

IMPLEMENTATION PLAN

REGIONAL TOTAL MAXIMUM DAILY LOAD Study of Fecal Coliform Bacteria Impairments In the Lower Mississippi River Basin Of Southeast Minnesota

October 15, 2003

Minnesota Pollution Control Agency
Basin Alliance for the Lower Mississippi in Minnesota

INSIDE COVER

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Introduction:

This Watershed Restoration Action Strategy has been prepared as a plan to implement the source-reduction requirements of the Regional Total Maximum Daily Load (TMDL) for Fecal Coliform Bacteria in the Lower Mississippi River Basin of Southeast Minnesota. Information used in this Strategy is drawn from the Draft TMDL report, the Lower Mississippi River Basin Plan Scoping Document, and the US Environmental Protection Agency's "Protocol for Developing Pathogen TMDLs," documents which are listed as references under Section 7.0. The Watershed Restoration Action Strategy conforms to the organizational scheme laid out in the MPCA's CWP/319 Combined Application form, with "Implementation Plan Requirements" from draft EPA guidance incorporated under existing headings. The latter will be identified with asterisks behind the headings.

The following individual 319 projects will be funded in fall 2003 to implement the Regional Fecal Coliform TMDL. This WRAS, therefore, applies to these projects:

- *Improved Livestock Management in Sensitive Riparian Areas* – Minnesota Department of Agriculture
- *Reduction of Fecal Coliform Bacteria from Human Sources* – Southeast Minnesota Water Resources Board
- *Straight River Fecal Coliform Reduction Project* – Cannon River Watershed Partnership

1.0 Definition of Problem

1.1 Existing Conditions, Opportunities for Pollution Prevention

The Lower Mississippi River Basin in southeastern Minnesota is endowed with a rich variety of landscapes and land uses. Landscapes range from the hills and bluffs of the Driftless Area ecoregion close to the Mississippi River, where land use remains relatively varied and cold-water streams frequently support trout, to the prairie landscape on the western side of the basin which is dominated by row-crop agriculture and hog production. The entire 7,266 square mile region is drained by a network of 11,556 miles of rivers and streams. These streams differ significantly in size, condition of the aquatic environment, and economic uses of the water resource. The Mississippi River with its riverine backwaters and navigation system defines one extreme. On the other extreme are 736 miles of trout water in 102 small, cold-water streams. In-between are main stem warm water tributaries such as the Root, Zumbro and Cannon Rivers.

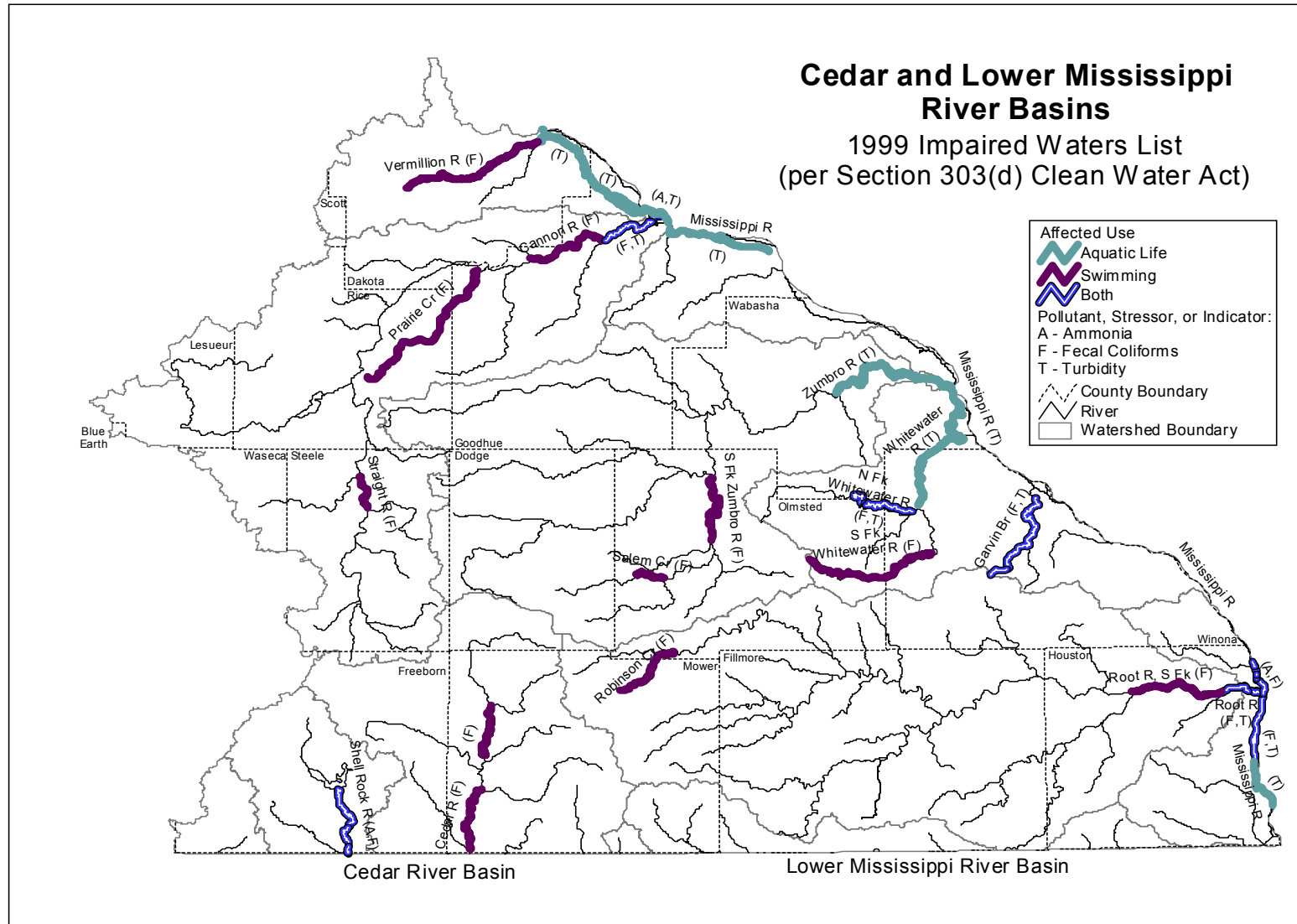
The recreational potential offered by the region's rivers and streams is high, but limited by various forms of aquatic and terrestrial habitat degradation. Fishing, boating, and hiking in and along the region's streams is very popular. In 1998, a Minnesota Department of Natural Resources (DNR) creel survey estimated total mean angling pressure to be 617 hours per acre for the region's trout streams. By contrast, annual angling pressure on Minnesota lakes rarely exceeds 100 hours/acre. Total estimated angling pressure in southeastern Minnesota is 500,000 hours. The Minnesota DNR manages six streams in the basin as

Table 1: Lower Mississippi River Basin 303(d) Impairments for Fecal Coliform, 1998

Reach Name on 1998 303(d) List	Stations	Reach #	Reach Length (miles)	# of Monthly Means > 200 col/100 ml	% of Individual Samples > 2000 col/100 ml	# of Obs.	Use Support
Cannon River, Pine Cr. To Mississippi R.	CA-13 *	07040002-001	9.4	2	4.8	62	Partial
Cannon River, Pine Cr. To Mississippi R.	CA-13	07040002-002	11	2	4.8	62	Partial
Garvin Brook, Headwaters to Mississippi R.	GB-4.5, 6.5	07040003-023	17.1	6	37.3	67	Non
Prairie Creek, Headwaters to Cannon R.	PRA-0.5, 1.5, 2.6	07040002-033	22.8	4	4.3	46	Non
Robinson Creek, Headwaters to N. Br. Root R.	ROB-0.03	07040008-418	8.9	3	23.2	60	Non
Root River, S. Fk. Root R. to Mississippi R.	RT-3	07040008-001	6	6	18	61	Non
Root River, S. Fk. Root R. to Mississippi R.	RT-3 *	07040008-002	11.3	6	18	61	Non
Salem Creek, Split at 220 to S. Fr. Zumbro R.	SAL-7.2, 9.1, 9.9	07040004-120	15	4	16.7	42	Non
Straight River, Maple Cr. to Crane Cr.	ST-18	07040002-021	4.7	4	19.4	62	Non
Mississippi River, La Crosse R. to Root R.	UM-698	07040006-001	0.8	1	1.5	68	Partial
Mississippi River, La Crosse R. to Root R.	UM-698	07040006-002	0.8	1	1.5	68	Partial
Mississippi River, Root R. to Coon Cr.	UM-698 *	07060001-021	8.9	1	1.5	68	Partial

Reach Name on 1998 303(d) List	Stations	Reach #	Reach Length (miles)	# of Monthly Means > 200 col/100 ml	% of Individual Samples > 2000 col/100 ml	# of Obs.	Use Support
Vermillion River, S. Br. Vermillion R. to the Hastings Dam	5346000	07040001-212	11.9	0	15.4	26	Partial
Vermillion River, Headwaters to S. Br. Vermillion R.	VR-32.5, 05345000	07040001-312	8.6	3	4.1	73	Non
Whitewater River, South Fork, Source to Split at 122 S. Fk. Whitewater River	WWR-26	07040003-222	19.5	4	23.8	63	Non
Whitewater River, North Fork, Unnamed Cr. to Middle Fk. Whitewater River	5376000	07040003-120	13.2	0	15.4	26	Partial
S. Fk., Zumbro R., Cascade Cr. To Mid. Fk. Zumbro R.	ZSF-5.7 & ZSF-11.6	07040004-016	12.9	4	23.5	68	Non
Cedar River, Roberts Cr. to Austin Dam, Upper	CD-24	07080201-321	8.8	4	15.9	63	Non
Cedar River, Rose Cr. to Woodbury Cr.	CD-10	07080201-016	10.3	4	11.1	63	Non
Shell Rock River, Albert Lea Lk. to Goose Cr.	SR-1.5 (& SR-1.2 & SR-5.3)	07080202-009	9.8	4	8.8	68	Non

Figure 1: Map of Lower Mississippi River 303(d) Impairments



designated canoe routes. This totals nearly 300 stream miles for canoeing. Usage data provided to the DNR indicates that on an average summer weekend, from 200 to 250 canoes can be found on the Lower Zumbro River alone. Nine DNR trails ranging from three to 48 miles have been established on abandoned railroad grades for hiking, biking, and in-line skating. Hundreds of miles of additional trails are planned for the future. These trails frequently run parallel to streams, and have helped to stimulate interest in tubing in the Root, Zumbro and Cannon Rivers. Maintenance of high water quality in streams adjacent to the trails is integral to the quality of outdoor experience valued by the thousands of people who use the trails.

The recreational use of streams and rivers is limited, however, by various kinds of environmental degradation. Water quality monitoring over several decades has shown widespread exceedances of state and federal water quality standards throughout the basin for turbidity (suspended solids) and fecal coliform bacteria, along with increasing concentrations of nitrate nitrogen. Nitrate concentrations exceeding drinking water standards are found in shallow aquifers. Intensive land use, including significant artificial drainage, coupled with extreme weather, has led to increased flooding and stream bank erosion. The sources of these problems number in the thousands and are widely distributed over the rural and urban landscape. Sources pertinent to fecal coliform, a problem which directly affects recreational suitability of the areas streams, include failing residential septic systems, unprotected feedlots or manured fields, and pet waste that enters surface water through urban stormwater runoff.

The widespread problem of fecal coliform impairment is caused by thousands of ubiquitous pollutant sources spread across the basin – feedlots, manured fields, and failing septic systems, to name the main ones -- rather than by a few large, discrete sources. Pollution can be reduced and prevented by ensuring that these individual sources are brought into conformance with state rules and local ordinances as well as Best Management Practices for land use.

The Regional TMDL addresses the widespread problem of fecal coliform impairment through a single pollutant reduction plan, developed and implemented in collaboration with other agencies through basin management. Aside from its obvious efficiency advantages, the regional approach is considered appropriate because the similarities among these impairments and their contributing watersheds are greater than their differences. Natural differences in landscape, soils and hydrology have a less significant influence on the problem of fecal coliform than do the main pollutant sources (humans, livestock) and management practices (e.g., how manure is handled.) Moreover, regional differences in the latter are not significant enough to require to totally separate TMDL evaluations. Rather, these differences are dealt with in individual watershed chapters. These chapters evaluate the degree and types of adjustments to the Regional TMDL allocation and source reductions that will likely be appropriate for the individual reach impairments within the watershed.

In summary, the Regional TMDL approach is designed to deal with a single, basinwide problem caused by the cumulative impact of thousands of small, ubiquitous sources. It is designed to be implemented through collaborative strategies developed through basin management and implemented by existing units of government – frequently local, but also state and federal. These strategies should be geographically targeted to deal with differences in severity of impairment and types and quantity of pollutant sources as they occur across the basin. Information provided in individual watershed chapters is meant to help guide such efforts. Through basin management efforts, the implementation of several key source reduction strategies already is underway.

1.2 Water Quality Problem: Summary of Data

Minnesota's water quality standard for fecal coliform bacteria (Minn. R. ch. 7050.0222 subp. 4 and 5) for class 2B and 2C waters states that fecal coliform shall not exceed 200 organisms per 100 milliliters as a geometric mean of not less than five samples in any calendar month, nor shall more than ten percent of all samples taken during a calendar month individually exceed 2,000 organisms per 100 milliliters. The standard applies between April 1 and October 31. For Class 2A waters, the same standard applies with the following modification: no more than 10 percent of all samples taken during a calendar month shall exceed 400 organisms per 100 milliliters. The part of the standard that references a monthly geometric mean of 200 organisms per 100 milliliters was chosen as the environmental endpoint for the TMDL study. This is the common reference point for determining exceedances of the fecal coliform standard.

