	0.0%		0.0%		0.0%		0.0%		0.0%	
Load Allocation	65.8%		54.4%		51.2%		29.1%		66.7%	
Margin of Safety	34.2%		45.6%		48.8%		70.9%		33.3%	

*Note-WWTF design/discharge flow exceed low flow

Allocation- (Flow contribution from a given source) X (200 org./100ml.)

Table 2.10 - Buffalo Creek: High Island Ditch 5 to Unnamed Stream Allocations

Drainage Area (square miles): 19 Total WWTF Design Flow (mgd): 0.00	Flow Zone									
	High		Moist		Mid		Dry		Low	
	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily
	values expressed as trillion organisms per month/day									
Total Monthly / Daily Loading Capacity	6.57	2.19	2.43	0.81	0.92	0.31	0.13	0.04	0.02	0.01
Wasteload Allocation										
Permitted Wastewater Treatment Facilities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Livestock Facilities Requiring NPDES Permits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

"Straight Pipe" Septic Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Load Allocation	4.32	1.44	1.32	0.44	0.47	0.16	0.04	0.01	0.01	0.00
Margin of Safety	2.25	0.75	1.11	0.37	0.45	0.15	0.09	0.03	0.01	0.00
	values expressed as percent of total monthly/daily loading capacity									
Total Monthly / Daily Loading Capacity	100%		100%		100%		100%		100%	
Wasteload Allocation										
Permitted Wastewater Treatment Facilities	0.0%		0.0%		0.0%		0.0%		0.0%	
Livestock Facilities Requiring NPDES Permits	0.0%		0.0%		0.0%		0.0%		0.0%	
"Straight Pipe" Septic Systems	0.0%		0.0%		0.0%		0.0%		0.0%	
Load Allocation	65.8%		54.4%		51.2%		29.1%		50.0%	
Margin of Safety	34.2%		45.6%		48.8%		70.9%		50.0%	

*Note-WWTF design/discharge flow exceed low flow

Allocation- (Flow contribution from a given source) X (200 org./100ml.)

Table 2.11 - Rush River: South Branch Rush River to Minnesota River Allocations

Drainage Area (square miles): 403 Total WWTF Design Flow (mgd): 7.66	**Flow Zone**									
	High		Moist		Mid		Dry		Low	
	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily
	values expressed as trillion organisms per month/day									
Total Monthly / Daily Loading Capacity	137.11	45.70	50.64	16.88	19.27	6.42	2.72	0.91	*	*
Wasteload Allocation										
Permitted Wastewater Treatment Facilities	0.93	0.31	0.93	0.31	0.93	0.31	0.93	0.31	*	*
Livestock Facilities Requiring NPDES Permits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
"Straight Pipe" Septic Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Load Allocation	89.27	29.76	26.62	8.87	8.93	2.98	0.00	0.00	*	*
Margin of Safety	46.91	15.64	23.10	7.70	9.41	3.14	1.79	0.60	n/a	n/a
	values expressed as percent of total monthly/daily loading capacity									
Total Monthly / Daily Loading Capacity	100%		100%		100%		100%		*	
Wasteload Allocation										
Permitted Wastewater Treatment Facilities	0.7%		1.8%		4.8%		34.2%		*	
Livestock Facilities Requiring NPDES Permits	0.0%		0.0%		0.0%		0.0%		0.0%	
"Straight Pipe" Septic Systems	0.0%		0.0%		0.0%		0.0%		0.0%	
Load Allocation	65.1%		52.6%		46.3%		0.0%		*	
Margin of Safety	34.2%		45.6%		48.8%		65.8%		n/a	

*Note-WWTF design/discharge flow exceed low flow

Allocation- (Flow contribution from a given source) X (200 org./100ml.)

Table 2.12 - Rush River, South Branch: Unnamed Ditch to Rush River Allocations

Drainage Area (square miles): 184 Total WWTF Design Flow (mgd): 0.35	**Flow Zone**									
	High		Moist		Mid		Dry		Low	
	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily

	values expressed as trillion organisms per month/day									
Total Monthly / Daily Loading Capacity	62.72	20.91	23.17	7.72	8.81	2.94	1.24	0.41	0.23	0.08
Wasteload Allocation										
Permitted Wastewater Treatment Facilities	0.08	0.03	0.08	0.03	0.08	0.03	0.08	0.03	0.08	0.03
Livestock Facilities Requiring NPDES Permits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
"Straight Pipe" Septic Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Load Allocation	41.18	13.73	12.52	4.17	4.43	1.48	0.28	0.09	0.01	0.00
Margin of Safety	21.46	7.15	10.57	3.52	4.31	1.44	0.88	0.29	0.11	0.04

	values expressed as percent of total monthly/daily loading capacity				
Total Monthly / Daily Loading Capacity	100%	100%	100%	100%	100%
Wasteload Allocation					
Permitted Wastewater Treatment Facilities	0.1%	0.3%	0.9%	6.4%	0.0%
Livestock Facilities Requiring NPDES Permits	0.0%	0.0%	0.0%	0.0%	0.0%
"Straight Pipe" Septic Systems	0.0%	0.0%	0.0%	0.0%	0.0%
Load Allocation	65.7%	54.0%	50.3%	22.7%	50.0%
Margin of Safety	34.2%	45.6%	48.8%	70.9%	50.0%

*Note-WWTF design/discharge flow exceed low flow

Allocation- (Flow contribution from a given source) X (200 org./100ml.)

Section 3. Public Participation and Stakeholder Process

Public input and community involvement has been an important part of the High Island Creek and Rush River watersheds since the beginning of the FC TMDL process. At the beginning of the FC TMDL Assessment study, the projects created a six page newsletter that included information on fecal coliform, major fecal coliform sources, information on public open houses and a short survey about citizen's septic systems. The TMDL Assessment Study also held three open houses in various locations around the watersheds to further educate residents on TMDLs, fecal coliform and water quality monitoring. A final public meeting was held to present the draft of the implementation plan to the public for comments and questions.

A fourteen member Technical Committee was developed at the start of the FC TMDL implementation plan process. It provided representation from local, state and federal agencies. A list of the Technical Committee members is displayed in the preface on page 2. Members of the Technical Committee helped seek out citizens to attend public stakeholder meetings representing various groups and interests. Two public stakeholder meetings were held in Gaylord, MN at the Sibley County Service Center. All watershed residents were invited to attend through the watersheds' *River Watcher* newsletter and a press release in the area newspapers. Stakeholder organizations were notified of the meeting through personal email invitations. While these meetings were targeted at residents to create a Citizen Advisory Committee, members of the Technical Committee were also invited to attend.

The first public meeting was held on February 19, 2009 and had 37 attendees (32 signed in). Attendees for this meeting and the follow-up meeting on March 4, 2009 established the Citizen Advisory Committee, consisting of thirty-one members. A list of the Citizen Advisory Committee members is displayed in the preface on page 2. The first public meeting educated attendees on the TMDL process, results of the FC TMDL Assessment of the High Island Creek and Rush River and monitoring results since the TMDL study. The attendees were given homework to educate them on various implementation practices that reduce bacteria transport to surface waters and to help prepare them for the next meeting's discussions and voting.

The second public meeting, held on March 4, 2009, had 32 attendees. At this meeting, the attendees were presented information on possible funding sources for TMDL implementation and rules/guidelines regarding the land application of manure. An open discussion was held on each general implementation category identified in the TMDL and specific practices within each category. This allowed the attendees to ask questions and voice their opinions on certain categories and direct action items. The meeting ended with members of the Citizen Advisory Committee casting their ballots for what management measure should receive priority. Committee members were also asked to suggest direct action items to address the general management category they chose to receive the top priority. Members were allowed to mail their ballots in if they could not make the second meeting or felt that they were unable to decide at the voting time. Technical Committee members not present at these two meetings were requested to submit their ballots through mail or email.

The meeting agendas, press releases, minutes, handouts, presentations and homework assignments are provided in Appendix A. The results of voting are displayed in Exhibit 7. The results of these ballots determined that upgrading non-conforming septic systems was the top general implementation strategy, with manure management and feedlot runoff controls finishing second and third respectively.

A third meeting was held on June 25, 2009 to review the draft of the implementation plan. The Technical Committee provided support throughout the writing of the plan. Both the Citizen Advisory Committee and Technical Committee received copies of the draft implementation plan for review. Comments received are displayed in Exhibit 8. Revisions were made based upon editing suggestions and comments from the committees. The final version of the High Island Creek and Rush River FC TMDL Implementation Plan was submitted to the MPCA for approval on July 1, 2009.

Both watersheds feel that the Technical Committee and the Citizen Advisory Committee represented a broad range of interests including concerned citizens with agricultural interests, community groups, agricultural producer organizations, municipalities, environmental groups and other interested parties. This provided participants with a voice in the creation of this implementation plan. Local input is critical for the development and ultimate success of any implementation plan. Committee members will continue to be involved in the FC TMDL Implementation Plan and future TMDLs in the watersheds.

Section 4. Non-Point Source Management Measures Alternatives and Analysis

4.1 Evaluation of Management Measures Alternatives

Section 4.1.1 Manure Management

- *Manure Management Plans:* A Manure Management Plan (MMP) is a written document that describes how the manure generated at a feedlot facility is going to be used during the upcoming cropping year(s) in a way that meets all regulations and protects surface and ground waters, while maximizing the benefits of applying manure to cropland. These plans aid producers in managing the rate, timing, location and method of nutrient applications. MMPs usually contain the following information: (1) manure storage, handling and testing practices (2) field locations and acreage used for spreading manure (3) field-specific nutrient management (4) management for sensitive areas. As of January 2006, the MPCA requires any livestock operations with 300 or more animal units to complete a MMP or have manure spread by a certified commercial applicator. Even when the ownership of manure is transferred for application to fields that are not owned or leased by an animal feedlot owner, a MMP is to be partially completed by the feedlot owner and partially completed by the manager of the field(s) where the manure is applied. Producers are not required to submit MMPs unless requested by the MPCA or their local County Feedlot Officer, but they may be required to show their updated MMP and associated records when the feedlot is inspected. All feedlots containing 100 or more animal units are required to keep records of certain manure applications. MMPs are to be reviewed and updated each year in order to reflect changes in crop rotation, manure nutrient levels, manure application methods, etc. For a basic MMP, producers can receive assistance in completing their MMP from Local Extension Educators or through online MPCA documents and spreadsheets. If a producer is working with NRCS on a structural practice for manure or Ag waste, assistance will be provided to complete a comprehensive MMP or update their current plan. A comprehensive MMP can be more costly to complete.

- *Manure Management Workshops:* The U of M Extension holds free small group workshops on how to complete basic MMPs. These workshops help producers in creating MMPs using their own farm and field information. At the conclusion of the workshop, producers are able to meet one on one with Extension staff for help or further development of their management plans. In previous grants, the HICW and RRW have co-hosted manure and nutrient management workshops with the U of M Extension resulting in all attendees having MMPs.

- *Custom Application Inspections:* A MMP is not required if a landowner is hiring a Commercial Animal Waste Technician (CAWT) to apply manure to their fields. The Custom Waste Applicator program is administered by the Minnesota Department of Agriculture (MDA). The inspections completed on custom land manure applications are currently limited due to a restricted MDA budget, which could lead to improper manure application. Custom application inspections could require staff time to inspect and calibrate manure application equipment with CAWTs to ensure proper manure application.

- *Level III Land Application Inspections:* Everyone applying manure, including those who do not need a permit or written manure management plan, are required to follow state rules regarding setbacks and sensitive areas. Making sure that these land application rules are being followed is an important part of reducing fecal coliform levels. County officials could perform Level III Land Application inspections at the same time as a feedlot site compliance check. Costs would include additional staff time spent during site visits ensuring that the state rules regarding manure applications are being followed.

- *Manure Application Calibrations:* Manure application equipment should always be calibrated prior to applying manure in order to ensure the proper rate of application. The NRCS Practice Standard 633 recommends that the manure application rate should never exceed the soil's absorption capacity in the top eight inches of soil. Calibration of manure application equipment can assist producers in the proper application of manure. Project staff could assist producers with equipment calibration using scale pads. Another option available is a less expensive method of calibrating a spreader by using a tarp and a bathroom scale. This method is not 100% accurate, but it can give a close estimate and be done by the farmer on a regular basis.