Table 2 summarizes the results of 2300 water samples collected at 113 monitoring sites throughout the basin from 1997-2001. Although impairment designations were generally made using data collected prior to this time, the more recent data is felt to better describe the degree of impairment under current conditions in the basin. A relatively small number of samples collected from the Mississippi River have not been included, as they reflect contributions from outside of the basin (i.e. Minnesota River, Upper Mississippi, and Wisconsin tributaries). In general, average Mississippi River fecal coliform concentrations have been lower than most other streams and rivers in the basin. As such, fecal coliform reduction efforts necessary to meet water quality standards throughout the basin should be sufficient to address the basin's portion of the fecal coliform load to the Lower Mississippi River.

Table 2: Summary of 1997-2001 Fecal Coliform Data for Lower Mississippi Basin in Minnesota

Impaired Reach Monitoring Sites						All Monitoring Sites in Watershed					
Watershed	Site	May Geo. Mean (orgs./100ml)	N	Summer Geo. Mean (orgs./100ml)	N	Number of Sites	Median of May Geo. Mean (orgs./100ml)	n	Number of Sites	Median of Summer Geo. Mean (orgs./100ml)	n
Vermillion*	VR-32.5	86	6	249	26	23	200	109	33	400	451
Cannon	CA-13	98	6	213	26	19	212	96	24	640	414
	ST-18	167	6	603	32						
	PRA-0.05	238	5	754	31						
Zumbro	ZSF-5.7	73	6	430	26	10	103	39	17	430	230
	SAL-7.2	170	5	233	22						
Whitewater	WWR-26	325	6	1712	25	6	1988	26	6	1075	190
Garvin	GB-4.5	285	2	1209	8	8	401	24	8	437	161
Root	RT-3	34	6	853	26	5	437	21	10	785	94
	ROB-0.03	251	5	334	22						
Cedar						15	455	30	15	485	415
Basin		168	53	516	244	86	401	345	113	485	1955

* Values for all monitoring sites in Vermillion River watershed are approximate

1.3 Main Sources of Water Quality Problem

Table 3 summarizes the major sources of fecal coliform in the basin. It is important to recognize that there is a fair amount of uncertainty associated with all of the numbers in the table. The facility numbers and livestock animal units came mainly from county feedlot inventory records. In some cases, inventory numbers could be based on the capacity of the facility rather than the actual livestock present, resulting in an overestimate of actual livestock numbers. The rural population with inadequate wastewater treatment is based largely on the rural population of each county, multiplied by a local estimate of the percentage of septic systems that are not functioning properly. Pet numbers are derived from a national survey that may not completely reflect conditions in southeastern Minnesota.

Table 3: Inventory of Fecal Coliform Producers in Lower Mississippi Basin in Minnesota

Category	Sub-Category	Animal Units or Individuals	
Livestock	The Basin contains an estimated 8,800 livestock facilities ranging in size from a few animal units to several thousand	Dairy	508,273 animal units
		Beef	531,623 animal units
		Swine	640,945 animal units
		Poultry	72,166 animal units
		Other	44,554 animal units
Human	Rural Population with Inadequate Wastewater Treatment	65,314 people	
	Rural Population with Adequate Wastewater Treatment	82,533 people	
	Municipal Wastewater Treatment Facilities	490,173 people	
Wildlife	Deer (average 10 per square mile)	72,660 deer	
	Geese*	20,000 geese	
	Other	It was not possible to obtain reliable estimates of numbers for other wildlife. In an attempt to account for the fecal coliform bacteria that might be produced by other wildlife, an equivalency to all deer in the basin was assumed	
Pets	Dogs and Cats in Urban Areas**	256,850 dogs and cats	
	Dogs and Cats in Rural Areas***	77,470 dogs and cats	

* rough estimate, likely representing maximum numbers

**490,173 people x 2.5 people/household, 0.58 dogs/household, 0.73 cats/household

*** 147,847 people x 2.5 people/household, 0.58 dogs/household, 0.73 cats/household

Load proportions (Table 4) were obtained by multiplying the available fecal coliform with the delivery percentage (See Section I, Chapter 4, Regional Fecal Coliform TMDL). The exception was for municipal wastewater treatment facilities, where the cumulative flow from all mechanical facilities was multiplied by 200 orgs./100ml. A review of records from these facilities indicated a relatively small number of discharges in excess of 200 orgs./100ml. In effect, this leads to “worst case” proportions for municipal wastewater treatment facilities. Wastewater bypasses are not included in Table 4 due to their episodic nature, and the limited number of facilities at which they occur. For short periods of time in localized areas, however, they could be responsible for a significant proportion of the fecal coliform load in a stream or river.

Table 4: Estimated Current Fecal Coliform Bacteria Load Contributions from Different Sources to the Streams and Rivers of the Lower Mississippi Basin in Minnesota

Source	Current Load Contributions (percent of total daily load for entire basin)			
	May (Wet)	May (Dry)	Summer (Wet)	Summer (Dry)
Overgrazed Pasture near Streams or Waterways	5%	38%	21%	38%
Feedlots or Manure Stockpiles without Runoff Controls	17%	0%	37%	0%
Surface Applied Manure	66%	0%	29%	0%
Incorporated Manure	8%	0%	0%	0%
Failing Septic Systems and Unsewered Communities	2%	52%	7%	52%
Municipal Wastewater Treatment Facilities*	1%**	1%	1%**	1%
Deer	<1%	2%	<1%	2%
Geese	<1%	3%	<1%	3%
Other Wildlife**	<1%	4%	<1%	4%
Urban Stormwater Runoff***	1%	0%	3%	0%
<p>Note – All sources shown in this table are present throughout the entire basin. However, source contributions may vary from these basinwide values for a given location on a given stream or river.</p> <p>* Does not include wastewater bypasses, which may occur at some facilities under extreme weather conditions. These events, while rare, have the potential for significant localized fecal coliform loading.</p> <p>** Average flow differences between May and summer were considered, but not between wet and dry conditions. Assuming a constant fecal coliform discharge from wastewater treatment facilities, these are likely overestimates during higher flows associated with wet conditions.</p> <p>*** Assumed that all other wildlife produce a fecal coliform bacteria load equal to that of all deer, plus pets in rural areas</p> <p>**** Assumed that uncontained pet waste was the major source of fecal coliform bacteria</p>				

2.0 Build a Project Team and Public Support

2.1 Agency roles and responsibilities --

Basin Management: Problems of water quality impairment in general, and fecal coliform pollution in particular, are being addressed in the region through two complementary processes: basin management, and Clean Water Act implementation. Through basin management, local, state and federal agencies and organizations have joined together in a collaborative called the Basin Alliance for the Lower Mississippi in Minnesota (BALMM) to set common water quality goals, develop interagency strategies to achieve them, and implement the strategies through existing local units of government. The MPCA is working through BALMM, and directly with local units of government, to address surface water quality impairments for fecal coliform bacteria through the Total Maximum Daily Load (TMDL) process described in Section 303 of the Federal Clean Water Act. The TMDL process mirrors basin management in its focus on setting water quality goals, identifying sources, and developing strategies to achieve these goals. However, it calls for more precision than usually is attempted in basin management strategies in requiring pollutant loads to be allocated among sources, and in calling for load reduction targets for pollutant sources to achieve.

The simultaneous implementation of basin management and the TMDL process in the Lower Mississippi River Basin of southeastern Minnesota has resulted in a synthesis called a Regional TMDL. Typically, TMDL evaluations focus on a single reach impairment. By contrast, the Regional TMDL deals with a group of stream impairments across a large region. The Minnesota Pollution Control Agency has listed 20 stream reaches in the Lower Mississippi River Basin and the contiguous Cedar River Basin as impaired for swimming designated use (primary contact recreation) under Section 303(d) of the Clean Water Act. Sixty-five percent of the basin land area drains to these impaired reaches (Figure S-1) The main cause contributing to impairment is excessive fecal coliform bacteria load.

This Regional TMDL evaluation treats these impairments as 20 indicators of a single, widespread problem, rather than as indicators of 20 separate, individual problems. The efficiencies thereby obtained will enable the MPCA and partners to move more rapidly to implementation of source reduction strategies, rather than preparing many similar TMDL evaluations. The broad geographic scope of the regional TMDL means that its implementation will help to protect waters that meet water quality standards while it works toward source reductions to address widespread impairments. As more water quality monitoring leads to the addition of

more reaches to the 303(d) impaired waters list, the regional TMDL including the appropriate watershed chapter will provide a context within which the impairments can be addressed, removing the need to conduct additional independent TMDL studies within the same watershed or basin.

The MPCA has had the main responsibility for completing the Regional TMDL study. However, ensuring that the source-reduction objectives and water quality targets of the Regional TMDL are met is very much a shared responsibility. The following grid shows the main local, state and federal agencies responsible for the key fecal coliform source-reduction categories.

Table 5: Agency Roles and Responsibilities for Fecal Coliform Source-Reduction Categories			
Source-Reduction Category	Leading Local Agencies	Leading State Agencies	Leading Federal Agencies
Feedlot Runoff	Counties, SWCDs	MPCA, BWSR	NRCS
Manure Management	Extension, SWCDs, Counties	MPCA, MDA, BWSR	NRCS
Pasture Management	SWCDs, Extension	BWSR; MDA	NRCS
ISTS	Counties	MPCA, DTED, MDA	EPA
Unsewered Areas	Counties	MPCA	EPA, USDA Rural Development
Stormwater	Municipalities, Counties, SWCDs	MPCA	EPA
Municipal Wastewater	Municipalities	MPCA	EPA
Shoreland Management	SWCDs, Counties	DNR, MPCA	NRCS, USFWS
Conservation Tillage	Extension, SWCDs	BWSR, University of Minnesota	NRCS

2.2 Coordination of Activities

As is evident from Table 5, a large number of agencies at the local, state and federal level are responsible for the key source-reduction management activities identified in this implementation plan. Coordinating their activities to ensure that effective and workable strategies are developed and implemented in a timely fashion is a tremendous logistical and political challenge.

Basin Alliance for the Lower Mississippi in Minnesota (BALMM) provides overall coordination amongst local, regional, state and federal agencies concerned with natural resources management in the basin. The Lower Mississippi River Basin Plan Scoping Document 2001 developed by BALMM contains water quality objectives upon which there is broad agreement. This includes achievement of the fecal coliform bacteria standard within the decade. The basin plan also includes strategies for achieving water quality objectives. Strategies for feedlots, manure management, urban runoff, wastewater treatment and pasture management serve as the basis for developing more specific source-reduction projects to achieve the objectives of the Regional TMDL. BALMM provides ongoing coordination among agencies through monthly meetings, a regular e-mail newsletter, and widely recognized leadership with regard to regional water quality management.

In addition to BALMM, several regional organizations provide ongoing coordination for key source-reduction activities.

The Southeast Minnesota Water Resources Board (SWMWRB) is a joint powers board of nine counties: Dodge, Fillmore, Goodhue, Houston, Mower, Olmsted, Rice, Wabasha, and Winona. The SEMWRB is playing an active role in coordinating county activities in the basin with respect to feedlots (implementing the Open Lot Agreement, a feature of the recently revised state feedlot rules); ISTS; and unsewered areas.

Southeast Minnesota SWCD Technical Support Joint Powers Board -- (SE SWCD TSJPB) is a joint powers board of 11 Southeast Minnesota SWCDs that provides additional engineering assistance to nonpoint source pollution control projects in the basin, feedlots in particular.

Area 7, Minnesota Association of Soil and Water Conservation Districts Association – an association that takes a leading role in promoting soil conservation practices including conservation tillage and urban/suburban stormwater management.

Cannon River Watershed Partnership – A nonprofit organization that coordinates water quality monitoring and restoration activities within the Cannon River watershed, including participation in the Straight River TMDL project, key aspects of which were applied to the Regional TMDL.

Whitewater River Watershed Partnership – A joint powers board of SWCDs and counties in Winona, Wabasha and Olmsted Counties, which coordinates assessment and implementation activities in the Whitewater River watershed.

University of Minnesota – The University takes a lead role in developing and promoting conservation tillage, and in conducting training and education on the proper management of ISTS, and in fostering community solutions to the problem of inadequate wastewater treatment.

2.3 Integration with Existing Programs –

The key strategies of the implementation plan for fecal coliform source reduction are built on a foundation of local government program activity. This is particularly true of the two major projects that have been implemented through the SEMWRB with the support of 319 funding: the Targeted Feedlot Runoff Reduction Project, and the Targeted Residential Wastewater Treatment Acceleration Project. In each of these cases, the projects were developed following a careful and quantitative assessment of county programs to implement Minn. Rule ch 7020 and Minn Rule ch 7080. These assessments have since been updated, and serve as a foundation for additional implementation strategies included in this plan.

In addition, the source-reduction strategies for feedlots and ISTS have been developed taking into account the likely availability of federal and state funding in the form of cost share for feedlot improvements, revolving loan funds for septic system upgrades and Rural Development-USDA funding for unsewered communities. As a result, the primary use of 319 funds will be to increase local capacity to provide technical assistance for feedlots, manure management and pasture management, and to provide intensive training and education on ISTS and unsewered community issues. At the present time, it appears that it would be duplicative to use 319 funds primarily for cost-share or loans.

Stormwater source reduction strategies will be closely coordinated with the introduction of Phase II permitting of Municipal Separate Storm Sewer Systems required of communities with a population of 10,000 or more in addition to other communities listed by EPA.

In 2000 MPCA established a provisional objective of 50 percent fecal bacteria source reduction basinwide, in the first step towards a regional approach to addressing fecal coliform impairments. This information was presented April 21, 2001 at the BALMM meeting at the River Bend Nature Center in Faribault, as part of a proposal for a regional TMDL.

The provisional 50 percent fecal coliform source reduction goal was chosen as the main environmental objective of a Section 319 Grant application developed by the Southeast Minnesota Water Resources Board (SEMWRB). This application, the Targeted Residential Wastewater Reduction Project, included 11 counties in the basin who were involved in its development through surveys, meetings and other conversations. This project, which received full funding, became the main implementation

strategy for source reduction from failing septic systems and unsewered communities. The project targets educational and technical assistance according to guidance provided by county staff responsible for Individual Sewage Treatment System program administration. It will be initiated in autumn 2002.

A 319 project entitled "Targeted Feedlot Runoff Reduction Project" was developed for eight counties by the SEMWRB in 2000. It adopted the fecal coliform standard as a main environmental objective. Through this project, eight counties in the basin have obtained additional resources to implement the Open Lot Agreement, a new feature of state feedlot rules which allow for phased-in compliance of feedlots of 300 animal units or less. Implementation of this project to supplement existing county efforts is a major aspect of the fecal source reduction strategy for livestock manure. Each county helped to determine how it would use the grant resources to increase its capacity to implement the Open Lot Agreement, thereby participating directly in the development of a strategy to achieve the source-reduction objectives of the Regional TMDL. This grant was initiated in August 2001.

2.4 Public Participation and Involvement

From the very beginning of the Regional Fecal Coliform TMDL Project, a broad array of state and local agencies and stakeholders have been involved through BALMM. This locally led alliance of land and water resource agencies formed in late 1999 in order to coordinate efforts to protect and improve water quality in the Lower Mississippi River Basin. BALMM covers both the Lower Mississippi and Cedar River Basins, and includes a wide range of local, state, and federal resource agencies. Members of the Alliance include Soil and Water Conservation District managers, county water planners, and regional staff of the Board of Soil and Water Resources, Pollution Control Agency, Natural Resources Conservation Service, U.S. Fish and Wildlife Service, University of Minnesota Extension, Department of Natural Resources, the Southeastern Minnesota Water Resources Board, the Cannon River Watershed Partnership, and others. BALMM meetings are open to all interested individuals and organizations. Existing staff from county and state agencies provide administrative, logistical and planning support. These include: Bev Nordby, Mower SWCD, Chair; Norman Senjem, MPCA-Rochester, Basin Coordinator; Clarence Anderson, Rice SWCD, Area 7 MASWCD Liaison; Bea Hoffmann, SE Minnesota Water Resources Board Liaison.

This Basin Plan Scoping Document is the fruit of a year-long effort by participants in BALMM. Environmental Goals, Geographic Management Strategies, and Land-Use Strategies were developed by either individual BALMM members or strategy teams. An effort was made to involve those

who will implement the strategies in developing them. Each strategy was presented at least once, at a monthly BALMM meeting, and subsequently revised, based on comments received, before being included in this draft document. Other parts of the document were prepared by the Basin Coordinator, who drew on a multitude of published sources to describe the basin's geology, water quality, and land-water relationships.

BALMM and other organizations have been provided with opportunities for comments and suggestions regarding the Regional Fecal Coliform TMDL.

In spring 2002, BALMM members began developing additional source-reduction proposals for funding, after it was learned that special 319 funding would be available in watersheds with completed TMDLs. These proposals, still in progress, include: a) provision of additional engineering resources to assist small feedlot operators in developing and implementing runoff reduction solutions (Southeast Minnesota Soil and Water Conservation District Technical Support Joint Powers Board); b) promotion of manure composting (Whitewater River Watershed Partnership); c) livestock exclusion from streams (Board of Water and Soil Resources); additional technical assistance to address failing septic systems and unsewered communities (SEMWRB). These projects are being prepared for funding applications by October 2002, and are contributing to the development of a plan to achieve the source-reduction objectives of the Regional TMDL.

The involvement of BALMM in developing implementation strategies to achieve major fecal coliform source reductions is cited in the Regional TMDL as providing reasonable assurance that its objectives will be achieved.

MPCA staff gave a presentation to BALMM on the Regional Fecal Coliform TMDL on April 17, 2002 with updates provided at each monthly meeting through August 2002.

MPCA staff gave presentations on the Regional TMDL to the SEMWRB on May 13, 2002. MPCA gave a presentation on the Regional TMDL to the SEMWRB Advisory Committee, composed of county water planning coordinators, on May 1, 2002.

On June 27, 2002, in Northfield, MPCA staff met with Kris Sigford, Minnesota Center for Environmental Advocacy (MCEA), and Patrick Ganey, Cannon River Watershed Partnership, to present the Regional TMDL and answer questions. Mississippi River Revival (MRR) and Clean Water Action Alliance (CWAA) were invited but did not attend.

A public comment period for the Regional TMDL extended from July 8 – August 12, 2002. The Regional TMDL was posted on the MPCA web site along with a Regional TMDL Fact Sheet. A total of 15 comments were received during this period. Twelve of the comments were received as letters, faxes and e-mail messages. Three additional comments were made at public meetings held on July 30, 2002. Comment letters from the MCEA and MRR dated August 12, 2002, included requests for a contested case hearing on the Regional TMDL. A comment letter from CWAA stated their support of the MCEA request.

Three public meetings were held on July 30, 2002, at the Rochester MPCA regional office. Two were for the general public, one was for farmers and others interested in agriculture. These meetings were attended by a total of 87 people.

A news release on the Regional TMDL was distributed July 8, 2002, the first day of the public comment period. This led to a front-page article in the July 9 Star-Tribune, which was picked up by newswires, leading to stories in many additional news media. Agri-News, a major weekly newspaper for farmers, ran stories on the Regional TMDL August 1 and August 8, 2002.

In addition to the above opportunities for public involvement in the Regional TMDL, there were many more opportunities associated with the Straight River TMDL project, which became incorporated in the Regional TMDL. A project steering committee included representatives of local government, agriculture, cities and other citizens. The Straight River TMDL Technical Committee consisted of the MPCA, MCEA, Steele County and Cannon River Watershed Partnership. The steering committee and technical committee met from January 2001 to December 2001 to develop a fecal coliform TMDL for the Straight River watershed, a tributary of the Cannon River. Quantification methods for calculating waste load allocations and load allocations were developed in the Straight River TMDL. These methods were used with minor adjustments to make similar calculations in the Regional TMDL.

2.5 Education and Outreach

Education and outreach efforts are built into each of the individual strategies that compose the implementation plan for the Regional TMDL. The feedlot strategy promoting the Open Lot Agreement includes training of Feedlot Officers, Feedlot Agriculturists and Technical Support staff through University Extension. Those who are trained, in turn, provide education to feedlot operators. The residential wastewater project just getting underway provides funding for an Extension Educator to provide education and training on fecal coliform and ISTS issues, in addition to two people to work with residents of unsewered communities. A 319 grant

promoting better pasture management includes training and education as key components. Also, BALMM promotes education regarding urban stormwater, agricultural soil conservation, management of shoreland areas with buffer strips, and other practices through its diverse membership. Projects being proposed for future 319 funding will build upon this educational foundation. These efforts will be used to enhance public understanding of the Regional TMDL and individual source-reduction strategies and projects. They also will encourage the participation of landowners, local government and others in selecting, designing and implementing the nonpoint source management measures.

Karst Campaign: The University of Minnesota Extension in 2002 received a USDA grant to develop a karst campaign, consisting of an integrated approach to promoting the adoption of water quality best management practices by farmers in the karst region of southeast Minnesota. An aspect of this grant of pertinence to the Regional TMDL is the development of agricultural best management practice guidelines to attain TMDL requirements. Among the specific agricultural management practices being addressed that are relevant to the Regional TMDL are feedlot siting and design criteria for karst geology; promotion of forage-based livestock farming practices that are productive, profitable and environmentally sound; conservation tillage; and nutrient management (including manure management). In addition, the karst campaign includes developing and delivering effective messages on water quality status and hydrology in the karst region of southeast Minnesota and how it relates to farming practices. The karst campaign thus will establish a comprehensive context for delivering information to farmers concerning fecal coliform impairments as well as related environmental issues. When the karst campaign is completed, efforts will be made to seek support and funding to implement its components.

2.6 Communicating Lessons to Others in State and Beyond

The communication of lessons learned is already happening and will continue into the future. The intensive involvement of University Extension in the strategies for ISTS and unsewered communities has already resulted in sharing of lessons across the state. The programmatic template developed for the Lower Mississippi River Basin through the 319 grant for residential wastewater treatment will be applied across the state in future years. Those Extension staff working in southeast Minnesota also work in the rest of the state, so sharing of lessons learned will occur naturally. The same is true with regard to the rotational grazing strategy, as the NRCS staff person concentrating in southeast Minnesota also works statewide. MPCA staff have given presentations on the Open Lot Agreement project at state meetings. The same is true of the Regional TMDL itself. As new projects are developed to implement the Regional

TMDL, opportunities will be sought out to present lessons learned on these projects as well as on the Regional TMDL project as a whole, which is the first of its kind in the Upper Midwest.

3.0 Set Goals and Identify Solutions

3.1 Existing vs. Desired Uses of Waters of Concern

The Regional TMDL study focuses on a single cause of use impairment – fecal coliform bacteria. It has found widespread impairment of the region’s rivers and streams, often at twice the level of the water quality standard or greater. Thus, current body contact recreation of impaired streams is occurring at levels of health risk that are higher than the risk level associated with the water quality standard. Achieving the ultimate goal of the Regional TMDL by meeting water quality standards would restore these waters to their designated uses – that is, body contact recreation with minimal risk of disease transmission from the aquatic environment to recreational users. This can be expected to lead to increased use as well as safer use of the region’s streams by the public.

3.2 Water Quality Goals

The approach to describing the degree of fecal coliform impairment (and magnitude of reduction required to meet the load allocation) was to calculate the median of the geometric mean for all sites within seven different basin watersheds. May data was analyzed separately from summer (June-September) data to reflect seasonal differences in weather, stream flow, and fecal coliform sources. The amount of data that were available prior to May and after September was very limited, so was not included. The median of the seven watershed values was then used to suggest the degree of impairment basinwide. These basinwide median fecal coliform concentrations are 401 organisms/100 ml for May, and 485 organisms/100 ml for summer. Because these concentrations will be multiplied by average flows to estimate daily fecal coliform loads, the concentrations will be directly proportional to the loads. As such, the overall magnitude of load reduction necessary to meet an average in-stream concentration of 200 organisms/100 ml will be:

$$\begin{aligned} \text{May} & - (401-200)/401 = 50\% \\ \text{Summer} & - (485-200)/485 = 59\% \end{aligned}$$

To determine if a higher level of reduction is necessary for particular reaches (Chapters 12-19 in the Regional TMDL study), both the impaired reach and watershed data shown in Table 3.50 were considered. Because of the higher number of observations, as well as greater spatial and temporal coverage, the watershed median fecal coliform concentrations were generally felt to be better indicators of reduction magnitude than the more limited individual reach data set.

TMDL Endpoints. Target fecal coliform concentrations were determined to be the water quality standard for class 1B, 2A and 2C waters, a monthly geometric mean of 200 organisms/100 mL for the season April 1 through October 31. The endpoint will meet designated uses for these waters.

3.3 Fecal Coliform Source Reductions Needed to Satisfy the TMDL

Based on average fecal coliform concentrations (Table 2) and average total flow for the basin¹, daily fecal coliform loads in the basin are:

May: 5.64×10^{13} organisms/day
Summer: 3.91×10^{13} organisms/day

To meet water quality standards, the allowable daily fecal coliform loads in the basin's rivers and streams are:

May: 2.81×10^{13} organisms/day
Summer: 1.61×10^{13} organisms/day

Table 6 presents an "equal reduction" scenario for the major sources in the basin that will be necessary to meet the allowable fecal coliform loads.

¹ Based on long-term USGS flow records for the Straight, Vermillion, Cannon, Zumbro, Whitewater, Root, and Cedar Rivers, and extrapolating for areas not covered by these stations, May and Summer average daily flows for the entire basin was estimated at 3723 mgd, and 2135 mgd respectively.

Table 6: Percent Reductions from Current Fecal Coliform Bacteria Levels Necessary to Meet Total Maximum Daily Load Allocation for the Lower Mississippi Basin in Minnesota

Source	Load Reduction (from current load contribution)			
	May (Wet)	May (Dry)	Summer (Wet)	Summer (Dry)
Overgrazed Pasture near Streams or Waterways	52%	56%	61%	65%
Feedlots or Manure Stockpiles without Runoff Controls	52%	0%	61%	0%
Surface Applied Manure	52%	0%	61%	0%
Incorporated Manure	52%	0%	0%	0%
Failing Septic Systems and Unsewered Communities	52%	56%	61%	65%
Municipal Wastewater Treatment Facilities	0%	0%	0%	0%
Deer	0%	0%	0%	0%
Geese	0%	0%	0%	0%
Other Wildlife	0%	0%	0%	0%
Urban Stormwater Runoff	52%	0%	61%	0%
For the sources where fecal coliform load reduction was deemed feasible, an equal reduction was applied for each column				

The degree of source reduction needed to reach water quality endpoints in the basin is estimated to be 52-56 percent in May and 61-65 percent in summer (June –September). Across the basin, it is proposed that a 65 percent reduction be equitably applied to all major sources listed in Table 6, for both for spring and summer months. Reduction requirements for individual reach impairments can be adjusted to take into account the composition of local sources, and local preferences, as long as the resultant percentages can be demonstrated to achieve the TMDL end points.

These source reduction allocations apply to aggregate categories of sources such as feedlots, manured fields, failing ISTS, urban stormwater runoff, etc. This TMDL assessment does not intend to suggest that every single member of a source category poses a pollutant risk or is a significant contributor of fecal coliform bacteria. Aggregate source reduction targets should not be applied uniformly to all members of a source category. Precisely which individual sources within these aggregate categories are significant contributors of fecal coliform bacteria and, therefore, need to be reduced, is beyond the scope of this TMDL assessment to determine. Such questions will be addressed in the process of implementing the TMDL.

The use of averages for estimating pollutant contributions from major source category is a practical requirement that is not meant to imply anything close to uniform contributions by individual sources. The degree of pollutant risk posed by individual sources within each category will range from zero or negligible to very significant. Source reduction allocations are also given as an average to be applied to each category. However, implementation efforts will not be uniformly applied to all members of each source. Implementation efforts will target the highest-risk, highest-contributing individual sources of fecal coliform bacteria.