- *Other Land Application Best Management Practices:*

  Environmental Setbacks: The MPCA has established specific setbacks for manure application near sensitive areas including perennial and intermittent streams, lakes, drainage ditches and open intakes. These setbacks must be followed in order to ensure protection of surface waters. The setbacks are as follows:

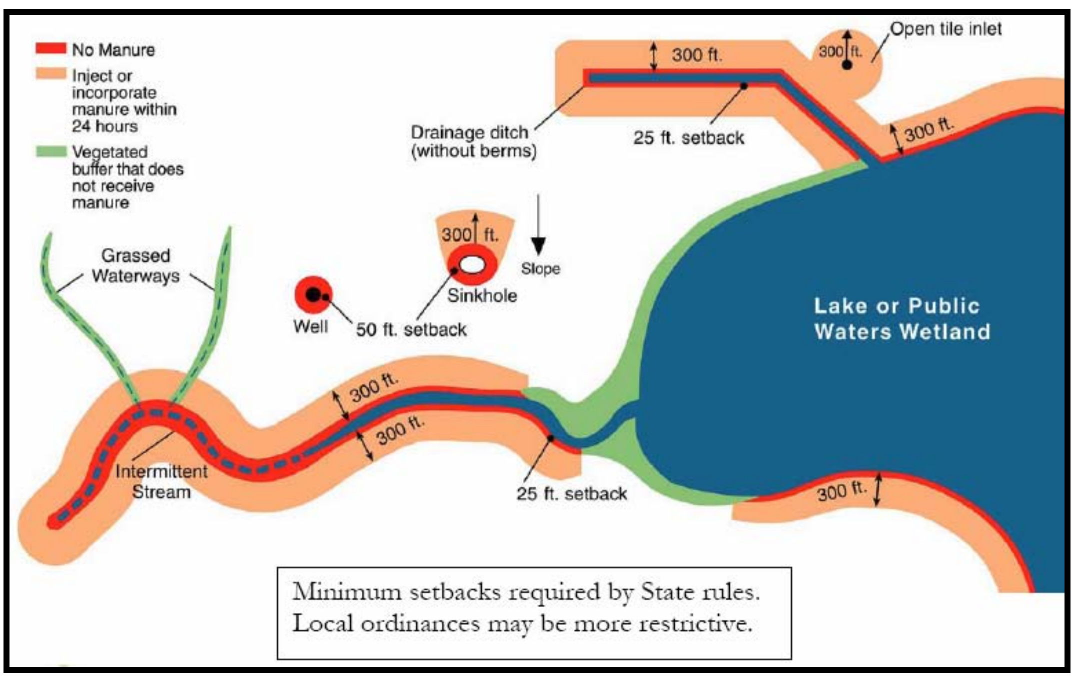

Figure 4.1 – Minnesota manure spreading setbacks.

Manure Incorporation: When applying manure, it is a requirement to incorporate the manure within 24 hours and prior to rainfall for areas within 25 to 300 feet from a water body and within 300 feet from an open tile intake. Incorporation aids in reducing the potential of fecal material runoff to surface water. Manure incorporation can also have the financial benefit of reducing nitrogen loss. The drawbacks of incorporation could be the additional time required to incorporate and reduced exposure to bacteria killing UV light.

Winter Manure Application: Pathogen survival in manure and soil is enhanced at low temperatures, increasing the risk of transport of viable pathogens in surface runoff from winter-applied manure. Such situations typically arise from a lack of storage capacity, weather conditions or other problems that could delay manure application. When winter application is necessary, producers should follow the winter application guidelines laid out in NRCS Practice Standards 590, 633 and all applicable Minnesota Rule 7020 requirements. Also, producers should only apply the manure to fields with the lowest risk of polluting waterways and with adequate cover. Fields considered for winter application should conduct a "MN P index" model to determine suitability of a field for winter application. A MMP should not plan for routine winter application. Producers can receive financial assistance in increasing manure storage capacity through the USDA/NRCS Environmental Quality Incentives Program (EQIP).

Manure Stockpiling: Manure stockpiling is a common way of storing solid manure until conditions are appropriate for land application. There are many different types of storage structures and stockpiling designs that depend on such things as the size of livestock operation and intended field applications. There are also different regulations for storage sites that are short term versus permanent. In order for stockpiling of manure to be environmentally safe, the site selection must be chosen carefully due to the ability of water to pick up the manure and nutrient particles and transport them off-site. Permanent stockpiles must be placed on a concrete pad or clay base and have at least two feet of separation distance between the base of the stockpile and the seasonal high-water table. Catch basins can be used to prevent runoff from permanently stockpiled manure from reaching surface water. Soil permeability must also be considered in order to prevent excessive runoff percolation through the soil into tile lines. Restriction information can also be found at www.pca.state.mn.us/hot/feedlots.html.

Section 4.1.2 Feedlot Runoff Controls

2005 – 2008 data indicates that there are approximately 150 feedlots in the HICW and 363 feedlots in the RRW. Of these 513 feedlots, 14 of them have greater than 1,000 animal units and are therefore NPDES permitted. The FC TMDL study determined feedlots and manure stockpiles without runoff controls to be moderate contributors to FC bacteria in wet conditions. Feedlot runoff controls are aimed at reducing the amount of water entering the feedlot and the concentration of bacteria and nutrients in the runoff water. State rules for feedlot runoff control will reduce, but not eliminate, bacteria transport to waters from open lots with less than 300 animal units by October 2010.

State and federal cost-share is available to assist operators with the financial and technical assistance needed to make feedlot improvements. The Environmental Quality Incentive Program (EQIP) assists feedlots that have a high risk for runoff problems. This cost share funding typically goes for high cost fixes, such as manure storage basins.

Also, most of the practices that are eligible for cost-share under NRCS for feedlot runoff control are intended to be part of a Comprehensive Nutrient Management Plan (CNMP). There is still need for low cost feedlot runoff fixes. While county Soil and Water Conservation Districts receive some money for smaller, low cost practices, this funding is usually quickly expended. Therefore, additional cost share for low cost feedlot upgrades would prove beneficial. Feedlot runoff control practices considered for cost-share are described below.

- Clean Water Diversions: A clean water diversion is used to divert runoff and rain water away from open lots or other areas where manure may accumulate. By preventing excess water from entering the feedlot or manure stockpile area, diversions can reduce the pollution transport potential of fecal coliform and nutrients. Some examples of clean water diversions are:

  Gutters: Gutters and downspouts divert roof runoff water from feedlot facilities to a location away from the feedlot. One can also install rock channels at the base of feedlot buildings instead of a gutter to direct roof runoff.

  Berms & Ditches: Earthen berms and ditches can be used to divert up-slope runoff and rain water from buildings away from open lots or other areas where manure may accumulate. Preventing this excess water from entering the lot or manure stockpile area will reduce pollution potential and keep these areas drier. Drier facilities can improve animal health, which in turn lowers pathogen levels in manure. Berms can also be installed in locations to direct the runoff to a collection area (catch basin, vegetative filter, constructed wetland) where solids in the runoff can settle out.

  Grassed Waterways: A grassed waterway is a natural or constructed channel that has been graded or shaped to form a bowl shaped channel. Runoff water can be directed to move across the grassed channel away from the lot. The grass cover also acts as a filter to absorb some of the bacteria and nutrients in the runoff water.

- Waste Storage Facility/Catch Basin: A catch basin retains runoff and reduces runoff flow rate to allow for the settling out of solids. The liquids are drained off to a holding pond, lagoon, constructed wetland or vegetative treatment area. The solids remain in the catch basin for drying and later removal and spreading. These basins are usually designed to contain all manure and runoff for up to a full year. A drawback to implementing a runoff control structure, such as a catch basin, can be cost and lack of space to install the structure. Also, some catch basins can have odor problems.

- Vegetative Practices to Control Feedlot Runoff:

  Vegetative Treatment Area: As mentioned above, feedlot runoff can be diverted into a catch basin to allow for solids to settle out and then be routed into a vegetated area to be further treated. The vegetative treatment area can be designed either for overland flow or slow-rate infiltration. The vegetated area may also be designed either as a long, gently sloping grassed channel or a broad, flat area sloped away from the inlet. It is important to divert all outside surface water so that only lot runoff and direct precipitation enter the infiltration area.

Filter Strips: Vegetative filter strips can also be placed around the open feedlot as a field border. This allows for a reduction in runoff water entering the feedlot and a reduction in runoff water leaving the feedlot.

For additional details and definitions on all of the vegetative practices considered, refer to page 25.

- Pasture Management:

  Fencing for the exclusion of livestock in streams and other waterways: This involves fencing off areas of the fields where livestock have direct access to the stream. Keeping animals away from open water will prevent urination and defecation in the stream which can lead to bacterial pollution. This may require the operator to find alternative water sources for livestock.

  Moving the boundaries of the lot to create a vegetative buffer where the feedlot used to be: The feedlot owner moves the outer fence and plants a vegetative cover in the areas where the lot was in order to filter out manure as it moves off the lot. This vegetated area can be mowed, bailed or flashed grazed to remove excess nutrients in the vegetation.

  Placing a fence with narrow slots at the end of the lot where the runoff is occurring: The narrow spacing between the slots slows runoff as it leaves the feedlot. This allows a significant portion of the solids to remain in the lot where they can then be scraped and removed. The purpose of the fence is to remove enough of the solids so that the solids do not overload the filter strip.

- Feedlot Inspections: Through the proper and continuous inspection of feedlots, those lots needing corrective measures would be identified and prioritized by watershed staff. Feedlots could be prioritized based upon proximity to waterways, need for financial assistance and the seriousness of the runoff problems. County feedlot officers are already required to complete feedlot compliance inspections, so costs from additional staff time should not be affected unless current county staffs are already too stretched to complete feedlot inspections in a timely manner. Project staff could aid Feedlot Officers and Open Lot technicians in prioritizing open lot runoff problem site in need of assistance and talking with producers on low cost fixes and how to be in compliance.

Section 4.1.3 Pathogen Reduction

Irrespective of the size of their farms, all livestock producers have an important role in limiting pathogen movement from their operation to the environment. Pathogen reduction best management practices (BMPs) are broken down into the following categories: animal management and housing, land application of manure, dietary modifications, and the chemical and biological treatment of stored manure.

- Animal management and housing:

The type of animal housing facility can also influence presence of pathogens. For example, the use of slotted floors can decrease Salmonella compared to other floor types such as concrete or dirt lots for swine. This is likely due to the fact that animals housed on solid floors are repeatedly exposed to contaminated feces, while the contaminated feces from animals in a slotted-floor barn fall to the underground pit.

Fly and vermin control in livestock facilities may also reduce the spread and subsequent infection of other animals with pathogenic bacteria. Flies and bird fecal samples from cattle farms in the U.S. have tested positive for E. coli. Salmonella can survive in rodent feces for up to five months, which underlines the need for adequate rodent control, and frequent and thorough cleaning of animal facilities.

- Dietary modifications:
  Diet selection to decrease pathogen excretion in feces can reduce pathogen levels in manure. Fecal shedding of bacterial pathogens can be reduced through the addition of antimicrobials to livestock diets. Antimicrobials have been used for growth promotion and to treat specific diseases.

  The use of dietary modifications can be a relatively simple management tool to use for reduction of pathogen excretion from a livestock operation. Producers should work with their herd veterinarian to determine which pathogens are present and if the pathogen level is high enough to justify a dietary modification. Because results have been inconsistent, producers need to consider the economical and performance impacts of a diet change and any necessary adjustments to management that will result from the diet change relative to the benefits of reducing pathogens in their operation. Each livestock operation is unique and results may vary from farm to farm.

- Land Application:
  The greatest risk of pathogen transfer from manured land to surface waters is through runoff. Runoff into tile lines or surface fractures can contaminate ground water. Production practices that reduce or eliminate runoff of manure-contaminated water will ultimately reduce pathogen transfer. When it comes time to land-apply livestock manure, calibrating application equipment and applying manure at recommended rates based on crop nutrient needs is vital. All land applications of manure must follow Minnesota Rule 7020.2225.

- Biological Treatment of Manure:
  Anaerobic storage: Deep pits, a type of anaerobic storage system, located beneath animal housing facilities, are commonly used in Minnesota. In an anaerobic system, bacteria are not exposed to oxygen. Although bacteria can survive anaerobic conditions for long periods of time, most pathogens are reduced within 30 days. Bacteria that do survive may be destroyed during the land application process due to exposure to UV light and the natural drying out of the bacteria if the manure is surface applied.

  Composting: Compost is an organically rich soil amendment produced by the decomposition of organic materials. During the composting process, organic materials such as animal manure and livestock carcasses are broken down by microorganisms. Active composting generates heat, carbon dioxide (CO_2) and water vapor. The end product of composting is a dark, earthy-smelling material. Reference Minnesota Rule 7020.2150 for composting requirements. The Minnesota Board of Animal Health recommends two heat cycles of greater than 131°F to ensure pathogen destruction. Heat must be uniform throughout the compost pile and the composted manure must be turned and mixed on a regular basis so that all manure has sustained exposure to the pathogen-killing temperatures.

Aeration: The combination of supplemented heat and aeration can reduce pathogens in manure. Storage at 68°F for two to four days in an aerated system reduced infectious viral load 90% (Spiehs & Goyal, 2007). The combination of aeration and high temperature (122°F) can destroy Salmonella, E. coli, fecal Streptococci, and Cryptosporidium oocysts in cattle manure in as little as 24 hours. Due to the costly nature and the reduced effectiveness of aeration systems during cold weather, they are not commonly used in Minnesota.

Anaerobic digesters: Anaerobic digesters can be manufactured from different materials depending on the location, climate and waste to be processed. These materials include; concrete, steel, brick, or plastic. Anaerobic digesters are also manufactured in a variety of shapes, including; silos, troughs, basins or may also be a pond or lagoon, and may be placed underground or on the surface. All anaerobic digesters system designs incorporate the same basic components:

- A pre-mixing area or tank
- A digester vessel(s)
- A system for using the biogas
- A system for distributing or spreading the effluent (the remaining digested material).

Many livestock producers, particularly those raising swine and dairy, may already be utilizing anaerobic manure treatments such as deep pits in their operation. Farms that generate solid waste can modify their operation to incorporate composting. There is growing interest in the use of anaerobic methane digesters for manure treatment. This expensive BMP has other benefits such as odor control and the generation of alternative energy.

- <u>Chemical Treatment of Manure:</u>

Chlorine: Chlorine is very effective against bacteria but less effective against viruses and protozoa. Unfortunately, the high organic matter found in manure substantially inhibits the effectiveness of chlorine. The chemical reactions that occur when chlorine and organic matter are exposed to each other also produce toxic and carcinogenic by-products**.**

Lime stabilization: Lime stabilization of animal slurry has been used to reduce odor and pathogens before land application. The advantages include low cost of lime, easy disposal of treated slurry and reduction in soil acidification. Lime stabilization may be the only chemical treatment that could be implemented economically on small to mid-sized farms.