4.0 Nonpoint Source Management Measures and Expected Load Reductions from Implementation

In this section, nine types of management measures for achieving fecal coliform bacteria source reductions are described. Included in the description of each management measure is an estimate of the time and the types of additional resources that will be required to achieve the Phase I goal of a 65% source reduction. More precise estimates of funding and time required to implement these management measures will be developed as detailed strategies are prepared for implementation.

The following implementation strategies are referenced in the BALMM Basin Plan Scoping Document and are in the process of being implemented, often with support from federal grants. Several of the strategies build upon a solid foundation of state rules (feedlots, manure management, ISTS, stormwater, and municipal wastewater and biosolids) and county-delegated programs as a delivery system for technical and financial support and rule enforcement. Others will be pursued through strictly voluntary programs, such as promotion of buffers, rotational grazing, and conservation tillage. In the latter cases, BALMM strategies work through local delivery systems for technical and financial assistance, and are based on effective inter-agency collaboration. For these reasons, there is a very high degree of “reasonable assurance” that source reduction strategies for this Regional Fecal Coliform TMDL will be implemented within the near to mid-term future – the BALMM Basin Plan Scoping Document, on which all the strategies are based, calls for full implementation by 2010.

Quality Assurance: Quality assurance of the following management measures are ensured by adherence to state and federal rules and guidelines for ISTS, feedlots, municipal wastewater treatment systems, manure management plans, stormwater management plans, rotational grazing systems, livestock exclusion systems, and riparian buffer strips. University of Minnesota guidelines are available for conservation tillage.

4.1 Overgrazed Pasture Near Streams or Waterways

4.1.1 Pasture Management Measures

Managed Rotational Grazing – Well-managed pasture and hay provide important environmental benefits by increasing infiltration and reducing surface runoff. The steady reduction in pasture acreage from 472,000 acres in 1982 to 368,000 acres in 1997 (National Resources Inventory, NRCS) thus is viewed as an alarming trend in the Lower Mississippi River Basin. However, the continued presence of overgrazed pastures, particularly those that provide cattle unrestricted access to streams, remains a significant source of fecal coliform and turbidity problems.

Managed rotational grazing presents a way of addressing both of these concerns. Well-managed rotational grazing is demonstrated to be both economically viable and environmentally beneficial. Thus, it is a system whose wider adoption could help to keep land in perennial vegetation while ensuring that it is managed in such a way as to minimize environmental impacts on water quality. Sovell, et. al. (2000) demonstrated that rotational grazing, in contrast to conventional grazing, significantly reduces both sedimentation and fecal coliform concentrations in water downstream of study sites in southeastern Minnesota.

Since managed rotational grazing is a livestock farming system that is quite different from conventional production methods, it needs to be presented to farmers in the context of a farm plan with discrete technical components. Accordingly, the basin plan calls for an education and technical assistance program to farmers based on the following components of a grazing plan delivered through workshops, tours and one-on-one assistance:

- Pasture Forage Plant Identification
- Fencing for Livestock
- Livestock Watering Systems
- Planning Rotational Grazing Systems
- Strategies for Maximizing Forage Production
- Pasture Monitoring
- Sensitive Areas Identification and Management

Accelerated Adoption of Rotational Grazing – This BALMM Strategy is being implemented in part through a Section 319 Grant for which funding of \$139,300 will begin in the 2002 fiscal year. The project focuses on four counties especially suitable for this practice – Fillmore, Houston, Wabasha, and Winona. By assisting producers in the writing of managed rotational grazing plans, it would increase estimated acreage of this practice from 7,500 to almost 20,000 acres. It would also train local resource managers to continue helping beef and dairy farmers to convert from conventional to rotational grazing, with the goal of the latter becoming the dominant pasture management practice in the region. Future projects will be needed to build upon and expand the foundation established through this grant.

Riparian Buffers with Livestock Exclusion – This management system will be promoted and implemented to reduce runoff where pastured livestock have unrestricted access to streams. It is composed of just two of the above elements of a planned rotational grazing system, shown above (fencing and watering), in addition to management of the riparian vegetation. This practice, and rotational grazing, are eligible for funding through the NRCS Environmental Quality Incentives Program (EQIP). Additional funding sources may be needed to supplement EQIP in targeted areas.

4.1.2 Load-Reductions Expected from Management Measures

Managed Rotational Grazing and Riparian Buffers with Livestock Exclusion – Research by Laurie Sovell (“Impacts of Rotational Grazing and Riparian Buffers on Physiochemical and Biological Characteristics of Southeast Minnesota Streams,” *Environmental Management*, 26(6), pp. 629-641, 2000) demonstrates that this management practice results in significant reductions in fecal coliform bacteria concentrations, when compared to conventional livestock grazing. Through targeted implementation, projects will be implemented over the next 10 years with the ultimate goal of converting 65 percent of over-grazed riparian pastures to managed rotational grazing or to exclude cattle from such areas through other measures.

4.1.3 Critical Areas for Implementing Management Measures

Critical areas are overgrazed pastures that provide cattle with unrestricted access to intermittent or permanent streams, particularly where steep gradient to the stream increases the potential for surface runoff.

Critical watersheds where relatively high levels of fecal coliform impairment warrant additional implementation are the Whitewater River (north and south branch), Prairie Creek, Straight River and Root River watersheds.

4.2 Feedlots or Manure Stockpiles without Runoff Controls

4.2.1 Management Measures

Feedlots are an important source of fecal coliform bacteria during wet weather periods – 17 percent in May, and 37 percent in summer, according to the Regional TMDL source allocation. Among feedlots, the majority of problems that have not yet been addressed through MPCA or county permitting programs are of moderate and small size, less than 300 animal units. These feedlots account for an estimated 87 percent of the total feedlots in

Table 7: County Feedlot Inventory and Open Lot Agreement Tracking as of October 2002

County	Total Number Of Feedlots	Number of Feedlots <300 au	Number of Feedlots 300-999 au	Number of Feedlots >1,000 au	Number Of Animal Units in basin	Enrolled in OLA	OLA Plan Prepared
Dakota	291	231	58	2	60,300		
Dodge	460	367	81	12	98,100		
Fillmore	1534	1354	174	6	216,700		
Freeborn	449	431	16	2	79,100		
Goodhue	996	890	92	14	142,100		
Houston*	481	457	23	1	99,600		
Le Sueur	314	245	62	7	20,600		
Mower	822	674	139	9	151,800		
Olmsted	645	586	52	7	92,300		
Rice	1225	1125	91	9	118,100		
Steele	576	497	67	12	86,200		
Wabasha	680	561	108	11	104,700		
Waseca	329	225	70	34	21,700		
Winona	847	715	121	11	150,600		
TOTAL	9,649	8,358	1,154	137	1,441,900		

*Based on minimum of range reported by county

the basin. Through the Open Lot Agreement, the newly revised state feedlot rules allow feedlots of this size to come into compliance in a two-phase process: 1) reduce feedlot runoff by approximately 50 percent through implementation of a standard set of water diversions and filters (roof gutters, clean water diversions, picket fences and grassed buffers), by October 2005; and 2) achieve full compliance with state feedlot rules by October 2010. This new provision is commonly referred to as the Open Lot Agreement.

The BALMM Basin Plan Scoping Document supports maximum producer participation in the Open Lot Agreement (Strategy 6B, page 114-115). The Southeast Minnesota Joint Powers Board received a Section 319 Grant to provide resources to assist eight counties in maximizing producer participation in the Open Lot Agreement. The SEMWRB has received a 319 grant to supplement efforts in eight counties (Dodge, Fillmore, Goodhue, Houston, Olmsted, Rice, Wabasha, Winona) to achieve 90 percent participation by eligible producers. The grant provides counties and SWCDs with funding to hire part-time agriculturists to assist in informing producers about the Open Lot Agreement, and to secure additional technical assistance to develop feedlot improvement plans for producers who enroll in the Open Lot Agreement. Other counties in the basin could also benefit from this kind of program, especially to accelerate the Open Lot Agreement in watersheds with high fecal coliform impairment levels.

As more producers sign up for the Open Lot Agreement, the demand for technical assistance will increase sharply as these producers develop plans to achieve partial or complete runoff reduction. The limited availability of engineering staff, in particular, threatens to impede progress toward meeting the October 2005 deadline in state rule for achieving partial runoff reductions under the Open Lot Agreement.

In most cases, producers in the Open Lot Agreement will not be required to implement complete feedlot fixes if it will cost them more than \$3000 and they do not have access to 75 percent cost share. The NRCS is moving now to provide mostly 50 percent cost share on structural practices, as a result of EQIP rules and federal guidelines to state NRCS offices. Therefore, it is not more important than ever that state or local government provide at least 25 percent to the cost-share amount of EQIP-eligible projects.

As of September 2002, it appeared that federal funding may be adequate to meet the projected increased demand for financial

assistance to implement Open Lot Agreement plans. Substantially increased funding is expected through the U.S. Department of Agriculture's Environmental Quality Incentives Program (EQIP). Discussions are underway through the Natural Resources Conservation Service in Minnesota to provide the flexibility needed to allow EQIP to be used to fund the kinds of partial feedlot runoff solutions that will be used to meet the requirements of the Open Lot Agreement.

Although such funding appears to be available currently, its future availability is less certain. Thus, it is crucial that technical engineering assistance be increased, so that producers enrolled in the Open Lot Agreement can develop plans in a timely fashion to meet state program deadlines and apply for cost-share assistance while it is in ample supply.

Inspection and Enforcement: Strategy 6C of the Basin Plan Scoping Document calls for determining priorities for feedlot inspection, assistance and enforcement. The following actions are appropriate for achieving accelerated reductions of fecal coliform loadings from feedlots.

- Action 1 calls for identification of key priority areas. The Regional TMDL indicates that the following four watersheds should be so considered: Whitewater River, Prairie Creek, Straight River, and Root River.
- Action 2 calls for prioritization of feedlots by counties;
- Action 3 calls for feedlots from 300 to 999 animal units to be prioritized for inspection, assistance and enforcement activities according to feedlot size, pollution hazard and priority area.
- Action 4 calls for identification and coordination of funding sources for fixing feedlot pollution hazards in priority areas through watershed management or wellhead protection projects.
- Action 5 suggests use of self-audits in highest priority areas to identify and correct problems feedlots, as well as with septic systems and other potential environmental hazards.
- Self-audits. There may be opportunities to work with producer groups on self audits. One example is the Milk Producers Environmental Quality Assurance program audit, which is designed to move producers beyond minimum state requirements.

Financial Needs Analysis: Strategy 6E, Action 5, of the Basin Plan Scoping Document calls for evaluating the aggregate private cost of complying with the Open Lot Agreement; evaluating the adequacy of existing funding sources and levels relative to this need; and

exploring how to better coordinate federal and state funding sources available to feedlot operators.

4.2.2 Load-Reductions Expected from Management Measures

- Achievement of 90 percent participation in the Open Lot Agreement would lead to reductions in runoff of 50 percent by October 2005 and full compliance with feedlot rules by October 2010. Since the majority of feedlots (87 percent) fall within this category, the Open Lot Agreement is the main program through which improperly designed feedlots will be addressed.
- 300 to 999 animal units – The vast majority of feedlots of this size are permitted to discharge limited pollution following precipitation events.
- 1000 animal units or greater – These feedlots are subject to zero-discharge permits through the National Pollution Discharge Elimination System (NPDES) program.
- The above provisions in combination are considered sufficient to achieve a 65 percent reduction in fecal coliform loading from feedlots, unless implementation is limited by the lack of financial and technical assistance.

4.2.3 Critical Areas for Implementing Management Measures

The eight counties which received 319 funding to accelerate implementation of the Open Lot Agreement were required to place feedlots into one of three priority categories based on environmental risk. These priority areas included the following: sites within 300 feet or less to surface water; proximity to sinkholes; a combination risk factor combining feedlot size, slope, and delivery potential to surface water; wellhead protection areas; and priority watersheds with higher than average fecal coliform impairment.

Critical watersheds where relatively high levels of fecal coliform impairment warrant additional implementation are the Whitewater River (north and south branch), Prairie Creek, Straight River and Root River watersheds.

4.3 Manure Management

4.3.1 Management Measures. The following activities will be undertaken to reduce pathogen runoff from surface-applied manure:

Land Application of Manure – Buffer strips, immediate incorporation, and maintenance of surface residue have been demonstrated to reduce manure and pathogen runoff (Environmental Quality Board, General Environmental Impact

Statement for Feedlots). The new state feedlots rules (Minn. R. ch. 7020) require manure application record-keeping and manure management planning, with the exact requirements differing according to size of operation and pollution risk of application, based on method, time and place of application.

Manure Management Planning – New feedlot rules require that manure management plans be developed for any feedlots that need a permit. These include the following categories of feedlots:

- Those with more than 300 animal units that are planning new construction or expansion;
- There is a pollution hazard that has not been corrected through the Open Lot Agreement;
- Feedlot has been designated as a CAFO (more than 1000 animal units or direct man-made conveyance to waters)
- Feedlot has more than 300 animal units and is applying manure in sensitive areas, including: a) soil P levels exceeding 120/150 ppm Olsen/Bray, or half those values within 300 feet of public waters; b) vulnerable drinking water supply management areas; or c) slopes exceeding 6 percent within 300 feet of waters.
- Feedlot has 300 to 1000 animal units and is not hiring a certified manure applicator (manure management plan needed by January 2005).

The development of manure management plans for these feedlots should result in at least half the volume of manure in the basin being subject to manure management planning by 2005. This percentage will continue to increase thereafter, making the goal of a 65 percent reduction from this source appear achievable. Practices that reduce fecal coliform runoff will be promoted for manure management plans within the project area, and may be required for CAFOs. The MPCA is required to conduct annual inspections of all NPDES permittees. This includes inspections of manure application records and manure management plans. For feedlots with 300 to 999 animal units, with interim permits or construction permits, counties are responsible for inspections of manure application records and manure management plans. Funding to support technical assistance and to provide producer incentives will be sought to maximize producer adoption of manure management plans.