Ozone: Ozone is a powerful oxidizing agent that is very effective at killing bacteria. E. coli counts have been shown to be reduced by 99.9% and total coliforms decreased 90% after treatment with ozone. However, organic materials found in animal waste interfere with ozonation and therefore a pretreatment such as solids separation would be needed for an effective ozonation process.

Ultraviolet light (UV) Irradiation: Ultraviolet light irradiation destroys the DNA and RNA of pathogens. There are no residual compounds present after UV disinfection and the nutrient content of manure is not affected by UV exposure. Viruses are more resistant to UV treatment than bacteria and protozoa.

Section 4.1.4 Vegetative Practices

The effectiveness of vegetative practices at removing sediment, pollutants and bacteria depends upon site characteristics such as slope, amount of runoff, type of wastes and the concentration of flows. In previous grants, both the HICW and RRW offered landowners incentive payments for filter strips, riparian buffers, grassed waterways and wetland restorations that were given in addition to the payments received by other federal and state cost-share programs. Due to rising prices of agricultural commodities, continued incentives or increased financial assistance would be necessary to entice a landowner to take acreage out of production.

- *Vegetative Buffers:* Filter strips are strips or areas of herbaceous vegetation that slow water flow and cause contaminants like sediment, nutrients, chemicals and bacteria to collect in vegetation. Nutrients and chemicals are then taken up by the vegetation or settle out, rather than entering waterways. Filter strips are often constructed along ditches and the natural channel to move row crop operations farther from the stream and reduce the amount of direct runoff entering waterways. Riparian buffers are strips of grasses, trees or shrubs that also slow water flow and reduce the amount of contaminants like sediments, nutrients, chemicals and bacteria from reaching waterways. Riparian buffers consist of re-establishing native plant species along streams and cultivated floodplain areas.

  Vegetative buffers can be placed around feedlots and waste storage facilities or strategically placed between crops to reduce agricultural and animal waste runoff. These buffers would be most effective if targeted for areas where nearby fields apply manure, around feedlot locations with steep slopes down to a stream or ditch or general surface runoff problem areas. The success of a vegetative buffer can be dependent upon the runoff water being uniformly spread over the buffer width.

- *Grassed Waterways:* A grassed waterway is a natural or constructed drainage way that has been graded and shaped to form a smooth, bowl shaped channel. Runoff water that flows down the drainage way moves across the grass rather than tearing away soil and forming a large gully. Runoff from open feedlots and fields that have had manure spread on them can be routed through grass waterways, which act as filters to remove the sediment, nutrients and bacteria.

- *Wetland Restorations:* Wetlands provide wildlife habitat and serve as natural filters for agricultural runoff. While slowing overland flow and storing runoff water, wetlands help remove sediment, nutrients and bacteria from surface waters. They can also act as an efficient, low cost sewage and animal waste treatment practice. When using a wetland to control runoff from feedlots, the lot runoff must first enter a sediment basin to separate the solids from the liquids. Then, a controlled release will be needed to move the water through the wetland.

Section 4.1.5 Open Intake Removal

Open intakes provide the valuable function of allowing for the drainage of cropland. However, these intakes provide a direct pathway for bacteria, sediment and other nutrients to enter ditches and streams. With the exception of large debris, nearly everything from the field is susceptible to being washed down the open intake during a storm event. In order to prevent open tile intakes from being a pathway for fecal coliform to enter surface water, an incentive should be provided for the option to remove open intakes. It would also prove beneficial to educate landowners about the potential impact to water quality from open tile intakes.

Section 4.2. Selection of Non-Point Source Pollution Management Measures

The practice of Manure Management Planning received the most votes as the priority measure to reduce fecal coliform from a non-point source. Feedlot runoff controls received the second highest priority votes. Although vegetative practices did not receive many votes by Stakeholder Committee members, vegetative practices will still receive some focus in this implementation plan due to the cost effectiveness of implementing some of these practices. Pathogen reduction practices were deemed too costly for smaller and mid-sized farm operations. Copies of the ballot totals and comments can be found in Appendix A. Upon receiving feedback, it was decided that adding a section on open intake removal would be important.

Section 4.3 Further Research

To aid in the validation and public acceptance of management measures to reduce fecal coliform, further research needs to be completed. The first step in further research would be to identify a small manageable sub-watershed, roughly 15-20,000 acres that would allow for the isolation of the sub watershed and subsequent implementation. Buffalo Creek Watershed, located within the High Island Creek Watershed, would be the most applicable sub-watershed to research the adoption and effectiveness of implementation practices. Site 9P near the outlet of Buffalo Creek has been monitored 10 out of the last 11 years providing a record of water quality and quantity data. This particular site represents 11.7% of the High Island Creek Watershed. The Buffalo Creek Watershed is very flat in the western portion and becomes steeply sloped as it flows toward the east. In addition to fecal coliform, some of the highest concentrations of sediment, phosphorus and nitrogen were consistently found at this site. A variety of implementation activities and best management practices have been targeted for this watershed in the past with success.

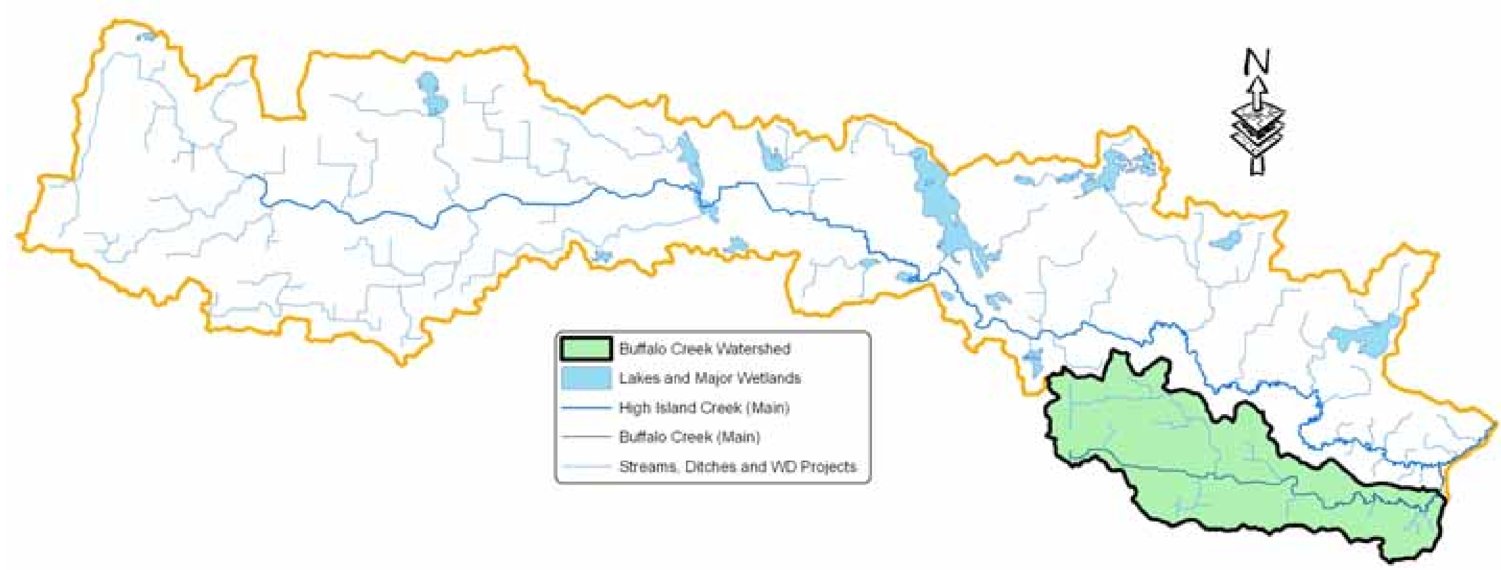

Figure 4.2 - Buffalo Creek Watershed, sub-watershed of the High Island Creek Watershed, represents roughly 17,754 acres.

Before implementation, one to two years will be needed to gather data (ex: preliminary monitoring data) and to make watershed contacts. Specifically, this time could be used to research who owns and operates the land, discuss where their manure is coming from, the amounts of manure being applied and if setbacks are being followed. This initiation with the residents will also give them a "heads up" on what activities will happen in the future.

The educational system we will apply is a more targeted approach for landowners. Landowners will be contacted individually and provided with information regarding BMPs and cost-share programs. Individualized information packets will be developed for landowners within the watershed, including current aerial photographs of their property with eligible lands and financial options highlighted. Some potential ideas could include but are not limited to the following:

- Develop a digitized, comprehensive inventory of riparian corridors within the watershed. All relevant GIS data will be collected and used as input for a model that will act as a general guide for developing priority areas.
- Create landowner packets highlighting lands potentially eligible for conservation programs, with payment schedule and further information. Packets will be created as priority areas are identified.
- Packets highlighting the various conservation practices which may include, prescribed grazing plans, manure management plans, grassed filter strips, forested riparian buffers, livestock use exclusion, manure storage facilities, and runoff control structures.
- Identify sites within the watershed that are overgrazed pastures and prioritize pollution potential based on distance to waters, slope, species, and size.
- Incorporate workshops/demos with particular landowners on calibrating spreaders, keeping setbacks from sensitive land features, and proper manure sampling.

- The project could offer services like calibrating spreaders, putting up flags around intakes, cost share for seeding and services around open intakes or walk the fields with them to identify potential hazards.
- Bring all SSTSs up to compliance with state standards through assistance from low-interest loan programs.
- When appropriate, landowners will be directed to technical service agencies, such as NRCS and Sibley county SWCD.

Continual education of the local residents is considered to be a beginning step to make sure that everyone realizes the importance of their contribution to either the problem or the solution. To do so, the watersheds will present the public with the data gathered to give them the complete picture of what is here now and the anticipated end result. Education, in many cases, can be a simpler, less costly and more community friendly way of achieving goals and policies. It is recognized however, that education by itself will not always meet intended goals.

In order to accurately evaluate the progress of meeting the fecal coliform bacteria TMDL, the watersheds would track the adoption of practices and monitor changes in water quality. This tracking will also include when and where manure gets spread in the watershed, the rate at which it is applied and if setbacks are being maintained. To track changes (i.e. conservation tillage, manure management), current programs, such as GIS, e-Link and transect surveys will be utilized. SSTS and feedlot permits will also be tracked. Water quality monitoring stations will be established to evaluate changes in water quality. Since the monitoring sites chosen would be situated on the sub-watershed break line, we will be able to accurately assess how the implementation plan is affecting water quality based on practices implemented solely in the targeted watershed.

Hopefully with local acceptance by the landowners, sufficient fecal coliform control measures would be implemented throughout Buffalo Creek Watershed to determine the effectiveness of the control measures and project the ultimate success of the plan within the 10 year time frame. Landowner incentive to buy into this sort of program is compliance with state regulations and the services the watersheds can provide. Alternatively, if the control measures implemented prove ineffective or show limited performance, any new or innovative measures for fecal coliform control will need to be evaluated and implemented to keep the implementation plan on course with the water quality goals. In either case, this research would further the understanding of pathogens in surface water and greatly support both watersheds' future TMDL studies and implementation efforts.

Section 5. Point Source Management Measures Alternatives and Analysis

5.1 Evaluation of Management Measures Alternatives

Section 5.1.1 Non-Conforming SSTS

Subsurface Sewage Treatment Systems (SSTS) treat sewage from individual dwellings. They are soil-based treatment systems used by homes and businesses which are not connected to a municipal sewer system. SSTS were formerly called Individual Sewage Treatment Systems (ISTS). Even though their name has changed, their purpose has not. They treat and dispose of the wastewater generated on site each day by non-municipal homes and businesses.

An estimated 53% of SSTS in HICW and 55% in RRW are allowing inadequately treated wastewater into waterways. These systems are often connected directly into county tile drainage which outlet into the nearest ditch or stream. These systems are called “straight pipe” systems. Under Minnesota statutes, a straight pipe discharge that has no soil treatment is an “imminent threat to public health or safety” (ITPHS) and when discovered, must be upgraded to acceptable standards within ten months.

There are an estimated 533 “straight pipe” systems in HICW and 880 in RRW. These estimates are highly subjective however, as the method of inventorying varies from one county to the next. As a result of state and local rules, ordinances, and programs, the number of straight pipe septic systems will decrease over time. Because these systems constitute illegal discharges, they were not provided a load allocation for any of the impaired reaches covered in the TMDL Assessment Study.

The major deterrent to upgrading a septic system is the cost and financing of the system. Financing of these systems can be difficult, especially for low-income households. To provide some incentive for homeowners, both watersheds Clean Water Partnerships offered a 10 year, 3% low interest loan program for watershed residents to upgrade their system. These loans achieved success and should be continued.

Acceptable septic system designs are described in Minn. R. ch. 7080. All counties in the High Island Creek and Rush River watersheds are responsible for enforcing these rules. Failing and non-compliant septic systems are a relatively low contributor of fecal coliform load during wet conditions, but the TMDL showed that they can be a high contributor of the load during the periods of low flow.

There is a need for a comprehensive inventory of septic system compliance in the watersheds. Current administrative funding does not adequately allow for proper compliance inventorying or educational activities related to septic systems. It is recommended that funding be increased or that additional funding be obtained through available grant opportunities. Implementation Plan stakeholders suggested further educating septic pumpers on proper disposal of waste and encouraging them to start pumping contracts with landowners so that proper septic system maintenance could be achieved.