The following activities may be pursued to accelerate the development and use of manure management plans and related manure management activities in the basin:

1. Promote Buffer Strip Initiative – Basin Alliance for the Lower Mississippi in Minnesota
 - Counties and SWCDs participate in a project to increase the percent of riparian acreage that is in permanent vegetation.
 - This initiative puts a priority on buffering fields where manure is applied.

2. Education on manure management – MPCA and University Extension
 - Develop a checklist of manure management practices that reduce pathogen runoff and optimize use of crop nutrients. As a starting point consider the following items:
 1. Special area setback requirements
 2. Site selection guidelines for application and stockpiling of manure
 3. Promote immediate incorporation with tillage or sweep injection
 4. Promote composting or other new technology that destroys pathogens
 5. Promote runoff controls, including riparian and field vegetated buffers

3. Consider county-specific requirements that go beyond state rule (Minnesota Rule chapter 7020.2225, subp. 4-8)
 - Manure management plan requirement
 - Manure application record requirement

4. Manure management planning
 - Encourage inclusion of manure management practices checklist items in manure management plans.
 - Manure management plans required for NPDES permittees – 2001
 - 300 – 999 a.u. feedlots – Manure management plans required – 2005. This includes feedlots that need interim permits (about 15%).
 - New and expanding feedlots where plans are required – 200/year in basin
 - TOTAL ESTIMATE: By 2005, manure management plans will be written for more than 50% of the manure volume in the basin.

5. Inspection and Enforcement
 - NPDES individual permits – annual inspection by MPCA to include manure application records and management plans.
 - For feedlots with more than 300 a.u., with interim permits, counties are responsible for inspection of manure application records and manure management plans. In delegated counties ,

the county is responsible for inspecting all non-NPDES permitted facilities.

- For construction permits on feedlots from 300 – 999 animal units, counties are responsible for inspection of manure application records and manure management plans.

Manure Composting: The composting of manure has several environmental advantages. The first is destruction of pathogens through the heat generated in the composting process. The second is the conversion of manure to a dry, spreadable material of uniform nutrient content that can be applied as a fertilizer as part of a reliable nutrient management plan. This reduces the potential for overapplication of nutrients. Thirdly, when composting is combined with the separation of manure solids and liquids, it can appreciably reduce the requirements for manure storage, thereby reducing the cost of construction of new or modified facilities. Thus, education, technical assistance and financial assistance targeted to increase the adoption of manure composting by livestock producers can contribute significantly to pathogen runoff reduction from manure. It appears to be particularly suitable for larger facilities, where the fixed costs of composting systems can be spread over a large quantity of production. Thus, it may be particularly effective when promoted to large producers in watersheds with relatively high levels of fecal coliform impairment, such as the Whitewater River, Prairie Creek, Root River and Straight River watersheds.

4.3.2 Load-Reductions Expected from Management Measures

If manure management plans are written and implemented for 50 percent of the manure generated in the basin by 2005, and for increased proportions thereafter, as new feedlot rules are implemented and technical assistance increased, the Regional TMDL goal of a 65 percent source reduction by 2012 appears to be feasible. However, the current rate of farmer compliance with the provisions of manure management plans is not known. Efforts should be made to provide adequate levels of technical and financial assistance as well as inspection and enforcement of manure management plans to ensure a high degree of compliance.

4.3.3 Critical Areas for Implementing Management Measures

- Critical areas are fields designated for manure application in feedlot permits, in addition to other fields where manure application is frequent, that have a high potential for runoff to surface water by virtue of slope and proximity to surface water.
- Critical watersheds where relatively high levels of fecal coliform impairment warrant additional implementation are the

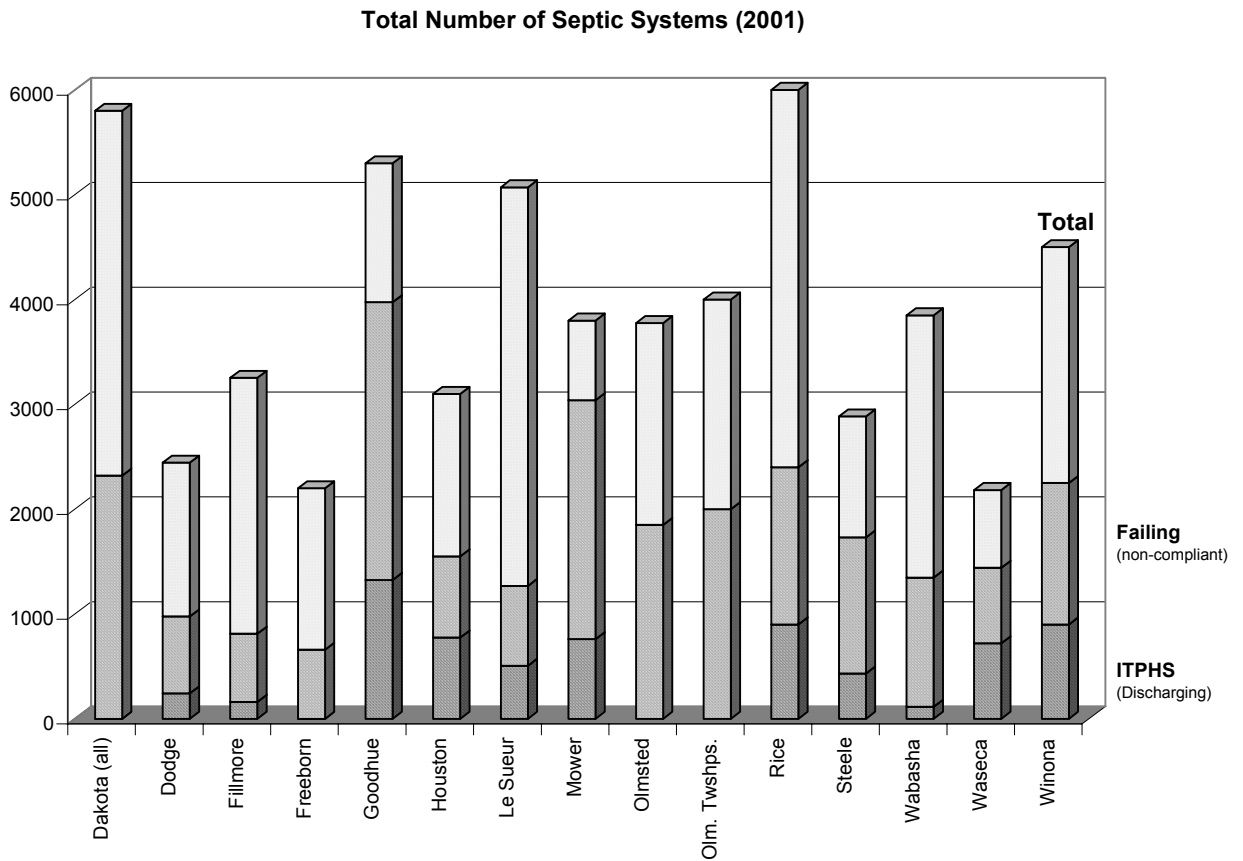
Whitewater River (north and south branch), Prairie Creek, Straight River and Root River watersheds.

4.4 Nonconforming Septic Systems

4.4.1 Management Measures

Individual Sewage Treatment Systems – ISTS with proper drain fields provide virtually complete treatment of fecal coliform bacteria. Acceptable designs are described in Minn. R. ch. 7080. All counties in the basin are delegated to implement these rules, which require conformance with state standards for new construction and disclosure of the state of the ISTS when property transfers ownership. Several counties require ISTS upgrades at property transfer.

Figure 2: Total Number of Septic Systems by Category 2001

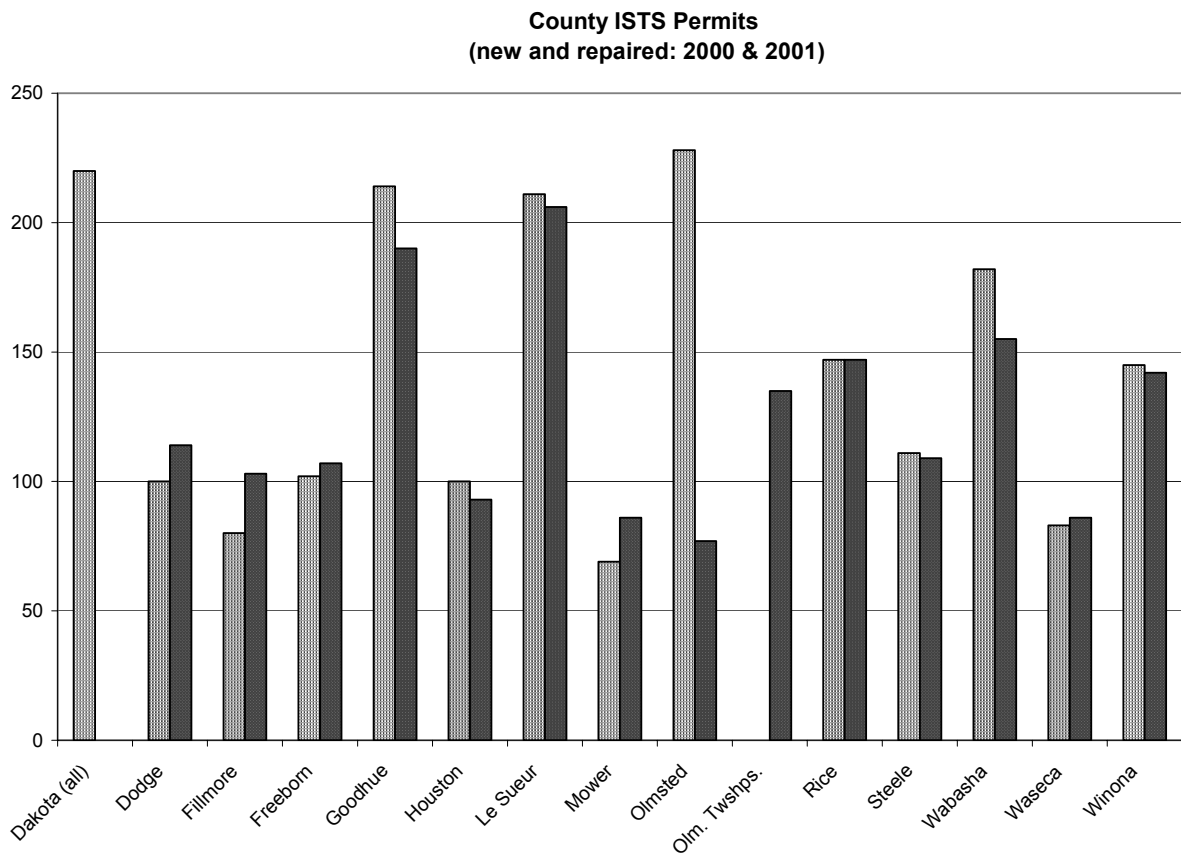


The information from Figures 2 and 3 were obtained from annual county reports to MPCA. It shows that untreated human sewage is a ubiquitous source of fecal

coliform bacteria. Out of a total of 45,000 individual sewage treatment systems (ISTS) in the basin, 18,000 to 20,000 are failing to provide adequate treatment, according to county estimates. An estimated 20 percent of ISTS, about 8,800 systems, are believed to pose an Imminent Public Health Threat (IPHT) through a direct discharge to surface water

Each of the 14 counties in the basin has delegated authority to implement the state ISTS rule, MN Statutes ch. 7080. To design a basinwide strategy, MPCA assessed current levels of ISTS repair and replacement by counties in the basin (Figure 3). According to this assessment, the current rate at which counties are able to fix failing ISTS ranges from 23 to over 100 per year. At this rate, the years required by counties to achieve a 65% reduction in failing ISTS (assuming no increase in system failures) would range from about 7 to 30 years. With additional education, technical assistance, and low-interest loans, this range changes to 5 to 15 years.

Figure 3: County ISTS Permits (new and repaired, 2001 and 2002)



The SEMWRB conducted a mail survey of county water planners to assess how this project should be designed to increase the level of ISTS compliance and the rate at which unsewered areas obtain wastewater treatment.

A large majority of county staff reported that most people are unaware of fecal coliform bacteria pollution, its implications for human health, and major sources

of bacteria. The public, as well as elected officials, are believed to be largely uninformed about these topics. Lack of knowledge is thought to be a major impediment to making more rapid progress toward BALMM goals and objectives for ISTS and unsewered communities. This includes lack of awareness of the management and operational requirements of ISTS, and the environmental consequences of widespread system failure. The complexity of addressing unsewered community issues tends to discourage county activity in this area. The availability of financial assistance, particularly low-interest loans, is thought to be an essential catalyst to accelerating fixes of failing ISTS. This and other forms of financial assistance are needed to accelerate progress with unsewered communities.

The following targeted audience approach was developed to achieve accelerated ISTS repairs and reduced failure rates:

Target Audience 1: Owners of ISTS that are failing and pose an “Imminent Public Health Threat,” through direct discharge to tile lines or surface ditches or system failure caused by lack of proper management.

Approach: Through mail surveys (and one-to-one visits in targeted watersheds) help residents determine whether their ISTS are adequately functioning, inadequately installed, or are failing to function properly because of poor management. Follow up with programs tailored to specific problems – ISTS management workshops for failing systems; technical and financial assistance to owners needing new systems. Help counties to set up revolving loan programs based on successful experience in Mower and Rice counties.

Target Audience 2: Residents of unsewered communities

Approach: Through wastewater facilitators, help unsewered communities to understand the need for wastewater treatment, assist them through each phase of the community decision-making process, while building the capacity of local and regional government staff to provide such assistance to other communities in the future. Goal is to get 60 communities started in this process.

Target Audience 3: Elected Officials, e.g. county commissioners, township officers and SWCD supervisors.