Section 5.1.2 NPDES Livestock Facilities

National Pollutant Discharge Elimination System or NPDES Livestock facilities that have been issued permits are allowed zero discharge as permitted by the Minnesota Pollution Control Agency. These facilities have a capacity of 1,000 animal units or more. Also, these facilities must meet or exceed the EPA large concentrated animal feeding operation threshold. The High Island Creek Watershed has 5 livestock facilities, while Rush River Watershed has 9, for a total of 14 NPDES facilities between the two watersheds. See figure 5.1 for the locations of the permitted sites. Land application of manure from these sites is regulated by the requirements of their permit. Discharge of fecal coliform from fields where manure has been land applied might occur at times. NPDES Livestock facilities are inspected by the MPCA to ensure compliance with all permit requirements, applicable rules and regulations, and whether the required plans are being followed. Table 5.1 lists all the permitted sites within the two watersheds, including permit number.

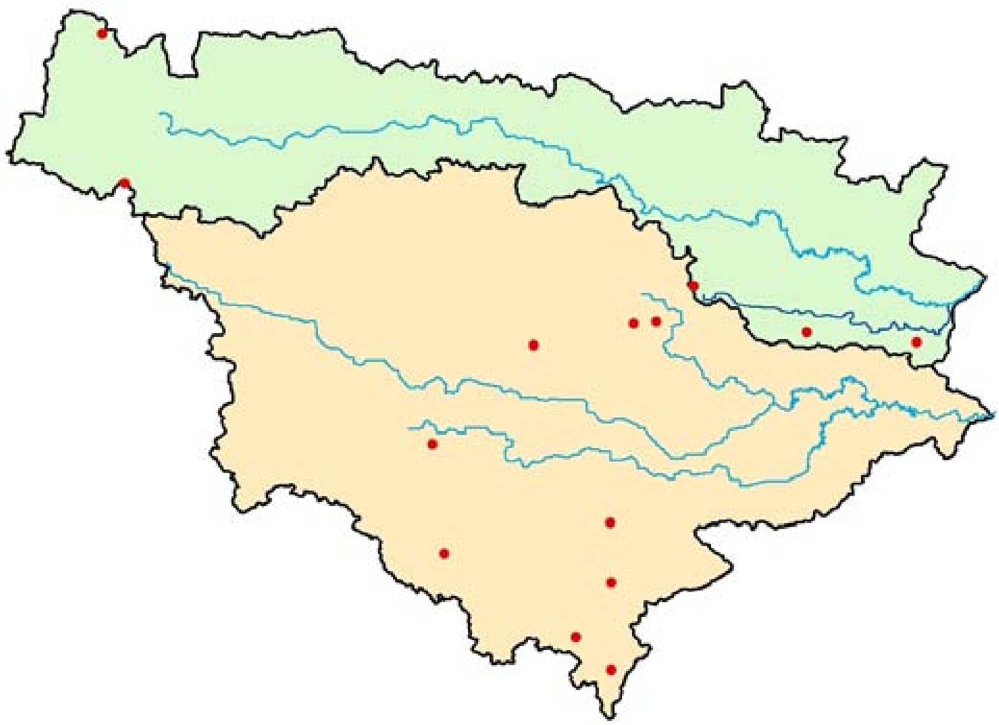

Figure 5.1 - NPDES Permitted Sites within HIC and RR Watersheds

Table 5.1 - NPDES Permitted Sites within HIC and RR Watersheds

Livestock Facilities with NPDES Permits	
Facility	**ID Number**
High Island Creek Watershed	
Brad Baumgard Farm	129-103300
Daniel Thoele Farm	143-89168
Five Star Dairy LLC	143-60460
Larry Baumgardt Farm	143-89746
Tesch Farms	143-50002
Rush River Watershed	
Christensen Farms Site C016	103-50008
Josie's Pork Farm Inc. - Gaylord	103-50017

MG Waldbaum - Golden Eggs Farm	143-50004
Minnesota Pullets	143-50005
Paul & Donita Platz Farm	143-50001
Pinpoint Research	103-97780
Swine Complex Inc.	103-50003
Warren Krohn Farm	103-50002
Brian Asmus	143-89761

Section 5.1.3 Municipal Sewage Control

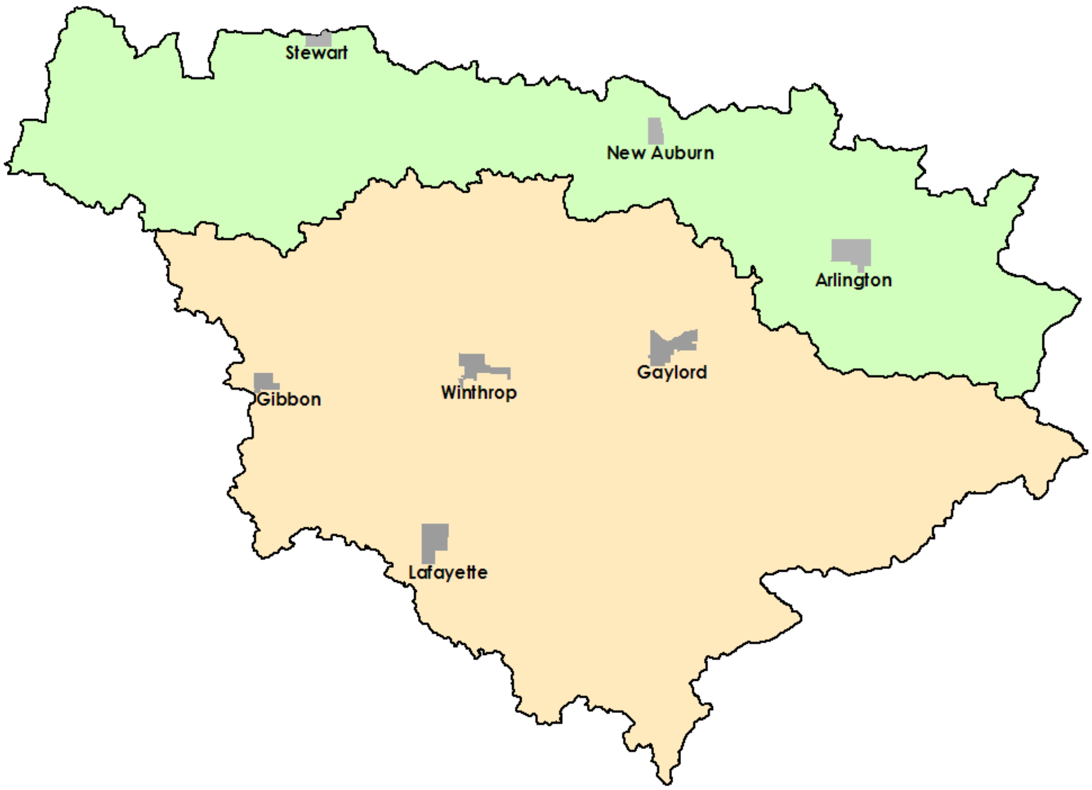

Figure 5.2 – Municipalities within the High Island Creek and Rush River Watersheds

The High Island Creek Watershed fully contains two municipalities, Arlington and New Auburn, and a portion of Stewart. Arlington and Stewart currently use the biological method of activated sludge for their secondary wastewater treatment. New Auburn uses non-surface discharging ponds for their wastewater treatment. They then use a spray irrigation system to distribute the effluent evenly over the surface of the ground.

The Rush River Watershed fully contains four municipalities: Gaylord, Gibbon, Lafayette and Winthrop. Gaylord, Gibbon and Winthrop utilize ponds for their treatment of wastewater. Discharges from these wastewater treatment ponds is monitored and also regulated directly by the MPCA. Lafayette uses a trickling filter for secondary wastewater treatment. There are no un-sewered communities in either HICW or RRW.

Municipal wastewater treatment facilities (WWTF) are required to test E. coli bacteria levels in effluent on a weekly basis. Facilities report an E. coli geometric level for each month, April through October. The geometric mean for all samples collected in a month must not exceed 126 cfu/100 ml of E. coli bacteria. Exceedance of the 126 cfu/100 ml limit is considered a WWTF violation. According to MPCA records, no wastewater treatment facility violations for fecal coliform bacteria were reported from 2001 through 2005.

Municipal bypasses are emergency discharges of partially or untreated human sewage from WWTFs. Municipal bypasses usually occur during periods of heavy precipitation, when WWTFs become overloaded. Municipal bypasses typically last from a few hours to a few days. Table 5.2 provides the city and date of emergency bypasses that have occurred from 2000 through 2007 in both watersheds.

Table 5.2 – WWTP Bypasses in HICW and RRW by Year (2000-2008)

Watershed	Bypass City	Bypass Date
High Island Creek	New Auburn	4/11/2001
High Island Creek	New Auburn	4/22/2001
High Island Creek	New Auburn	7/14/2004
High Island Creek	Arlington	10/7/2007
Rush River	Lafayette	4/21/2000
Rush River	Lafayette	4/11/2001
Rush River	Lafayette	4/23/2001
Rush River	Winthrop	8/29/2001
Rush River	Winthrop	4/22/2004

Section 5.1.4 MS4 Communities

Cities with populations greater than 5,000 are required to have Municipal Separate Storm Sewer System (MS4) stormwater permits. The stormwater program for MS4s is designed to reduce the amount of sediment and pollution that enters surface and groundwater from storm sewer systems to the maximum extent practicable. Through this permit, the owner or operator is required to develop a stormwater pollution prevention program that incorporates BMPs applicable to their MS4. However, there are no MS4 communities in either HICW or RRW at this time. A TMDL revision would be needed if a municipality within the watershed achieved a population greater than 5,000.

Section 5.2. Selection of Point Source Pollution Management Measures

The practice of upgrading non-conforming subsurface sewage septic systems into compliance received the most votes as the priority measure to reduce fecal coliform from a point source. Copies of the ballot totals and comments can be found in Appendix A.

Section 6. Identification and Summary of Implementation Objectives

Objective 1: Nonpoint Source Management Measures

Task A: Manure Management

Action A-1: Manure Management Plans

- Provide a cash incentive of $900 to producers with 0 – 300 animal units to develop and maintain a manure/nutrient management plan. Producers must work with a Certified Crop Consultant, agronomist, UM Extension or through NRCS in the creation of their MMP. This will be a $300 per plan per year incentive. In order to receive the second and third year's payment, proof of following the MMP must be shown.
- Project Partners: NRCS, local agronomists or certified crop consultants, UM Extension
- Total Costs:
  - Cash: $135,000
    $300 per plan x 3 plan years x 150 plans = $135,000
    (50 plans in High Island Creek, 100 in Rush River)
  - Match: $60,000
    Landowner: 10 hrs per plan x $15/hr x 150 plans = $22,500
    Technical Assistance: 10 hrs per plan x $25/hr x 150 plans = $37,500

Action A-2: Manure Management Workshops

- The watershed projects will partner with the UM Extension to host 4 manure management planning workshops in different locations for feedlot operators with 0 – 999 animal units
  - Timeframe: Years 2, 4, 6, 8
- Project Partners: UM Extension, County Environmental Services, NRCS
- Total Costs:
  - Cash: $1,300
    $325 workshop cost x 4 workshops = $1,300
  - Match: $5,200
    Landowner: $15/hr x 15 attendees/workshop x 4hrs x 4 workshops = $3,600
    Technical Assistance: $25/hr x 4 staff x 4hrs x 4 workshops = $1,600

Action A-3: Manure Management Field Days

- The watershed projects will hold five field days to educate producers on the importance of correct manure application and general manure management practices. Examples of different topics for field days could include, but are not limited to: runoff controls & setbacks, calibration of spreaders, earthworms/macropores, and proper manure sampling techniques. Scale pads purchased under Action A-6 (Manure Application Calibration).
  - Timeframe: Years 1, 3, 5, 7, 9
- Project Partners: U of M Extension, MPCA, NRCS, County Feedlot Officers
- Total Costs:
  - Cash: $5,540
    Total for five field days supplies

- o Match: $9,500
  Landowner: 25 attendees x $15/hr x 4hrs x 5 field days = $7,500
  Technical Assistance: 4 tech staff x $25/hr x 4hrs x 5 field days = $2,000

Action A-4: Custom Manure Application Inspections

- Provide local support to the MDA inspection program
  - o Timeframe: Years 1-10
- Project Partners: County Environmental Services, MDA
- Total Costs:
  - o Cash: $0
  - o Match: $10,000
    Technical Assistance: 4 counties x 10hrs/yr x 10 yrs x $25/hr = $10,000

Action A-5: Level III Land Application Inspections

- Have Level III land application inspections completed along with the feedlot inspections that each county is required to complete each year.
  - o Timeframe: Years 1-10
- Project Partners: County Environmental Services
- Total Costs:
  - o Cash: $0
  - o Match: $37,500
    Technical Assistance: $25/hr x 2hrs x 75 inspections/yr x 10 yrs = $37,500

Action A-6: Manure Application Calibrations

- Assist producers with manure calibrations through purchased weigh pads to measure and calibrate solid manure application.
  - o Timeframe: Years 1-10
- Project Partners: County Environmental Services, UM Extension
- Total Costs:
  - o Cash: $3,600
    $720 per scale pad x 5 pads = $3,600
  - o Match: $4,125
    Landowner: $15/hr x 1.5 hrs x 100 landowners = $2,250
    Technical Assistance: $25/hr x 1.5 hrs x 50 site visits = $1,875