Approach: Through surveys and workshops, inform elected officials of proper ISTS operation, community approaches to wastewater treatment, environmental problems from inadequate treatment, and the status of ISTS in their communities. At the same time, provide them opportunities to customize the basin project to address the specific needs of the water quality concerns and ISTS problems in their communities.

Target Audience 4: County ISTS inspectors, Planning and Zoning Administrators, and County Water Planners.

Approach: MPCA conducts audit of county ISTS programs to determine adequacy of performance in a number of key areas, including spot checks on recent ISTS installations, level of effort on ISTS inspections and follow-through on noncompliant systems, and dealing with contractors. Conduct audits of three counties in 2003, evaluate results, and plan additional audits in future years.

Project Participants:

Administration – SE Minnesota Water Resources Board; Cannon River Watershed Partnership
 Education and Training – University of Minnesota Extension, with Education Coordinator
 Technical Assistance to Communities – Wastewater Facilitators trained by U of M Extension
 Local Strategy Development and Implementation – County environmental services staff, elected officials

Residential Wastewater Treatment. The above BALMM strategy for is being implemented through a Section 319 grant for \$530,000 that began in summer 2002. This project addresses the impact of human sources of bacteria through a combination of education, technical assistance, and financial assistance to owners of failing ISTS. To this end, the BALMM, the SEMWRB, the Cannon River Watershed Partnership, and the University of Minnesota Extension Service have formed a partnership that will involve 12 of the 14 counties in the basin. Within a three-year period, the partnership proposes to double the average rate at which ISTS classified as Imminent Threats to Public Health and Safety (ITPHS) are being corrected through local efforts across the basin, from 300 to 600 per year. By 2012, a sustained effort of this magnitude could achieve the target source reduction of 65 percent. Both individual residents and unsewered communities will be addressed through the project. Additional funding will be sought to help to initiate county-based revolving loan programs in each county to help to assist ISTS repairs, to evaluate and implement tracking systems for ISTS permitting and maintenance, and to help unsewered communities to pay for the cost of engineering feasibility studies that are crucial in the evaluation of wastewater treatment options.

Table 8: Unsewered Areas in the Lower Mississippi River Basin

UNSEWERED AREA		ADJUSTED		
NAME	COUNTY	INCOR P.	POPULATION	COMMENTS
Coates	DAKOTA	Y	184	
Miesville	DAKOTA	Y	135	
New Trier	DAKOTA	Y	99	
Randolph	DAKOTA	Y	333	
Sunfish Lake	DAKOTA	Y	442	
Wasioja	DODGE	N	85	OLD ISTS/ SMALL LOTS
Old Concord	DODGE	N	70	OLD ISTS/ SMALL LOTS, 25 NEW SYSTEMS IN 1999 - 2000.
Mantorville City	DODGE	Y		OLD ISTS/ SMALL LOTS

Whalan	FILLMORE	Y	83	SMALL LOTS, SANDY SOILS/engineer study submitted
Granger	FILLMORE	N		NO SEPTIC TANKS-STRAIGHT PIPE TO RIVER/
Cherry Grove	FILLMORE	N		FAILING ONSITE SYSTEMS
Rushford Village	FILLMORE	Y	0	631 connected to rushford plant, \$780,000
City Of Conger	FREEBORN	Y	136	County Staff Assisting in finding solution, Ditch to Lime Creek/looking from RD
City Of Manchester	FREEBORN	Y	76	County Staff Assisting in finding solution/looking for funding from RD
City Of Myrtle	FREEBORN	Y	67	County Staff Assisting in finding solution/looking for funding from RD
Gordonsville	FREEBORN	N		
Maple Island	FREEBORN	N		
Belvidere Mills	GOODHUE	N		
Bombay	GOODHUE	N		
Forest Mills - Zumbrota	GOODHUE	N		
Lake Bylesby	GOODHUE	N		
Mingoview Drive	GOODHUE	N		
Old Frontenac	GOODHUE	N		looking for funding and installing a large ists
Roscoe	GOODHUE	N		
Skyberg	GOODHUE	N		
Stanton	GOODHUE	N		
Vasa	GOODHUE	N		
Money Creek	HOUSTON	N		
Freeburg	HOUSTON	N		
Sheldon	HOUSTON	N		
Reno	HOUSTON	N		
Mound Prairie	HOUSTON	N		
Riceford	HOUSTON	N		
Nicolville	MOWER	N	96	Imhoff tank collection system to stream
Belleman's	MOWER	N	48	connection to city of austin in 2003
Dinsmoor	MOWER	N	83	connected to city of Austin
Royal Manor	MOWER	N	91	failing ists, SAND PT. WELLS
Ramsey Prk.	MOWER	N	65	failing ists
Lansing	MOWER	N	96	failing ists. collection, SHALLOW WELLS Planning to construct new p
Andyville	MOWER	N	36	failing ists, connection to field tile
Norman Park	MOWER	N	29	no recent compalints
Lyle	MOWER	N	20	
St Michael's	MOWER	N	12	COMPLAINT ON SURFACING
Sargeant	MOWER	Y	77	Stabilization ponds funded, need land \$ 1,199,000
Taopi	MOWER	Y	81	Septic overflow
Bob's Trailer Park	OLMSTED	N	69	Inside of Rochester's planned urban service area
Chester Heights	OLMSTED	N	201	getting funding to hook to Rochester
Chosen Valley Trailer Park	OLMSTED	N	75	
City of Oronoco	OLMSTED	Y	862	looking at funding/have submitted a facility plan
Country Home Trailer Park	OLMSTED	N	58	
Douglas	OLMSTED	N	94	
Genoa	OLMSTED	N	53	
Hiawatha Mobile Home Village	OLMSTED	N	55	Inside of Rochester's planned urban service area
Lake Zumbro, Kings Park Hyland Sub	OLMSTED	N	36	
Lake Zumbro, Norton & Armstrong Sub	OLMSTED	N	62	
Lake Zumbro, 1st Addn to Cedar Beach	OLMSTED	N	34	
Lake Zumbro, Cedar Beach	OLMSTED	N	84	
Lake Zumbro, Mikes Sandy Point	OLMSTED	N	19	
Lake Zumbro, Blakely Sub	OLMSTED	N	31	
Lake Zumbro, White Bridge Sub	OLMSTED	N	43	

Lake Zumbro, Zumbro Slopes	OLMSTED	N	17	
Lake Zumbro, Bells Sub	OLMSTED	N	29	
Lake Zumbro, Kurths Sub	OLMSTED	N	70	
Lake Zumbro, Postiers 1st Replat	OLMSTED	N	7	
Lake Zumbro, Postiers 1st	OLMSTED	N	19	
Marion	OLMSTED	N	63	
Pleasant Grove	OLMSTED	N	72	
Sunrise Mobile Home Park	OLMSTED	N	62	
Viola	OLMSTED	N	91	
Veseli Village	RICE	N	60	TOWN SLOWING CONVERTING TO COMPLIANCE ISTS
Shieldsville Vilg	RICE	N	45	Tile to Ravine, FEASABILITY STUDY SHOULD BE DONE JUNE 199
Nerstrand	RICE	Y	259	Septic overflow, FP approved for \$1.1M recirculating sand filter system Funding
Beaver Lake	STEELE	N	228	looking at funding/have submitted a engineer study
Hope	STEELE	N	80	septic tanks connected to tile emptying into Straight River
Bixby	STEELE	N	59	outlets running to field tile
Pratt	STEELE	N	17	septic tanks connected to field tile
Meriden	STEELE	N	94	septic tanks connected to community tile which empties into a ditch
Sette	STEELE	N	22	individual septic tanks connected to tile lines
Havana	STEELE	N	26	drywells and septic tanks connected to tile lines
Clinton Falls	STEELE	N	48	drywells and septic tanks hooked up to tile lines
Hammond	WABASHA	Y	201	Septic Overflow
Millville	WABASHA	Y	170	Septic Overflow
Minneiska	WABASHA & WINONA	Y	133	
Elk's Park/Lakeview Rst	WASECA	N	25	TILE LINES, DIRECT DISCHARGE, ISTS
Rolling Greens	WASECA	N	8	FAILING ISTS, highly saturated soils
Fairway Acres	WASECA	N	18	FAILING ISTS, marshy, top of hill surrounded by golf course
Otisco	WASECA	N	36	COLLECTION SYSTEM TO TILE LINES, CD 43 runs through area to Riv.
Smiths Mill	WASECA	N	25	COLLECTION SYSTEM TO TILE LINES, very poor soils
Alma City	WASECA	N	20	COLLECTION SYSTEM TO TILE LINES, CD 23 Draining to LeSueur
Matawan	WASECA	N	24	COLLECTION SYSTEM TO TILE LINES, Near the start of the Cobb
Reeds Lake	WASECA	N	59	FAILING ISTS; LOT RESTRICTIONS, poor soils, shoreland
St. Olaf Lake	WASECA	N	37	FAILING ISTS; LOT RESTRICTIONS, shoreland, poor soils
Pichitino-Deichen	WASECA	N	3	FAILING ISTS; DIRECT DISCHARGE TO LAKE
East Lake Elysian Subd.	WASECA	N	29	DIRECT DISCHARGE; FAILING ISTS, shoreland
Saratoga	WINONA	N	20	shorelands, floodplains, failed ists, small lots
Wikota	WINONA	N	36	well setbacks, failed sewers, small lots, wells
Meadowbrook	WINONA	N	13	shoreland, floodplain, failed sewers, shallow wells
Springbrook	WINONA	N	0	steep slopes, high groundwater, wells, disturbed soils, limited ists sites
Pleasant Valley	WINONA	N	28	overdeveloped lots, wells
Pinecrest	WINONA	N	28	shoreland, wells. steep slopes, floodplain
Valley View	WINONA	N	0	well setbacks
Pickwick	WINONA	N	48	wells, shoreland, floodplain, small lots, failed systems, Karst Topo.
Voelkers	WINONA	N	44	wells, small lots
E. Richmond	WINONA	N	56	floodplain, failed ists, wells, small lots, shoreland
Richmond	WINONA	N	38	floodplain, failed ists, wells, small lots, shoreland
Marysvale	WINONA	N	22	wells, small lots
Ridgeway	WINONA	N	20	failed ists, small lots, wells
Bethany	WINONA	N	27	failed ists, small lots, wells
Nodine	WINONA	N	45	failed ists, small lots, wells
Gunderson	WINONA	N	30	shoreland, wells, small lots, failed ists
Kowalewski	WINONA	N	219	failed ists, wells, small lots
Dresbach	WINONA	N	219	shoreland, poor soils, failed ists, wells, small lots
Homer Village	WINONA	N	228	shoreland, small lots, wells, failed ists, steep slopes

Garvin Hgts.	WINONA	N	3	bedrock, disturbed soils, steep slopes
Gillmore Val.	WINONA	N	100	poor soil, floodplain, shoreland, failed ists, wells
Arches	WINONA	N	30	floodplain, small overdeveloped lots, failed ists, wells, shoreland
Dakota	WINONA	Y	357	Planning
Elba	WINONA	Y	0	Septic Overflow IN 1997, Community of 232 people upgraded by yr. 2
Minnesota City	WINONA	Y	252	Septic Overflow

Total Population Estimate:

8,235

4.4.2 Load-Reductions Expected from Management Measures

Properly functioning ISTS and community wastewater treatment systems for unsewered areas provide complete control of fecal coliform bacteria. Thus, as failing systems are fixed and new failures are prevented through implementation of the above strategies, fecal coliform loads from this source can be expected to decline at least in proportion to the share of failing systems that are fixed. Since the systems with the greatest environmental risk will be targeted for repairs, fecal coliform loads may decline in somewhat greater proportion to the share of failing systems that are fixed. It is anticipated that if the project described above succeeds in increasing the number of ITPHS that are fixed from 300 to 600 per year, and this increased level of activity is sustained until 2012, a reduction in fecal coliform loading of 65 percent or greater will occur from this source.

4.4.3 Critical Areas for Implementing Management Measures

Since septic system failure is a widespread problem, a basinwide approach to reducing fecal coliform from this source will be pursued. Failing systems with potential for high delivery of pollutants to public waters, such as straight pipe discharges and other types of ITPHS will be given priority attention. Careful targeting is needed to ensure that resources devoted to providing wastewater treatment yield environmental results in the form of reduced concentrations of fecal coliform bacteria. The potential for inadequate wastewater treatment exists for approximately 140,000 residents of the basin who live in rural areas and unsewered communities. That's about 23 percent of the basin population of 605,000. Surveys of county staff suggest that only 40 to 50 percent of the systems used by these 140,000 residents are failing to provide adequate wastewater treatment. And some failures present more severe problems than others do. County staff suggest that three kinds of targeting be used to ensure that the project's efforts focus on the worst problems:

- Imminent Public Health Threats – ISTS with a direct discharge to surface water, where little or no treatment is provided. These include direct discharges to drainage tile or surface ditches, and failing systems that discharge to surface water.

- Unsewered Communities -- Unsewered or undersewered communities include older individual systems that are generally failing, and/or collection systems that discharge directly to surface water. This results in locally high concentrations of wastewater contaminants in surface water, including fecal coliform bacteria. County staff in the basin have identified 104 such communities ranging in population from 3 to 1,000. County resources are inadequate for addressing these costly, complex problems.
- Watersheds with Known High Levels of Contaminants –Critical watersheds where relatively high levels of fecal coliform impairment warrant additional implementation are the Whitewater River (north and south branch), Prairie Creek, Straight River and Root River watersheds.

4.5 Urban Stormwater Runoff

4.5.1 Management Measures

Urban Stormwater Management: Practices such as runoff detention, infiltration, and street sweeping have been shown to be effective in reducing urban runoff and associated pollutants. Under the Clean Water Act Phase II Stormwater Program, several communities in the basin will be required to obtain a Municipal Separate Storm Sewer System (MS-4) General Permit beginning in March, 2003. The MS-4 Stormwater Permit will require new criteria for urban stormwater management and runoff treatment.