Task B: Feedlot Runoff Controls

Action B-1: Structural Practices

- Provide up to 75% total cost-share in conjunction with other state and federal funding (EQIP) for clean water diversions, catch basins, waste storage facilities and other feedlot runoff control structures. This cost-share will also include vegetative practices implemented in conjunction with another feedlot waste runoff control practice. If a potential practice is deemed beneficial in reducing feedlot runoff but does not qualify for state or federal cost-share, the watersheds will consider funding the project with up to 75% cost-share as determined by the Technical Committee.
  - o Timeframe: Years 1-10
- Project Partners: NRCS, County SWCDs

- Total Costs:
  - Cash: $200,000
    40 practices x $5,000 per practice cost-share = $200,000
  - Match: $600,000
    Landowner: 40 practices x $5,000 per practice = $200,000
    NRCS Cost-share: 40 practices x $10,000 per practice = $400,000

Action B-2: Pasture Management

- Provide operators with a $15 per acre incentive payment for their enrollment in and installation of a rotational grazing plan through EQIP(max of 320 acres per plan for 3 yrs). This incentive is added to the cost-share provided through EQIP. Pasture management plans usually include fencing, an alternative water system, seeding and an operation plan.
  - Timeframe: Years 1-10
- Project Partners: NRCS
- Total Costs:
  - Cash: $115,200
    $14,400 incentive per plan x 8 plans = $115,200
  - Match: $404,164
    Landowner: 1000 hrs per plan x $15 per/hr x 8 plans = $120,000
    EQIP cost-share: $37 per acre x 3yrs x 320 acres x 8 plans = $284,160

Task C: Vegetative Practices

Action C-1: Filter Strips, Riparian Buffers, Grassed Waterways

- Provide an incentive payment of $150 per acre for 10 year contracts and $225 per acre for 15 year contracts, given on top of funds from other state and federal funding, such as the CRP program. This incentive will also be available for contract re-enrollments.
  - Timeframe: Years 1-10
- Project Partners: FSA, NRCS, County SWCDs
- Total Costs:
  - Cash: $101,250
    3 acres per practice x 15 practices/yr x 10 yr plan x $225 per acre = $101,250
  - Match: $681,750
    Landowner: $15 per acre x 450 acres = $6,750
    USDA CRP Contract: $150 per acre x 10 years x 450 acres = $675,000

Action C-2: Wetland Restorations

- Provide an incentive payment for a wetland restoration of $1,125 per acre for a 10 year contract and $1,700 per acre on a 15 year contract, given on top of funds from other state and federal funding, such as the CRP program. Landowners can enroll a max of 5 acres per incentive payment. These incentives will also be available for contract re-enrollments.
  - Years 1-10
- Project Partners: NRCS, USFWS, County SWCDs
- Total Costs:

- Cash: $170,000
  100 acres x $1,700 per acres = $170,000
  (50 acres for each watershed)
- Match: $306,000
  Landowner: $60 per acre x 100 acres = $6,000
  USDA CRP Contract: $150 per acre x 10 years x 200 acres = $300,000

Task D: Open Intake Removal

- Provide 75% cost-share up to $300 for the removal of an open intake without replacement. Land that receives surface applied manure will receive the highest priority in funding.
  - Timeframe: Years 1-10
- Project Partners: County SWCDs
- Total Costs:
  - Cash: $60,000
    10 removals/ year x 2 watersheds x $300 x 10 yrs = $60,000
  - Match: $15,000
    Landowner: $75 x 10 removals/year x 2 watersheds x 10 yrs = $15,000

Objective 2: Point Source Management Measures

Task A: Upgrading Non-compliant Septic Systems

Action A-1: SSTS Loans

- The watersheds will aim to continue their current SSTS loan program from the MPCA State Revolving Fund Loan Program. The loan will be estimated to be a 10 year, 3% interest loan. The watersheds will offer an incentive payment of $1,000 to entice landowners to upgrade their system.
  - Timeframe: Years 1-10
- Project Partners: County Environmental Services
- Total Costs:
  - Cash: $300,000
    $1,000 per system incentive x 300 systems = $300,000
  - Match: $30,000
    Technical Assistance: $25 per hr x 4 hrs system x 300 systems = $30,000
  - Loan: $3,000,000
    $10,000 per loan x 150 systems per watershed x 2 watersheds = $3,000,000

Action A-2: Low-Income Financial Aid for SSTS Upgrades

- The watersheds will finance 50% of the cost to upgrade 10 IPHT SSTS (5 in each watershed) to households that live below the poverty line and are in financial need. Low-income residents will need to prove their low-income status through a copy of their income tax return. The watershed will then base their low-income status upon the 275% Federal Poverty Guideline. Residents will be required to attend a basic homeowner’s class in which they will learn about proper septic system maintenance. The watersheds will look to partner with other organizations, such as the Rural Water Association, for co-hosting this class.
  - Timeframe: Years 1-10
- Project Partners: County Environmental Services

- Total Costs:
    - Cash: $80,000
      10 systems x $5,000 = $50,000
      $300 per class x $10 materials per class x 10 people = $30,000
    - Match: $1,000
      Technical Assistances: $25 per hr x 4 hrs system x 10 systems = $1,000

Objective 3: Monitoring & Research

Task A: Water Quality Monitoring

Action A-1: Long-term Trend Monitoring

- Conduct water quality monitoring in order to determine if improvements in water quality are occurring. 25-35 samples will be taken yearly from April through October at sites 5P, 9P, 10P and 1RP. Water will be tested for the following parameters: E. coli, total suspended solids, total suspended volatile solids, turbidity, total phosphorous, ortho-phosphorous, nitrate-nitrite nitrogen, total kjeldahl nitrogen. Site visits will include transparency tests, water stage readings and visual observations. Flow weighted mean concentrations and annual loads will be calculated as a performance measure.
    - Timeframe: Years 1-10
- Project Partners: MVTL, DNR, USGS, MPCA
- Total Costs:
    - Cash: $301,630
      $100.00 lab analysis x 140 site visits x 10 years= $140,000
      103 Miles x $0.60 per mile x 350 site visits = $21,630
      $6,000 per year (Gauging Station) x 10 years = $60,000
      $2,000 per site (equipment/repair) x 4 sites x 10 years = $80,000
    - Match: $124,340
      MVTL Supplies
        Bottles: $3.00 per bottle x 12 bottles x 35 site visits x 10 yrs = $12,600
        MVTL Cooler $14 per year x 10 years = $140
      Gauging Station
        USGS $6,000 per year x 10 years = $60,000
        DNR $6,000 per year x 10 years = $60,000

Action A-2: MPCA's Intensive Watershed Monitoring

- MPCA will collect fish, invertebrate, water quality and habitat samples once every ten years as part of the MPCA Intensive Water Monitoring program. The monitoring will be conducted throughout both watersheds over a two-year period.
    - Timeframe: 2014-2015
- Project Partners: MPCA
- Total Costs:
    - Cash: $0.
      Match: $210,000
      High Island Creek Watershed: 20 sites x $3,500 per site = $70,000
      Rush River Watershed: 40 sites x $3,500 per site = $140,000

Action A-3: Point Source Monitoring

- Conduct sampling to determine whether E. coli point source pollution is occurring and who the responsible party is.
  - Timeframe: Years 1-10
- Project Partners: County Environmental Services, MPCA, MVTL
- Total Costs:
  - Cash: $34,200

    $0.60 per mile x 600 sample sites x 75 miles per sample site= $27,000

    $12.00 per sample x 60 samples x 10 years= $7,200
  - Match: $1,940

    MVTL Supplies

    Bottles: 600 samples x $3.00 per bottle = $1,800

    MVTL Cooler $14 per year x 10 years = $140

Action A-4: Citizen Stream Monitoring

- Utilize citizen stream volunteers to take transparency readings as well as record appearance and recreational suitability along the rivers, tributaries and ditches in the High Island Creek and Rush River watersheds.
  - Timeframe: Years 1-10
- Project Partners: Watershed citizens, MPCA
- Total Costs:
  - Cash: $0.00
  - Match: $36,000

    $15/hr x 60 months x 40 volunteers = $ 36,000

Task B: Research – Buffalo Creek Watershed

Action B-1: Intensive Tracking of Waste Management Practices at the Sub-watershed Scale

- Work closely with landowners in the Buffalo Creek watershed to track manure management practices, including rate and location of application, timing and adherence to setbacks. Develop field and farm specific conservation packets. Identify all non-compliant septic systems in the sub-watershed and work with homeowners to increase compliance to 100%. Monitor implementation effectiveness through water monitoring.
  - Timeframe: Years 1-10
- Project Partners: Buffalo Creek watershed landowners, homeowners, custom applicators, County Environmental Services, MPCA
- Total Costs:
  - Cash: $11,000

    The majority of the cash expenses will be staff time which is addressed in Objective 5: Task A.

    $0.60 per mile x 100 miles per round trip x 100 round trips = $6,000

    Materials and equipment = $5,000
  - Match: $16,250

    $15/hr x 30 watershed residents x 25 hrs = $11,250

    $25/hr x 200 hours for technical assistance = $5,000

Objective 4: Education and Outreach

Task A: Project Promotion

Action A-1: Quarterly Newsletter

- Continue the quarterly publication of 2,050 *River Watcher* newsletters, a joint watershed newsletter, to all rural watershed residents.
  - Timeframe: Quarterly, Years 1-10
- Project Partners:
- Total Costs:
  - Cash: $32,400
    $335 for postage x 40 newsletters = $13,400
    $475 for printing x 40 newsletters = $19,000
  - Match: $0

Action A-2: Promotional Items & Printed Media

- The watersheds will use the following promotional items and printed media to increase the public's knowledge of the watershed projects and what they offer: magnets, fact sheets, brochures, posters, calendars, newspaper articles, etc.
  - Timeframe: Years 1-10
- Project Partners/Responsibility:
- Total Costs:
  - Cash: $25,000
  - Match: $0

Action A-3: Watershed Project Websites

- Maintain and update the current MRBDC and county websites for both watersheds with current TMDL and project information.
  - Timeframe: Years 1-10
- Project Partners: MSUM, Sibley County
- Total Costs:
  - Cash: $10,000
    $5,000.00 x 2 watersheds = $10,000
  - Match: $7,440
    $372 per yr x 2 watersheds x 10 yrs = $7,440

Task B: Community Outreach

Action B-1: Community and School Activities

- Explain and promote the projects goals, activities, cost-share and monitoring results to watershed and area residents at community events, schools and local organizations as opportunities arise. The watersheds will aim to have a presence at the annual county fairs in their respective counties in which a considerable portion of either watershed is located. The projects will aim to collaborate with schools and local organizations on water quality project and events.
  - Timeframe: 1-10 years

- Project Partners: SWCDs, County Water Planners, other MN River Basin Watershed Projects
- Total Costs:
  - Cash: $6,000
    - Meeting Supplies, Educational tools, etc: $4,000
    - Booth Rentals: $50 per booth x 4 booths x 10 years = $2,000
  - Match: $21,500
    - 800 hrs x $15/hr (high school/non-professional public) = $12,000
    - 100 hrs x $20/hr (interns/college students) = $2,000
    - 300 hrs x $25/hr (professionals/teachers) = $7,500

Task C: Professional Education and Development

Action C-1: Workshop, Training and Educational Event Attendance

- Watershed staff will attend various conferences and workshops in order to educate themselves on new techniques and studies relating to water quality and water resource management. Watershed staff will also strive to learn valuable lessons and new ideas from other watershed projects and river basin organizations.
  - Timeframe: 1 – 10 years
- Project Partners:
- Total Costs:
  - Cash: $8,000
    Conference and workshop fees, parking, meals, etc.
  - Match: $0

Objective 5: Administration & Coordination

Task A: Staffing

- Two full-time coordinator staff positions and one part-time technician position will be needed to manage the watersheds and implement project activities. The coordinator will oversee all activities in their respective watershed as it relates to the Fecal Coliform TMDL Implementation Plan. Typical duties include but are not limited to: meeting with landowners, educating the public, developing educational programs, monitoring, applying for additional funds, meeting grant requirements and promoting the project. The coordinator will also oversee all BMP payments and will be responsible for all required reporting to the necessary agencies. The watershed technician responsibilities will include: meeting with landowners, signing up conservation practices, providing necessary technical assistance, etc.
  - Timeframe: Years 1-10
- Project Partners/Responsibility: Joint Powers Board, Sibley SWCD, Sibley County
- Total Costs:
  - Cash: $1,532,500
    Coordinator salaries: $50,000/yr x 2 staff x 10 years = $1,260,000
    Technician salaries: $25,000/yr x 10 years = $250,000
    *salary amounts include benefits

- Match: $67,200
  County Fiscal Management: $6,720 per year x 10 years = $67,200

Task B: Meetings and Communications

- Technical Committee meetings and Joint Powers Board meetings will be held quarterly for each watershed. Technical Committee meetings will be jointly hosted. The watersheds will continuously and effectively communicate with project partners on all project activities.
- Project Partners: Technical Committee, Joint Powers Boards
- Total Costs:
  - Cash: $1,800
    Meeting supplies – refreshments, presentation materials
    $15 per meeting x 120 meetings = $1,800
  - Match: $77,000
    Technical Committee: 25 members x $25/hr x 2 hrs x 40 meetings = $50,000
    Joint Powers Boards:
    9 board members x $25/hr x 1.5 hrs x 80 meetings = $27,000

Task C: Office Space

- The watershed coordinators are currently housed by Sibley County in the Sibley County Service Center for free, while the technician is housed in the Sibley SWCD office for free. Taking into consideration the possibility that the housing situations could change, some money will be budgeted towards office space costs.
  - Timeframe: Years 1-10
- Project Partners/Responsibility: Sibley SWCD, Sibley County
- Total Costs:
  - Cash: $115,200
    $10 per square ft, office space 8 x 8 ft, for 3 offices, 60 months = $115,200
  - Match: $115,200
    $10 per square ft, office space 8 x 8 ft, for 3 offices, 60 months = $115,200

Task D: Office Supplies, Equipment, Mileage, etc.