Part IV.C of the Municipal Storm Water Permit states: “ If your MS4 discharges to a water of the state that appears on the current USEPA-approved list of impaired waters under Section 303(d) of the Clean Water Act, you must review whether changes may be warranted in your Storm Water Pollution Prevention Program to reduce the impact of your discharge. If an implementation plan has been developed for a U.S. EPA-approved TMDL(s), you must review the adequacy of your Storm Water Pollution Prevention Program to meet the TMDLs load allocation set for storm water sources. This review must include assessment of: 1) your MS4's contribution to the overall storm water allocation, 2) your MS4's selected BMPs and there effectiveness in meeting the TMDLs allocation goal, and 3) whether your timeline for putting BMPs in place is consistent with the timeline of the TMDL implementation plan. If the Storm Water Pollution Prevention Program is not meeting the applicable requirements, schedules and objectives of the TMDL implementation plan, you must modify your Storm Water Pollution Prevention Program, as appropriate.”

This language is essentially a warning to the MS4s that TMDLs are coming and they should be considering them in their plans. This is a self-assessment and does not mandate a specific measure to be accomplished. It is MPCA's intention that the MS4 and other permits will follow the TMDL process. Potentially permits would be specifically modified in the next round by insertion of measures to meet

the agreed upon allocation. Since the process is public, it makes sense to wait for the outcome of that process.

BALMM Strategy 4A, page 102-103, Basin Plan Scoping Document, describes a comprehensive strategy for stormwater runoff control in the basin. To implement this strategy in communities required to have a Phase II Stormwater Permit, the Southeast Minnesota Water Resources Board has submitted a grant to the Legislative Commission on Minnesota Resources. In addition, BALMM has sponsored several presentations of Project NEMO and sustainable development, and similar efforts will continue. Several watershed projects are also working cooperatively with cities to address stormwater issues.

Table 9: Communities required to develop a stormwater management plan under Phase II of EPA's Stormwater Program:

Community	1999 Population Estimate	Listing in Dec. 8, 1999 Federal Register	Federal Register Review required	Pop. Density >1,000/Sq. Mi. Contiguous to 10,000 + municipalities
Dakota County	349131	Y		
Olmsted County	119077	Y		
Scott County	82994	Y		
Rochester city	80768	Y		
Burnsville city	60308	Y		
Apple Valley city	46905	Y		
Lakeville city	41231	Y		
Inver Grove Heights city	30263	Y		
Winona city	24965		Y	
Austin city	22210		Y	
Owatonna city	21245		Y	
Houston County	19489	Y		
Faribault city	19214		Y	
Hastings city (pt.)	18099		Y	
Albert Lea city	17611		Y	
Northfield city (pt.)	16300		Y	
Red Wing city	15941			
Rosemount city	13745	Y		
Farmington city	10893	Y		
La Crescent city	4954	Y		

La Crescent Township		Y	
Cascade Township		Y	
Marion Township		Y	
Rochester Township		Y	
Goodview city, Winona	3501		Y
Mapleview city, Austin	168		Y

Note: This is a draft listing, final listing to be published in rule, Fall 2002.

The Basin Plan Scoping Document Strategy 4A includes the following action items of relevance to fecal coliform runoff reduction:

Action 1: Encourage municipalities and local units of government to consider ordinance requirements for Better Site Design (BSD). Better Site Design promotes more green space and less imperviousness along with better natural areas preservation. BSD coupled with appropriate Best Management Practices (BMPs) such as swales and wet detention ponds provide for the least impact to wetlands, lakes and streams. BSDs minimize runoff generation up front instead of trying to retrofit BMP's. Traditional development plans should be revisited at the earliest possible phase in the approval process, particularly with regard to minimizing road lengths, widths, and *cul de sac* designs, decreasing large lot sizes and peak parking lot sizing designs.

Action 2: Encourage all communities to adopt the principles of the EPA Phase II Construction Stormwater requirements. While only certain communities are required to obtain the Municipal Separate Storm Sewer System (MS4, NPDES) permits, the principal requirements should guide all communities in their development decisions. The six Minimum Control Measures (MCMs) are:

1. Illicit discharge detection and elimination to eliminate oils, toxins and other pollutants from entering stormwater systems.
2. Municipal operations pollution prevention efforts to reduce the impacts of poor operations practices and designs (street sweeping, salt use and storage, debris removal, etc.)
3. Construction site requirements to reduce sediment discharges. One acre or larger sites should have a plan, a permit, and BMPs.
4. Post construction stormwater BMPs to reduce the amount of pollutants and the physical impact of new development. The BMPs are both structural (ponds, wetlands, devices) and administrative (fertilizer and pesticide control, advanced site design, economic incentives, etc.)

5. Public education and outreach to build community support and improve compliance.
6. Public involvement and participation to broaden support, reduce obstacles, gain expertise and build connections (storm drain stenciling, citizen watch groups, public meetings, etc.)

Action 3: Protect cool water streams.

Communities should require protection of the temperature status of cold-water streams. Practices that promote infiltration and maintain or increase the base flow of streams should be encouraged. Pre-treatment for pollutants may also be required for protection of ground water quality.

Action 4: Encourage all communities to set minimum stormwater standards by policy or ordinance. Some examples might be:

- No new direct discharges without treatment for sediment or other pollutants.
- Maximize ground water recharge. Runoff peaks and volumes controlled to not exceed stream geomorphology limits.
- Special protection for critical areas.

Action 5: Ensure that there are plans for BMP maintenance. Support local, county, and state efforts to enforce the existing ordinances or rules.

Action 6: Support the development of stormwater alternative management or BSD demonstration projects.

Finally, it is recommended that municipalities conduct water quality monitoring for fecal coliform bacteria in one or several representative urban or suburban watersheds to establish a baseline level of impairment against which the effectiveness of future stormwater runoff prevention or treatment measures can be evaluated.

4.6 Environmental Rule Enforcement

Several public comments on the Regional TMDL emphasized the need for the MPCA and counties to conduct higher levels of inspection and enforcement to increase the degree of compliance with environmental rules governing feedlots and septic systems. Compliance with manure management plans and the observance of shoreland ordinances could be added to the list of permits, rules and ordinances where questions are frequently raised about the adequacy of current levels of inspection and enforcement.

As a response, the MPCA proposes to conduct a public dialog on alternative approaches to more effective use of environmental inspection and enforcement with regard to these and possibly additional rules and ordinances. This dialog will include local, state and federal government

together with stakeholders and the public. Issues addressed will include the proper role of local, state and federal units of government, environmental and other stakeholder organizations, staff and financial resources required to support alternative levels of inspection and enforcement, and determining an appropriate balance of enforcement, education and assistance, and financial assistance to achieve compliance with different types of environmental rules and ordinances.

4.7 Conservation Tillage Adoption

Conservation tillage is a cost-effective way to reduce field runoff, including runoff contaminated with fecal coliform bacteria. Where manure is applied to cropland, the need for prompt incorporation must be balanced against the need to maintain surface residue cover for erosion control. With support from a Section 319 Grant, the University of Minnesota has just published a document entitled, "Tillage Best Management Practices for Water Quality Protection in Southeastern Minnesota." This publication will be used to promote conservation tillage in the context of manure management to reduce field runoff. This effort will be supported by a recently obtained USDA Cooperative State Research, Education, and Extension Service Grant for a "Karst Campaign" to promote agricultural BMPs in the region.

4.8 Landscape Buffer Initiative

This BALMM strategy includes as areas targeted for grass buffers agricultural fields that have been designated for manure application. An application for the Conservation Reserve Enhancement Program has been submitted to the Farm Service Agency of the U.S. Department of Agriculture, and to the state legislature for funding to match federal dollars at a ratio of 4 to 1. The CREP project requests funding for a total of 95,730 acres, and will provide funding for riparian buffers and contour strips to curtail runoff from manured fields and feedlots. Of this acreage, it is estimated that 25,000 acres are needed to provide vegetative cover to riparian corridors. Fields designated for manure application are recommended for priority consideration and promotion.

Table 10: 1990 Land Use / Land Cover for Watersheds of Fecal Coliform-Impaired Reaches

Impaired Reach Watershed	Area (acres)	Cultivated	Grassland	Forest	Water/Wetland	Urban, and Rural Residential
Cannon River	944,634	70%	10%	12%	4%	4%
Cedar River	376,806	87%	5%	4%	1%	4%
Garvin Brook	31,241	46%	14%	37%	<1%	3%
Prairie Creek	50,887	76%	10%	11%	<1%	3%
Robinson Creek	10,880	92%	5%	2%	<1%	2%
Root River	1,062,279	44%	38%	8%	<1%	9%
Salem Creek	39,866	80%	12%	5%	<1%	3%
Shell Rock River	155,337	76%	9%	5%	4%	5%
Straight River	161,270	82%	7%	5%	1%	5%
North Br. Whitewater	51,213	66%	19%	12%	<1%	3%
South Br. Whitewater	46,544	69%	17%	8%	<1%	6%
Vermillion*	174,092	50%	10%	10%	10%	20%
South Zumbro River	192,516	54%	23%	8%	<1%	13%

* approximate

4.9 Priority Areas for All Management Measures

There are two types of critical areas identified as priority areas for implementation:

1) Watersheds where the level of fecal coliform impairment is considerably higher than the basinwide level of impairment, as measured by the median of monthly geometric means during the period 1997-2001. These watersheds are identified in the shaded rows in the graphic below:

2) Implementation also is a priority in sensitive landscape positions throughout the basin, including land within 300 feet of sinkholes and streams.

5.0 Municipal Wastewater Treatment Facility Management

Municipal wastewater treatment facilities, in aggregate, generate a total daily discharge of about 80 million gallons per day in May and 60 million gallons per day in the summer (June-Sept.). According to state rule, each discharger is required to meet a discharge limit of 200 organisms/100mL fecal coliform concentration. This is accomplished through disinfection of the wastewater at the final treatment stage, through chlorination or equivalent processes.

All permitted wastewater treatment facilities are required to monitor their effluent to ensure that concentrations of specific pollutants remain within levels specified

Table 11: Detection of Fecal Coliform Exceedances in 2001 Facility Name and Location	Permit Number	Status of Fecal Coliform Problem
Caledonia WWTP	MN0020231	Detections in five months. Compliance Monitoring Survey (CMS) completed 5/29/02. Fecal violations were caused by equipment problems with chlorination. The Equipment has been replaced in response to CMS.
Cannon Falls WWTP	MN0022993	Detections in four months. Expansion of wastewater treatment facility is underway; upgrade has already initiated operations so is up and running.
Canton WWTP	MN0023001	Single detection; isolated instance.
Hallmark Terrace, Rochester	MNG580070	Single detection; isolated instance.
Kasson WWTP	MN0050725	Detections in five months. Expansion of wastewater treatment facility now underway is expected to correct the problem.
Kellogg WWTP	MNG580027	Single detection; isolated instance.
MDNR Lanesboro Hatchery	MN0004430	Single detection; isolated instance.
MnDOT High Forest Rest Area	MN0044377	Single detection; isolated instance
Ostrander WWTP	MN002449	Detections in four months. A new facility is almost complete. It should be operating in 11/02.
Peterson WWTP	MN002449	Detections in three months. No violations since 09/01. Reed beds have been constructed. Solids handling is improved and UV disinfection is more effective.
Red Wing WWTP		Single detection; isolated instance
Rollingstone WWTP	MNG580078	Detections in two months. Bad lab results from Winona State University. No violations since 2001. No action.
Zumbro Ridge Estates	MN0038661	Detections in two months. Violations continued in 2002 (April, May and June). CMS completed in 09/02. Possible enforcement action started.

in the discharge permit. The MPCA regularly reviews the Discharge Monitoring Reports from wastewater treatment facilities to determine whether one or more permit violations have occurred. Permit violations are summarized in Detection Reports. A review of MPCA Detection Reports from January 1, 2001, through December 31, 2001, reveals 14 facilities with one or more exceedance of the

fecal coliform permit limit reported. These facilities, and the status of the problem, are shown in Table 11.

Emergency bypasses at wastewater treatment facilities are an occasional source of bacteria and other pollutants. These bypasses are also referred to as sanitary sewer overflows (SSO's). Wastewater treatment plants and sanitary sewer systems are designed to handle at least 100 gallons of water per person per day, as well as the additional flow generated by commercial and industrial establishments. If the amount of water entering a system exceeds the design capacity of the system, some of the untreated wastewater is discharged to the environment. This event is called a bypass because the wastewater has bypassed part or all of the treatment process.

Bypasses may occur during certain weather conditions, such as heavy rain events or flooding, or in case of emergency because of equipment failure or when a pipe breaks. These diversions of wastewater are necessary in order to protect public health by preventing sewage from backing up into the streets and basements of homes and businesses. They are also necessary at times to prevent serious property damage that could result in the costly losses of equipment and the systems' ability to provide adequate treatment.

The MPCA considers all bypass events to be serious and expects treatment system operators to employ all reasonable measures to avoid bypassing. When that is not possible, the Agency requires the operators to take whatever steps necessary to protect the public health and to minimize impacts on the environment. Additionally, operators are required to notify state and local governments within one hour of the onset of a bypass event, to sample and monitor the bypass discharge, and to submit a detailed written report concerning the bypass. Intentional unreported bypasses are regarded as serious violations of Minnesota statute and rule and can result in the imposition of civil or criminal penalties. In cases where frequent bypasses have occurred, the Agency imposes Schedules of Compliance requiring the system operator to correct the problem within a specified period of time. In such cases, the MPCA also places a moratorium on the issuance of sewer extension permits to prevent the introduction of additional flow to the system until the system has adequate capacity.

Most communities expend a great deal of time, effort, and money to ensure that bypasses are, indeed, rare events. Preventive maintenance procedures and planning are key in controlling inflow and infiltration of clear water to the system. The MPCA requires that system operators be properly trained and have good maintenance programs in place. However, the public needs to be aware that they too can do their part to decrease the necessity for bypasses. Basement sump pumps and roof collections systems connected to the sewer system contribute to the problem by sending otherwise clean water through treatment systems unnecessarily during times of heavy rain, increasing the possibility of bypasses.