- Mileage, supplies and other miscellaneous expenses related to the administration and coordination of the projects.
- Project Partners:
- Total Costs:
  - Cash: $49,000
    Mileage: $0.60 per mile x 4,000 miles per year x 10 years = $24,000
    Supplies/Postage: $2,500 per year x 10 years = $25,000
  - Match: $42,500
    $0.10 x 250 black white copies x 2 watersheds x 10 years: $500
    Sibley SWCD (equipment use and supplies): $150/yr x 10 years = $1,500
    Mileage: $3,600 per year x 10 years = $36,000

Section 7. Roles and Responsibilities of Project Partners

Due to the considerable amount of resource expertise existing in the High Island Creek and Rush River watersheds, the success of this project will follow a cooperative approach to achieve its goals. The roles and responsibilities of project partners may be revised as programs, budgets or personnel change. The limiting factor for a project partner's support will be the ability to motivate citizens to participate in the variety of volunteer cost-share practices due to the increasing cropland rental rates and crop commodities. Major project partners will meet quarterly as a Technical Advisory Committee to discuss project activities, assess program element results, approve particular BMPs and evaluate both watersheds' success.

City of Gaylord: The City will support the Rush River Watershed by providing annual cash match and other services as needed.

City of Gibbon: The City will support the Rush River Watershed by providing annual cash match and other services as needed.

City of Lafayette: The City will support the Rush River Watershed by providing annual cash match and other services as needed.

City of Winthrop: The City will support the Rush River Watershed by providing annual cash match and other services as needed.

Coalition for a Clean Minnesota River (CCMR)/Friends of the Minnesota Valley: CCMR and the Friends of the Minnesota Valley will assist the watersheds in their education and outreach activities. These organizations will actively promote project activities and BMPs when applicable. A representative from CCMR/Friends of the Minnesota Valley will serve on the Technical Advisory Committee.

Conservation Partners of America (CPA): The CPA will promote project activities and conservation practices when applicable. They will inform the watersheds of any conservation activity within the watershed boundaries that the projects can offer technical assistance, cost-share or incentives for.

County Environmental Services – McLeod, Nicollet, Renville and Sibley: Staff members will provide technical assistance in areas such as ditch, feedlot and septic programs. Staff members will actively promote project BMP cost-share and SSTS loan opportunities when applicable. A representative from each county environmental services office will serve on the Technical Advisory Committee.

High Island Watershed District: The Watershed District will support the HICW project by providing semi-annual cash match. The Watershed District will also promote project activities and conservation practices whenever applicable. Six representatives from the watershed district will serve on the Technical Advisory Committee.

High Island Creek Watershed Joint Powers Board: The High Island Creek Joint Powers Board is the governing body of the High Island Creek Watershed Project. Its function is to provide oversight on watershed activities and funds.

Local Water Management Coordinators: Local Water Management Coordinators will be responsible for the administration of their county water plan and coordinating activities with the watersheds. Each county's Local Water Management Coordinator will serve on the Technical Advisory Committee.

McLeod County: One McLeod county commissioner will serve on the High Island Creek Joint Powers Board.

Minnesota Board of Water and Soil Resources (BWSR): BWSR is a state entity which provides cost-share and technical assistance in the restoration of impaired waters, including wetland restorations, buffer programs, feedlot design and streambank stabilization projects. A BWSR representative will serve on the Technical Advisory Committee. BWSR will provide project oversight on project activities, including financial and water quality BMP tracking.

Minnesota Department of Agriculture (MDA): MDA will continue their role in licensing Commercial Waste Applicators by providing training, recertification and oversight in the licensure of the custom manure applicators. The MDA will also continue promoting and providing education on best management practices for preventing sedimentation, erosion, and manure application.

Minnesota Department of Natural Resources (DNR): The DNR will provide technical assistance through the collection and analysis of flow data on primary water monitoring sites in both watersheds. The DNR will annually develop a flow rating curve for these sites. They will also provide technical assistance on water retention projects and fisheries management.

Minnesota Pollution Control Agency (MPCA): The MPCA will provide a regulatory role in feedlots, SSTS, stormwater and WWTP. They will also provide technical assistance and analysis in water quality monitoring. An MPCA representative will serve on the Technical Advisory Committee.

Minnesota Valley Testing Laboratory (MVTL): MVTL will complete laboratory testing on all water quality samples taken. They will provide the bottles, coolers, labels, preservatives and chain of custody forms necessary for proper water quality monitoring.

Nicollet County: Nicollet County will support the Rush River Watershed by providing annual cash match and other services as needed. Two commissioners from Nicollet County will serve on the Rush River Joint Powers Board.

Natural Resources Conservation Service (NRCS): NRCS will aid in the completion and implementation of priority practices through joint cost-share and technical assistance. NRCS staff will work with landowners to aid them in developing conservation plans and practices to meet their objectives. A NRCS representative from each watershed county will serve on the Technical Advisory Committee.

Pheasants Forever – McLeod & Sibley County Chapters: Pheasants Forever will promote project activities and conservation practices when applicable. The group will also provide technical assistance on wetland and vegetative restoration projects.

Renville County: Renville County will support the High Island Creek Watershed by providing annual cash match and other services as needed. One Renville County commissioner will serve on the High Island Creek Joint Powers Board.

Rush River Watershed Joint Powers Board: The Rush River Joint Powers Board is the governing body of the Rush River Watershed Project. Its function is to provide oversight on watershed activities and funds.

Sibley County: Sibley County will support both watersheds by providing annual cash match and other services as needed. Sibley County will be the fiscal agent for these projects. The Office of the Sibley County Auditor will provide any accounting assistance necessary for the management of grant funds received. Three county commissioners will serve on the Rush River Joint Powers Board and one county commissioner will serve on the High Island Creek Joint Powers Board.

Sibley County Water Resource Advisory Committee (WRAC): The WRAC will assist with the promotion of BMPs and educational activities. The WRAC will also provide technical assistance and input on various watershed activities.

Soil and Water Conservation Districts – McLeod, Nicollet, Renville & Sibley: Local SWCD offices will promote and provide technical assistance on all BMPs offered by the watersheds. The SWCDs will work with landowners to aid them in developing conservation plans and practices that meet their objectives. Local SWCDs will work with the watersheds to provide joint cost-share on conservation practices when available. A SWCD representative(s) from each watershed county will serve on the Technical Advisory Committee.

United States Fish and Wildlife Service (USFWS): The USFWS will provide technical assistance and cost-share on wetland restorations and stream bank stabilization projects.

United States Geological Survey (USGS): The USGS will provide technical and financial assistance with gauging sites.

University of Minnesota Extension: UM Extension will assist in education and outreach activities through publications and workshops. They will also aid farm operators by providing technical assistance on various manure management activities, including creating or updating their MMPs.

Water Resources Center at Minnesota State University, Mankato (WRC at MSUM): The WRC will develop the High Island Creek and Rush River Turbidity TMDL Assessment. Staff members will provide technical assistance on various activities related to the FC TMDL Implementation Plan's activities. The WRC will also be responsible for the maintenance of the watersheds' MRBDC websites.

Section 8. Timeline

High Island Creek & Rush River FC TMDL Implementation Plan													
		Years											
		1	2	3	4	5	Evaluate	6	7	8	9	10	Evaluate
Objective 1:	**Non-Point Source Management Measures**												
Task A	Manure Management												
	Manure Management Plans	X	X	X	X	X	X	X	X	X	X	X	X
	Manure Management Workshops		X		X		X	X		X			X
	Manure Management Field Days	X		X		X	X		X		X		X
	Custom Manure Application Inspections	X	X	X	X	X	X	X	X	X	X	X	X
	Level III Land Application Inspections	X	X	X	X	X	X	X	X	X	X	X	X
	Manure Application Calibrations	X	X	X	X	X	X	X	X	X	X	X	X
Task B	Feedlot Runoff Controls												
	Structural Practices	X	X	X	X	X	X	X	X	X	X	X	X
	Pasture Management	X	X	X	X	X	X	X	X	X	X	X	X
Task C	Vegetative Practices												
	Filter Strips, Riparian Buffers, Grassed Waterways	X	X	X	X	X	X	X	X	X	X	X	X
	Wetland Restorations	X	X	X	X	X	X	X	X	X	X	X	X
	Open Intake Removals	X	X	X	X	X	X	X	X	X	X	X	X
Objective 2:	**Point Source Management Measures**												
Task A	Upgrading Non-compliant Septic Systems												
	SSTS Loans (with Incentive)	X	X	X	X	X	X	X	X	X	X	X	X
	Upgrading High Priority SSTS	X	X	X	X	X	X	X	X	X	X	X	X
	Low Income Financial Aid for SSTS Upgrades	X	X	X	X	X	X	X	X	X	X	X	X
Objective 3:	**Monitoring & Research**												
Task A	Water Quality Monitoring												
	Long-term Trend Monitoring	X	X	X	X	X	X	X	X	X	X	X	X
	MPCA's Intensive Watershed Monitoring					X	X						
	Point Source Monitoring	X	X	X	X	X	X	X	X	X	X	X	X
	Citizen Stream Monitoring	X	X	X	X	X	X	X	X	X	X	X	X
Task B	Research												
	Buffalo Creek Watershed	X	X	X	X	X	X	X	X	X	X	X	X
Objective 4:	**Education & Outreach**												
Task A	Project Promotion												
	Quarterly Newsletter	X	X	X	X	X	X	X	X	X	X	X	X
	Promotional Items & Printed Media	X	X	X	X	X	X	X	X	X	X	X	X
	Watershed Project Websites	X	X	X	X	X	X	X	X	X	X	X	X
Task B	Community Outreach												
	Community & School Activities	X	X	X	X	X	X	X	X	X	X	X	X
Task C	Professional Education & Development												
	Workshops, Trainings & Educational Event Attendance	X	X	X	X	X	X	X	X	X	X	X	X
Objective 5:	**Administration & Coordination**												
Task A	Staffing	X	X	X	X	X	X	X	X	X	X	X	X
Task B	Meetings & Communications	X	X	X	X	X	X	X	X	X	X	X	X
Task C	Office Space	X	X	X	X	X	X	X	X	X	X	X	X
Task D	Office Supplies, Equipment, Mileage, etc.	X	X	X	X	X	X	X	X	X	X	X	X

Section 9. Adaptive Management

The implementation actions outlined in this implementation plan are intended to decrease fecal coliform bacteria loading to High Island Creek and Rush River. In certain cases, additional studies, information or monitoring results may reveal the need for adjustments in the implementation plan and its action items. As action items are being completed, water quality will continue to be monitored to evaluate the impact that the implementation practices are having on fecal coliform concentrations. If the concentrations of fecal coliform bacteria are decreasing, it can be assumed that the current method of implementation is working and should be continued. However, if the water quality results do not show improvement in fecal coliform bacteria concentrations, then this implementation plan will need to be evaluated and adapted to meet water quality goals. This implementation plan must also be adapted when additional information or research results indicate that certain practices are ineffective, could be better utilized under different circumstances or indicate new data on pollutant sources.

This process is referred to as adaptive management (Refer to Figure 9.1). In order for this implementation plan to be successful, the plan must be adaptable. The plan will be revisited and evaluated on a ten-year cycle or more often if new information supports changes to the plan. If staff or project partners identify a need to make adjustments to the implementation plan, the adjustments will be proposed to the watersheds' Technical Committees. The Technical Committees will then decide whether or not the adjustment is justified and should be made.

Figure 9.1: Adaptive Management Process

Section 10. Budget

Cost Category	Cash	Match	Loan	Total
Objective 1: Non-Point Source Management Measures				
Task A: Manure Management				
Manure Management Plans	$135,000	$60,000	$0	$195,000
Manure Management Workshops	$1,300	$5,200	$0	$6,500
Manure Management Field Days	$5,540	$9,500	$0	$15,040
Custom Manure Application Inspections	$0	$10,000	$0	$10,000
Level III Land Application Inspections	$0	$37,500	$0	$37,500
Manure Application Calibrations	$3,600	$4,125	$0	$7,725
Task B: Feedlot Runoff Controls				
Structural Practices	$200,000	$600,000	$0	$800,000
Pasture Management	$115,200	$404,160	$0	$519,360
Task C: Vegetative Practices				
Filter Strips, Riparian Buffers, Grassed Waterways	$101,250	$681,750	$0	$783,000
Wetland Restorations	$170,000	$306,000	$0	$476,000
Task D: Open Intake Removals	$60,000	$15,000	$0	$75,000
TOTAL OBJECTIVE 1	**$791,890**	**$2,133,235**	**$0**	**$2,925,125**
Objective 2: Point Source Management Measures				
Task A: Upgrading Non-compliant Septic Systems				
SSTS Loans	$300,000	$30,000	$3,000,000	$3,330,000
Low Income Financial Aid for SSTS Upgrades	$80,000	$1,000	$0	$81,000
TOTAL OBJECTIVE 2	**$380,000**	**$31,000**	**$3,000,000**	**$3,411,000**
Objective 3: Monitoring & Research				
Task A: Water Quality Monitoring				
Long-term Trend Monitoring	$301,630	$124,340	$0	$425,970
MPCA's Intensive Watershed Monitoring	$0	$210,000	$0	$210,000
Point Source Monitoring	$34,200	$1,940	$0	$36,140
Citizen Stream Monitoring	$0	$36,000	$0	$36,000
Task B: Research				
Buffalo Creek Watershed Research	$11,000	$5,450	$0	$16,450
TOTAL OBJECTIVE 3	**$346,830**	**$377,730**	**$0**	**$724,560**
Objective 4: Education & Outreach				
Task A: Project Promotion				
Quarterly Newsletter	$32,400	$0	$0	$32,400
Promotional Items & Printed Media	$25,000	$0	$0	$25,000
Watershed Project Websites	$10,000	$7,440	$0	$17,440
Task B: Community Outreach				
Community & School Activities	$6,000	$21,500	$0	$27,500
Task C: Professional Education & Development				
Workshops, Trainings & Educational Event Attendance	$8,000	$0	$0	$8,000
TOTAL OBJECTIVE 4	**$81,400**	**$28,940**	**$0**	**$110,340**
Objective 5: Administration & Coordination				
Task A: Staffing				
Coordinators	$1,000,000	$67,200	$0	$1,067,200
Technician	$250,000	$0	$0	$220,000
Task B: Meetings & Communications				
Meetings and Communications	$1,800	$77,000	$0	$78,800
Task C: Office Space	$0	$230,400	$0	$230,400
Task D: Office Supplies, Equipment, Mileage, etc.	$49,000	$38,000	$0	$87,000
TOTAL OBJECTIVE 5	**$1,300,800**	**$412,600**	**$0**	**$1,683,400**
PROJECT TOTALS	**$2,900,920**	**$2,983,505**	**$3,000,000**	**$8,884,425**

Section 11. References

Fecal Coliform TMDL Assessment for High Island Creek and Rush River, Water Resources Center – Minnesota State University Mankato, October 2008.
http://www.pca.state.mn.us/publications/wq-iw7-12e.pdf

Rock River Fecal Coliform and Turbidity TMDL Implementation Plan, Rock County Soil Water Conservation District and Land Management Office, October 2008.
http://www.pca.state.mn.us/publications/wq-iw7-11c.pdf

Pipestone Creek Fecal Coliform Bacteria and Turbidity TMDL Implementation Plan, Pipestone County Conservation and Zoning Office, September 2008.
http://www.pca.state.mn.us/publications/wq-iw7-07c.pdf

South Branch Yellow Medicine River Fecal Coliform Total Maximum Daily Load Report Implementation Plan, Yellow Medicine Watershed District, September 27, 2005.
http://www.pca.state.mn.us/publications/wq-iw7-07c.pdf

"Why Treat Sewage?," Minnesota Pollution Control Agency, June 2008.
http://www.pca.state.mn.us/publications/wq-wwists1-10.pdf

"Bacteria: Sources, Types and Impacts on Water Quality, "Minnesota Pollution Control Agency, February 2008.
http://www.pca.state.mn.us/publications/wq-iw3-20.pdf

"Soil-Based Sewage Treatment Systems," Minnesota Pollution Control Agency, June 2008. http://www.pca.state.mn.us/publications/wq-wwists1-11.pdf

Best Management Practices for Pathogen Control in Manure Management Systems, University of Minnesota Extension, 2007.
http://www.extension.umn.edu/distribution/livestocksystems/components/8544.pdf.

Runoff Water Quality and Crop Responses to Variable Manure Application Rates, Hansen and Goyal, Water Resources Center, 2001.
http://wrc.umn.edu/research/competitivegrants/archives/reports/2001hansen.pdf

Applying Manure in Sensitive Areas, Minnesota Pollution Control Agency and Natural Resources Conservation Service, May 2005.
http://www.mn.nrcs.usda.gov/technical/ecs/nutrient/assessment/SensitiveFeatures/ManureSensitiveAreas.pdf

"Protecting Water Quality from Agricultural Runoff," United States Environmental Protection Agency, March 2005.
http://www.epa.gov/owow/nps/Ag_Runoff_Fact_Sheet.pdf

"Conservation Reserve Program Continuous Sign-up," United States Department of Agriculture and Farm Service Agency, June 2006.
http://www.fsa.usda.gov/ Internet/FSA_File/crpcont06.pdf

Riparian Buffers and Controlled Drainage to Reduce Agricultural Nonpoint Source Pollution, North Carolina State University, September 2002. http://www.soil.ncsu.edu/lockers/Osmond_D/web/RiparianBuffers.pdf

National Management Measures to Control Nonpoint Pollution from Agriculture, United States Environmental Protection Agency, July 2003. <http://www.epa.gov/nps/agmm/>.

Management-Manure Nutrient Management, Minnesota Natural Resources Conservation Service, <http://www.mn.nrcs.usda.gov/technical/ecs/nutrient/manure/manure.htm>.

A Conservation Catalog: Practices for the Conservation of Pennsylvania's Resources, Pennsylvania Conservation Partnership, 1999. http://www.pa.nrcs.usda.gov/news/FTPPublications/conscatalog.pdf

Low-Cost Conservation Practices, University of Minnesota Extension and United States Department of Agriculture. http://wrc.umn.edu/publications/lowcost.pdf

Conservation Choices – Your Guide to 30 Conservation and Environmental Farming Practices, Conservation for Agriculture's Future, <http://www2.ctic.purdue.edu/Core4/CT/Choices/Choices.html>.

Agriculture EPA Sites, United States Environmental Protection Agency, <http://www.epa.gov/owow/nps/agriculture.html>.

Onsite Sewage Treatment Program – Research, University of Minnesota Extension, <http://septic.umn.edu/Research/?index.html>.

Appendix A

Exhibit 1: 2-19-2009 Meeting Agenda

High Island and Rush River Fecal Coliform Implementation Plan Advisory Committee Meeting
Gaylord, Minnesota 12:00-2:00pm
2/19/2009

Agenda – times are approximate

Lunch (20 minutes)

Welcome and Introductions – Brooke Patterson and Joel Wurscher (5 minutes)

TMDL Process - Scott MacLean (15-20 minutes)

High Island and Rush River Fecal Coliform TMDL Review - Scott Matteson (20 minutes)

Current Monitoring Efforts – Brooke Patterson and Joel Wurscher (5-10 minutes)

Implementation - Scott MacLean and Wayne Cords (20-25 minutes)

Homework Assignment and Preview of March Meeting - Brooke Patterson and Joel Wurscher (10 minutes)

Exhibit 2: 2-19-2009 Meeting Handouts/Folders

High Island Rush River Implementation Plan Advisory Committee Meeting
2/19/2009

Handouts and Resource List

Handouts

Why Treat Sewage? – MPCA factsheet
http://www.pca.state.mn.us/publications/wq-wwists1-10.pdf

Bacteria: Sources, Types and Impacts on Water Quality – MPCA factsheet
http://www.pca.state.mn.us/publications/wq-iw3-20.pdf

Soil-Based Sewage Treatment Systems – MPCA factsheet
http://www.pca.state.mn.us/publications/wq-wwists1-11.pdf

Best Management Practices for Pathogen Control in Manure Management Systems
http://www.extension.umn.edu/distribution/livestocksystems/components/8544.pdf

Runoff Water Quality and Crop Responses to Variable Manure Application Rates
http://wrc.umn.edu/research/competitivegrants/archives/reports/2001hansen.pdf

Applying Manure in Sensitive Areas
http://www.mn.nrcs.usda.gov/technical/ecs/nutrient/assessment/SensitiveFeatures/ManureSensitiveAreas.pdf

Protecting Water Quality from Agricultural Runoff
http://www.epa.gov/owow/nps/Ag_Runoff_Fact_Sheet.pdf

Conservation Reserve Program – Vegetative Practices
http://www.fsa.usda.gov/Internet/FSA_File/crpcont06.pdf

Resources

Fecal Coliform TMDL Assessment for High Island Creek and Rush River
http://www.pca.state.mn.us/publications/wq-iw7-12e.pdf

Riparian Buffers and Controlled Drainage to Reduce Agricultural Nonpoint Source Pollution
http://www.soil.ncsu.edu/lockers/Osmond_D/web/RiparianBuffers.pdf

Management Measure for Animal Feeding Operations
http://www.epa.gov/owow/nps/agmm/chap4d.pdf

MDA Conservation Practices Site
http://www.mda.state.mn.us/protecting/conservation/default.htm

Management-Manure Nutrient Management-Minnesota NRCS
http://www.mn.nrcs.usda.gov/technical/ecs/nutrient/manure/manure.htm

Conservation Catalog-Practices for the Conservation of Pennsylvania's Resources
http://www.pa.nrcs.usda.gov/news/FTPPublications/conscatalog.pdf

Low-Cost Conservation Practices
http://wrc.umn.edu/publications/lowcost.pdf

Your guide to 30 conservation and environmental farming practices
http://www2.ctic.purdue.edu/Core4/CT/Choices/Choices.html

Agriculture EPA Sites
http://www.epa.gov/owow/nps/agriculture.html

University of Minnesota Septic Research
http://septic.umn.edu/Research/?index.html

Exhibit 3: Homework Assignment/Ballot

Homework Assignment – High Island/Rush Fecal Coliform TMDL

Please choose one or two of the following general implementation strategies that you believe would produce the biggest improvement on the fecal coliform impairment in High Island Creek and Rush River. Reference pages 75-77 of the TMDL report.

Feedlot runoff controls

Manure management planning

Non-conforming septic systems

Vegetative practices

Pathogen reduction as described in Spiehs and Goyal (2007)

Other (please list) ______________________

Of the general implementation strategy(ies) you chose above, please list direct actions, ideas, thoughts and solutions that you believe would reduce fecal coliform bacteria levels in High Island Creek and Rush River. For example, if you chose pathogen control, a direct action could be composting. Demonstrations and education are also valid direct actions.

Questions to ask:

Exhibit 4: 2-19-2009 Meeting Minutes

Meeting Minutes

High Island Creek & Rush River Watersheds Fecal Coliform Implementation Plan Advisory Committee February 19, 2009

Brooke Patterson, Rush River Coordinator, opened the meeting with an overview of the agenda, thanking all for coming and inviting all to help themselves to pizza, cookies and refreshments.

The Fecal Coliform TMDL was approved by the EPA on November 14, 2008. The High Island Creek and Rush River Watersheds now have one year to write an implementation plan to address the TMDL. This open house is being held to field ideas to include in the implementation plan.

Scott MacLean, MN PCA, reviewed with the committee what the TMDL process is. In 2008 the Minnesota River Basin had 546 impaired reaches under Section 303b of the Clean Water Act. Section 303b lists are updated every two years. The High Island Creek and Rush River Watersheds have several reaches that are impaired. Scott explained that a Total Maximum Daily Load (TMDL) is defined as the maximum quantity of a pollutant that a water body can receive and continue to meet water quality standards for designated beneficial uses. A TMDL equals the Waste Load Allocation (WLA), the Load Allocation (LA) and the Margin of Safety (MOS). The Fecal Coliform TMDL final report can be found on the web at www. pca.state.mn.us/publications/wq-iw7-12.pdf.

Scott Matteson, MSUM Water Resources Center, talked to the group about fecal coliform bacteria and why it makes our streams impaired. TMDLs generally have two parts. The first is TMDL Allocations which are based on flow, point source permit data and water quality standards. The second is Source Assessment which is based on the review of water quality data, human and animal inventories and research. He also explained what is included in a TMDL calculation. He presented various graphs showing high and low flow data and what the bacteria counts were in those differing conditions. Data for the TMDL was obtained from samples that were taken during the April thru October sampling season from 1997-2005. The standard for fecal coliform is 200cfu/100ml. A stream is considered impaired if the geometric mean for one month exceeds the standard. The most likely major cause of fecal coliform contamination in the High Island Creek and Rush River Watersheds are septic systems, open feedlots and land applications of manure. He explained how the waste load allocation (source assessment) was calculated and how it was applied to the High Island Creek & Rush River TMDL.

Joel Wurscher, High Island Creek Watershed Coordinator, gave a short overview of the monitoring results from 2006-2008. Sampling continues to show increased fecal coliform in June, July and August. Brooke also had the same conclusions from monitoring on the Rush River.

Scott MacLean once again addressed the committee members about the next steps that are necessary to get the implementation plan written. Today we are developing a strategy for restoration. After the next meeting, ideas will be gathered and a plan will be written. Then a plan will be written and sometime this summer it will be sent to the committee members for review. After being reviewed members will convene another meeting to address changes from the review. The plan must be approved by the EPA by November 14, 2009. Scott mentioned that all of the best management practices that are placed in the plan will be voluntary.

Joel mentioned the work sheet, which is in the packet, should be filled out and brought to the next meeting. If you cannot attend the meeting there is an envelope in the packet to mail it back to Brooke or Joel. The next committee meeting will be March 4, 2009 at noon with lunch provided.

Question:
Is Lake Titloe a part of the TMDL?

Answer:
The North Branch of the Rush River is not impaired but because the outlet is impaired, Lake Titloe would be part of the TMDL and eligible for funding.

Question:
Are there setbacks from open intakes in his bacteria/drainage study?

Answer:
Scott responded that when manure was incorporated there are no setbacks.

There were 37 participants at the meeting with 32 signing the register.

Exhibit 5: 3-4-2009 Meeting Agenda

High Island and Rush River Fecal Coliform Implementation Plan Advisory Committee Meeting
Gaylord, Minnesota 12:00 pm - 2:00 pm
3/4/2009

Agenda – times are approximate

Lunch (15 minutes)

Welcome and introductions – Brooke Patterson and Joel Wurscher (5 minutes)

Funding opportunities – Matt Drewitz BWSR (30 minutes)

Land application of manure – Wayne Cords MPCA (20 minutes)

Open discussion of implementation options (30 minutes)

Ballot Casting – Brooke Patterson and Joel Wurscher (10 minutes)

Wrap-up and preview of summer meeting (5 minutes)

Exhibit 6: 3-4-2009 Meeting Minutes

Meeting Minutes
High Island Creek & Rush River Watersheds Fecal Coliform
Implementation Plan Stakeholder Committee
March 4, 2009

The second meeting of the Fecal Coliform TMDL Stakeholder Committee was opened by Joel Wurscher. Joel gave an overview of what this meeting was going to cover.

After lunch was finished Joel introduced Matt Drewitz who is with BWSR. Matt presented to the committee what the Clean Water Legacy Act (CWL) was about and how it became law. The CWL is Minnesota's strategy to meet the rules defined in the Federal Clean Water Act (CWA).

The CWL is a dual approach to compliance. It is consists of two parts which are restoration and protection. There are six implementation goals in the CWL act. They are to identify all impaired waters, comply with the CWA act, submit TMDLs to EPA, develop a reasonable time frame for restoration, provide technical and financial assistance and then delist the water when restoration is complete.

The Minnesota Legislature created the Clean Water Council (CWC) to rank and recommend projects for the legislature to act on for funding. Matt passed out a copy of the latest recommendations from the CWC that will be presented to the Legislature for FY10-11 funding. The CWC has $171.829 million for projects to be considered. Matt also talked about the 3/8% Constitutional Amendment and how those funds will be dispersed.

Joel next introduced Wayne Cords who is a Manure Management Enforcement Officer with MPCA. Land application of manure is a bigger problem than the feedlot site. Producers know what the setbacks are but may choose not to follow the rules. The more manure that is applied the greater the chance for pathogens to reach the water.

Wayne said that calibration of equipment for applying liquid manure is pretty good. Solid manure is much harder to calibrate and most often it is applied without much calibration. A simple way to calibrate solid manure is to place a 56 inch square piece of plastic on the ground and spread over it. Pick up the plastic and weigh it. The pounds of manure deposited on the plastic equal the tons of manure applied per acre.

Manure is being transported much farther now than it was in the past. Manure ownership is being transferred more often now than it was in past years because of economics. 35% of liquid manure and 65% of solid manure is now being transferred from one owner to another. Today inspection, education and economics are the tools being used to bring stakeholders into compliance.

Scott MacLean from MPCA was introduced as our next speaker. He related to the stakeholder committee what the Implementation Strategies and Direct Actions would be for the Fecal Coliform TMDL. Scott feels there are six strategies that should be looked at. They are feedlot runoff controls, manure management, non compliant septic systems, vegetative practices, pathogen reduction and effectiveness monitoring. There was discussion from the group which produced pros and cons to each idea.

Feedlot Runoff direct actions items were gutters, berms, fencing, filter strips, and basins. Runoff from smaller feedlots will be a bigger problem than runoff from large feedlots. Larger feedlots seem to address the runoff problem when they are going through the permitting process. Education and outreach will be the most effective means of solving feedlot runoff.

Direct action items for manure management are developing plans, workshops, calibration of equipment, custom applicator workshops and inspections. Encouraging applicators to GPS farm intakes and researching application methods/new technology were also thought to be good action items. The group thought that a blanket approach should not be taken but targeting certain operations would be a better way to approach the problem.

Non compliant septic systems were the next strategy that was discussed. The group felt that non compliant septic systems would be easy to target and act upon. Action items discussed were loans, grants to low income families, oversight/enforcement of septic pumpers by MPCA and EPA, more education for pumpers and have the pumpers develop contracts with home owners to keep septic pumping on a 3 year cycle.

Action items for vegetative practices were filter strips, grass waterways and wetland restorations. Another item that was discussed was redetermination of benefits of all ditches with a one rod buffer strip required. Targeting filter strips for areas of surface runoff was also included. Cons to vegetative practices would be the taking of acres out of agricultural production and it would benefit sediment reduction more that bacterial removal. Pros that were stated are removal of bacteria and erosion reduction in ditches.

Pathogen reduction may be cost prohibitive to operators, especially small operations. The watershed may think about offering incentives to ease the cost of this strategy.

The last strategy that was discussed was monitoring. The group felt that monitoring was necessary to see the effectiveness of practices that were established.

Also, consider cost-share funding for intake alternatives to reduce direct sources. Scott again mentioned that all practices would be voluntary.

Brooke and Joel will now tally the information from the survey and what transpired at the two TMDL meetings and then begin to write the implementation plan. There will be another meeting in early summer for stakeholders to look at the draft implementation plan and recommend changes. A target date of August 1, 2009 has been set for submission of the draft implementation plan to MPCA for their approval.

There were 32 stakeholders at this meeting.

Exhibit 7: Ballot Tally

Fecal Coliform Strategy

	Feedlot Runoff Controls	MMPs	Non-conforming Septic Systems	Vegetative Practices	Pathogen Reduction
#1 Priority Totals:	9	10	15	4	0
#2 Priority Totals:	3	2	2	1	0
#3 Priority Totals:	1	0	3	0	0
#4 Priority Totals:	0	1	0	3	0
#5 Priority Totals:	0	0	0	0	2

Other suggested Priority Strategies:
Slow down the flow of the Rush River - 1
Open intake removal/alternatives – 4
Cover/Cap open intakes - 3
City of Arlington Stormwater - 2
Exclusion fencing for manure management operations under 300 AU – 1
Reduction of flow to open intakes – 1
Research to identify the relationship between manure application and fecal coliform levels – 1
More general research – 1

Exhibit 8: Ballot Comments

- Increase inspections of manure application sites.
    - Supply scales and plastic sheets to encourage landowners to calibrate equipment.
- I agree with the septic pumper comments from the meeting.
- County must enforce rules of feedlot runoff, then educate.
- Are the manure management plans being followed, enforcement. Will they continue to test soil after cost share ends?
- Enforcement lacking from the counties. (non-conforming septic systems)
- Vegetative practices near open intakes if landowner is willing.
- Concerns about impacts to society. (Pathogen reduction)
- Demonstrations and education for feedlot runoff control and manure management planning.
- Both Feedlot runoff controls and open intake alternatives address animal agriculture, both at the source (feedlot), and on the lands to which the manure is applied. Eliminating the conduits whereby manure runoff is directly entering a water body should be the first step.
- Both of these will address problems at the source. (Non-conforming septic systems and Tile inlet alternatives.
- Slow down the flow of Rush River.
- Monitor and control when and where flow application is done.
- Educate owners on testing the fields to know what number is needed and what is abundant and no more is needed.
- Teach owners to pre-plan where storage pit or tanks to empty under proper conditions, non-winter months.
- Recommend to feeder injection or incorporation to save the most nutrients and pollution.
- The majority of the manure in the watersheds are applied in the fall, at a time when there is little occurrence of heavy rainfall events that move sediment. This is good. We also seem to know that bacteria probably are most likely killed off in the top soil over the winter.
- Keep up with the ongoing studies – these are excellent, and should provide information to do better over the next ten years.
- Increase education for manure application in seasons correlated with rainfall and sediment movement.
- Reduce the number of open tile intakes
    - Cost share
    - Education
- It is important that research is done prior to prioritizing implementation strategies. We need to identify the areas where the most effect can be had. Not make assumptions.
- All non-conforming septic systems should be identified and rectified. I think these have a higher contribution to high flow spikes in bacteria than we think, as the concentrate during times of low flow and then are flushed downstream during high flow events. Perhaps government assistance can be made available to help with the costs.
- It seems that the larger operations (over 300 AU) are well regulated and are following setbacks, etc. to reduce impacts on waters. However, many smaller operators are not. Cattle are still being pastured directly in streams and rivers, manure piled close to ditches and intakes, or feedlots that have runoff directly into streams, ditches, or intakes. I think a program which would educate and enforce the manure handling for small operators to the same extent as for the large operators would have a significant impact on the water quality.
- Data has been shown that the spike in bacteria following a rain event is high but short lived. When we talk about acceptable levels, how do we handle these short spikes? Do we need to look at it as an on-going average level rather than saying that the levels can "never" exceed the amount, even for a short time? This may be unattainable and unrealistic.

Perhaps we need to look at levels as a mean over a number of measurements during a month, taking into account somehow measurements that were taken during high flow events.

- We need to workout options for open fields tile inlets, such as intensive tile placement in low areas or some type of filters for intakes.
- Composting info to 200 AU horse owners.
- Open/Blind Intakes should be capped in fields receiving livestock waste, as well as road ditch inlets that may receive runoff from such fields.
- Research-We really need to know what would have the greatest impact for the cost. Without such knowledge we are just taking a stab in the dark.
- (Non-conforming Septic systems) According to Scott M. there are 500 in HI Creek and 900 in RR. How can that not be a huge part of the problem?
- We need to have more research to know where exactly the bacteria are coming from. How can we make a plan if we don't know where the source is? Are the bacteria multiplying after it reaches the ditches, etc.?
- (Feedlot runoff control) Have small operators follow the same rules as the larger operators.
- (Non-conforming Septic Systems) Enforce the current rules, we don't need any new ones.
- Old thinking was the small of manure was the smell of money! Now thinking is it's the small of money leaving! In other words, manure is so valuable you can't even afford to lose the smell, which usually is ammonia or nitrogen. Putting manure on low organic soil in a correct manner is a form of recycling and not pollution. Winter application can be problem, but is often the most practical for smaller operations and should not be outlawed.
- Vegetative practices are need both for water bodies and feedlots.
- Include vegetative highest buffers with feedlot runoff controls.
- Pathogen reduction is related to manure management.
- I see a fair amount of manure application on frozen ground - is this even legal? Would replacement of open intakes help? Application set back for open tile, water bodies? Incentives to increase setbacks - add buffers?
- Pathogen reduction as research finds possible.
- Continue ongoing efforts to reduce runoff and manage manure.
- How do we optimize manure use as fertilizer and minimize risk of loss of nutrients to surface waters? How can we afford maximum effect of efforts to insure some reduction in problems?
- Feedlot runoff controls are already 90%+ implemented.
- Manure Management plans are already 90%+ implemented.
- Vegetative practices have little impact on bacteria loading.
- Pathogen reduction is too expensive.
- Manure Management Planning - spreading manure by inlets and ditches.
- (No-conforming septic systems) Easier way for neighbors to report violations without formal reporting. Why doesn't environmental services office/MPCA become more pro-active on this?
- (Manure Management Planning) Do more checking, especially in spring to insure manure isn't spread too close - fine right away if they do.
- Larger sites are already doing manure management planning.
- Manure management planning for smaller operations, which would include the vegetative practices; application rates.
- Non-conforming septic systems: low interest loans, grants for low income persons.
- Education - smaller producers need a way to measure what they are applying. Larger producers hire commercial applicators. Education for commercial applicators. Look at smaller area - make sure everyone is complying and show proof that it is working. Before & After.
- Feedlot Runoff - focus on smaller operations, education and inventory on spreading acres. SSTS - incentives with proof of maintenance, incentive with proof of proper disposal of

sewage for pumpers and awards for compliance to all who comply, articles to media, about why proper maintenance is needed - possibly light-hearted article.

- This is not only a Sibley County Environmental Services major concern but the MPCA's concern as well. Land application of manure/setbacks/rates/run-off potential are the biggest concerns.
- Keep up with the mmps as well as ongoing education to producers.
- Non-conforming feedlots are starting to get under control.
- Non-conforming septics are continuing to get updates.
- 1 rod grass-strips, county wide would be ok but need more than this. (this is a start)
- Vegetative practices are of critical importance along sensitive areas such as drainage ditches, tile intakes, and wetlands. I believe that buffer strips will prevent much run-off from manure applications and soil erosion from reaching the waters of the state. The grasses that are planted need to be left standing and not mowed in order to achieve the desired results.
- Feedlot run-off controls and Manure management planning should be addressed as one.
- Direct action items:
    - Feedlot actions:
        - Funding and assistance to operators/landowners
        - Increased inspection/compliance activities
        - Increased education
        - Demonstration/field tour of compliant feedlot, manure management plan
    - Non-conforming septics:
        - Funding and assistance to individual homeowners
        - Increased education
        - Demonstration/site tour
        - Increased compliance activities after financial and educational activities
- What efforts will it take to obtain local residents' buy-in to address the TMDL?
- How much buy-in is there at the local level of government to implement what's needed to address the TMDL?
- Will the LGU look beyond political issues to do what's right for the environment while assisting the residents of the county to address the TMDL?

Exhibit 9: Implementation Plan Comments

- Action Item A-1: will there be follow up on MMPs?
- How will we reach people about news, events, and workshops?
- Offer incentives for intake removal and denser pattern tiling
    - pay for connections
    - pay only for 5 or 6 laterals
    - cap hook-up numbers
- Field day: Earthworm channels/macropores
- Do we have a way of identifying non-compliant septic systems?
- Partner with the Rural Water Association for septic system classes
- Page 9, Temperature: Is this water temperature or climate?
- Page 41, with county budget issues, would it be beneficial to add in funds for office space if a grant covers it? Or cover ½ and inkind is the other half?