To evaluate the problem of bypasses as a fecal coliform source, wastewater treatment facility reports for 2001 were examined to identify cities where one or more bypasses had occurred. In calendar year 2001, 24 cities in the Lower Mississippi River Basin reported one or more bypasses. Most of these cities (21) experienced bypasses one or two times. These were judged to be isolated occurrences triggered by extreme rainfall events, particularly flooding that occurred early in May and June. As such, bypasses are not expected to reoccur at these facilities unless caused by extreme weather and flooding.

For three of the cities, bypasses occurred three or more times, signifying structural problems that needs to be corrected. The most common structural problem contributing to wastewater bypasses is inflow and infiltration into the wastewater collection system. This problem can be compounded by limited hydraulic capacity at the wastewater treatment facility. Based on these criteria, three cities are considered to have a chronic bypass problem: Claremont, Kasson, and West Concord. These facilities discharge to the Middle Fork of the Zumbro River. Their current status is as follows:

Claremont - MN0022187 - The Environmental Assessment Worksheet has just been completed for the wastewater treatment facility upgrade and the city is currently working out their funding for the upgrade. They will have phosphorus limits when the upgrade is completed. The city is installing a new lift station in the immediate future to help reduce some of the bypass problems.

West Concord - MN0025241 - The Environmental Assessment Worksheet has been completed for the wastewater treatment facility upgrade and the city is currently working out their funding for the upgrade. They will have phosphorus limits when the upgrade is completed.

Kasson - MN0050725 - A plant upgrade has been completed.

No facilities in the basin are known to currently have combined storm and sanitary sewer systems, which may lead to combined sewer overflow (CSO) discharges to surface waters. The City of Red Wing on the Mississippi River did correct such interconnections several years ago.

6.0 Measures of Success

6.1 Agency Responsible for Evaluation:

The MPCA is responsible for evaluating water quality trends and progress toward source reduction. To carry out this responsibility, the MPCA will need to regularly collect pertinent data on source reductions from county government on feedlot on ISTS programs, and from state and federal agencies for riparian land use changes.

6.2 Criteria for Determining Progress and Need for Implementation Strategy or TMDL Revision

Water Quality Goals: A 20% reduction in fecal coliform bacteria by 2006, and a 65% reduction by 2012, as measured by as a basinwide ambient median concentration. This is consistent with the basinwide goal of achieving water quality standards for bacteria, as stated in Watermarks and the Lower Mississippi River Basin Plan Scoping Document, and with Phase I Regional TMDL goals. Where it is clear that these levels of reduction have not been achieved, implementation plans will be modified for the basin and for individual watersheds, as needed, or new TMDLs may be developed if the initial allocations are found to be incorrect, or the balance or source-reduction requirements ineffective in achieving water quality goals.

Pollutant Source Objectives: A 20% reduction in major sources of fecal coliform bacteria by 2006, and a 65% reduction by 2012, as measured by county data on feedlots, ISTS and (possibly) manure management planning.

6.3 Indicators of Progress

6.3.1 **Water Quality:** For water quality, the concentration of fecal coliform bacteria, measured as a monthly geometric mean, will be used as an indicator of progress at the 20 impaired reaches named in the Regional TMDL study.

A monitoring system for the Regional Fecal Coliform TMDL also will be used to evaluate progress in ambient water quality. This has a basinwide and targeted watershed component.

The basinwide component consists of a repetition of intensive monitoring of fecal coliform bacteria concentrations at Minnesota Milestone sites (Table 12) that took place in 1997/1998. This monitoring was conducted five times per month during the recreational use season, with monthly geometric means calculated to determine whether the state chronic standard of 200 org./100 ml was being exceeded or not. This will be repeated in 2006/2007 as part of the Regional TMDL plan.

In addition, targeted watersheds will be monitored in 2006/2007 at a five times/month frequency at sites monitored previously for a TMDL study. In addition to comparing geometric monthly means from both time periods, a comparison will be made of samples taken at lower flows during dry weather periods, when continuous sources such as ISTS are believed to dominate fecal coliform loadings. This will be done in the following watersheds: Prairie

Creek, Straight River, Vermillion River, Whitewater River, South Branch Root River, and Cedar River watersheds.

The MPCA will be responsible for implementing this monitoring plan, with assistance from partners in the target watersheds listed above.

As more water quality monitoring leads to the addition of more reaches to the 303(d) impaired waters list, the regional TMDL, including the appropriate watershed chapter, will provide a context within which the impairments can be addressed. This will remove the need to conduct additional independent TMDL studies within the same watershed or basin.

6.3.2 Fecal coliform sources: For fecal coliform sources, the following indicators of progress will be used to determine whether progress toward a 65 percent source reduction is being achieved:

Table 12: MPCA Routine Monitoring Sites in the Lower Mississippi River Basin

River Basin	ID Number	Site Location
Lower Mississippi	VR-32.5	VERMILLION R BR ON BLAINE AVE 4 MI NE FARMINGTON
	CA-13	CANNON RIVER AT BRIDGE ON CSAH-7 AT WELCH
	ST-18	STRAIGHT R NEAR CSAH-1 1 MI SE OF CLINTON FALLS
	UM-738	MISSISSIPPI R LOCK & DAM #5 3 MI SE OF MINNEISKA
	WWR-26	WHITEWATER R S FK N OF CR-115 3.5 MI NW OF UTICA
	GB-4.5	GARVIN BROOK AT CSAH-23, SW OF MINNESOTA CITY
	ZSF-5.7	ZUMBRO R S FORK AT CSAH-14, 3 MI N OF ROCHESTER
	UM-698	MISSISSIPPI R BELOW US-14 BRIDGE AT LA CROSSE
	UM-714	MISSISSIPPI R LOCK & DAM #6 AT TREMPLEAU, WIS
	RT-3	ROOT RIVER AT BRIDGE ON MN-26 3 MI EAST OF HOKAH
	CD-10	CEDAR RIVER AT CSAH-4, 3 MILES SOUTH OF AUSTIN
	CD-24	CEDAR RIVER AT CSAH-2, 0.5 MILES EAST OF LANSING
	SR-1.2	SHELL ROCK R BR ON CSAH-1 1 MI W OF GORDONVILLE

Table 13: Indicators of Progress for TMDL Implementation

Fecal Coliform Source	Indicator of Progress
Feedlots <300 animal units	1) # Eligible for Open Lot Agreement (OLA) 2) Open Lot Agreements Signed 3) Open Lot Agreement Plans Developed 4) Open Lot Agreement Plans Implemented <ul style="list-style-type: none"> ▪ Partial ▪ Complete
Feedlots 300 – 999 animal units	Starting 2005, Track Manure Management Plans – acreage and a.u.'s covered
Feedlots>1000 animal units	1) Permits 2) Inspections/year 3) Manure Management Plans <ul style="list-style-type: none"> ▪ Acreage and a.u.'s covered
Pasture Management	1) Number of Pasture Management Plans Written <ul style="list-style-type: none"> ▪ Acreage and a.u.'s covered 2) Number of Plans for Livestock Exclusion From Streams <ul style="list-style-type: none"> ▪ Acreage, a.u.'s, stream miles
Riparian Buffer Strips	Linear feet of streams protected
Failing Septic Systems	1) Number of ISTS in county 2) Number of Failing ISTS <ul style="list-style-type: none"> ▪ Number of ISTS classified as Imminent Public Health Threats 3) New construction permits 4) Repair permits <ul style="list-style-type: none"> ▪ Total ▪ Imminent Public Health Threats
Unsewered Communities	1) In initial planning stages for wastewater improvements 2) In Facility Planning Process 3) Submitted Engineering Plans to MPCA 4) In Process of Construction 5) Have completed wastewater projects or are managing individual systems in compliance with requirements.
Stormwater Runoff (>10,000 pop)	Basin population served by municipalities with approved Phase II Stormwater Plans that are in compliance with TMDL provisions
Wastewater Bypasses	1) Total number of bypass events 2) Total number of chronic bypass wwtps 3) Status of addressing chronic bypass problems

7. Funding

Funding needs to implement the practices described in this plan include point source and nonpoint source measures. An attempt is made to estimate the cost of the most significant of these measures. For point sources, the discussion is limited to wastewater bypasses, as under normal treatment disinfection is required to meet effluent limits from April 1 to October 31.

A. Wastewater Treatment – Untreated Bypasses

Untreated bypasses usually occur as a result of a combination of the following factors: excessive inflow and infiltration (I & I) increase in wastewater flow beyond original design; failing equipment at a lift station or at the wastewater treatment facility; and rain events that are beyond regular design. Aside from abnormal rain events, the MPCA expects cities to be able to deal with the rest of these things so the bypasses do not happen. The cities of Claremont, Kasson and West Concord have been bypassing for a combination of these reasons.

At Claremont, bypassing is due mostly to excess I&I. They have done several projects already to try to reduce the I&I. Claremont has replaced almost their entire collection system at their own cost, but still seem to have a big I&I problem. Because they are still bypassing in wet weather, Claremont is planning to build a new lift station and mostly new wastewater treatment facility to deal with the I&I they can't remove, plus add capacity for future growth. Construction plans, to be submitted in November 2003, will have a cost of about 2.7 million dollars. The current population is about 620 and the 20 year projected population is about 900.

At Kasson, bypassing was due to excess I&I, growth beyond original design, and failing or poorly designed equipment. The city built a new wastewater treatment facility to deal with this set of problems, with successful results. The project cost was about 6.2 million dollars. The current population is about 4400 and the 20 year projected population is about 6500.

At West Concord their bypassing is due to excess I&I and low design capacity of the wastewater treatment facility, compounded by a high groundwater level and leaky collection pipes. West Concord did an I&I project on the collection system a few years ago to remove several storm water catch basins and one bad section of sewer on main street. This helped the I&I situation a little but it did not solve it. Because of this they will be building a larger plant for the I&I capacity they cannot economically remove, and also for future growth. Their construction plans will be submitted soon and the cost is estimated to be about 2.3 million dollars. The current population is about 950 and the 20 year projected population is about 1260.

B. Nonpoint Sources

Detailed description of funding needs will be provided in individual 319 project applications used to implement this plan. A wide range of funding sources will be used to implement the management measures needed to reduce fecal coliform loadings by 65 percent over the coming 10 years. Many of these sources have already been mentioned. To summarize, they include (but are not limited to) the following:

- State and county funding of county feedlot and ISTS programs provides the foundation for addressing these fecal coliform sources.
- Section 319 funding is being used to augment technical and financial assistance to accelerate enrollment in and implementation of the Open Lot Agreement, to accelerate corrections of failing septic systems, and to enable unsewered communities to begin working toward collective solutions to inadequate wastewater treatment.
- USDA funding is being used to fund a major educational effort directed to farmers called the Karst Campaign, and EQIP funding is widely used to assist in the funding of management measures for farmers.
- State and county revolving load funds will be used to help to fund the repair of failing septic systems.
- Board of Water and Soil Resources cost-share funding and Challenge Grants also are available to fund the implementation of practices.
- BALMM has prepared an application for a 95,700-acre Conservation Reserve Enhancement Program (CREP) project. This would be jointly funded by USDA (through the Conservation Reserve Program) and the State of Minnesota, (through the Reinvest in Minnesota Program).
- Other funding sources will be sought as needed.

Table 14 summarizes the estimated cost of implementing best management practices to control the major sources of fecal coliform bacteria identified in the TMDL study. These include:

1. Pasture Management: Inventories of overgrazed pastures where manure poses a pollution hazard do not exist. However, it is known that such sites are plentiful throughout the basin, and can contribute to extremely high levels of fecal coliform impairment. With current grants for technical assistance, plus the prospect of increased capability by SWCDs to assist producers, it is projected that an average of 60 overgrazed pastures per year will be addressed through measures such as stream exclusion, remote watering systems and rotational grazing plans. At an estimated cost of \$60/acre (including labor) and an average pasture size of 60 acres, the annual cost of improving overgrazed pastures is \$216,000. Technical assistance is estimated to cost \$100,000 per year. Altogether, the estimated 10-year cost of improving overgrazed pastures is \$3.2 million.

2. Feedlot Runoff: Permitting programs are assumed to have already addressed feedlots greater than 300 animal units in size. The main focus of implementation will be to correct the estimated 3,600 feedlots below this size category that are believed to be causing a pollution hazard. This will be done in the context of the Open Lot Agreement, which aims for full compliance by October 2010. It is estimated that an additional \$500,000/year of technical assistance funding will be needed to accomplish this over the next seven years, for a total of \$3.5 million. The actual cost of feedlot fixes, based on county estimates, is \$78 million, for a total cost of \$83 million over the next seven years. To achieve a 65% reduction, the estimated cost is \$55 million. (The Minnesota Department of Agriculture estimates that the average feedlot in Minnesota will cost \$23,000 to bring into compliance, based on its database of Ag BMP loans. For a second, local, estimate, county feedlot officers in Fillmore, Goodhue and Winona Counties were asked to estimate the average cost of fixing feedlots in three cost categories – low-, medium- and high-cost. It was assumed the 3,600 feedlots needed improvements fall evenly into these three categories. The low-cost feedlot average cost was estimated to be \$5,000; medium cost was estimated to be \$20,000; and high-cost was estimated to be \$40,000 on average. Based on these estimates, the total cost of bringing the 3,600 feedlots into compliance is \$78 million, very close to the MDA estimate.)

3. Manure Management Planning. Manure management planning is a prerequisite for ensuring that the application of manure is done in a manner that minimizes the threat of polluted runoff. Manure management plans are required for all feedlots greater than 300 animal units in size. There are 1291 such feedlots in the basin, according to feedlot registration data. In addition, it is estimated that counties will be working with 2000 out of 8358 smaller feedlots (less than 300 animal units) to develop manure management plans. At a cost of \$500 per plan, it will cost \$1.65 million to develop plans for 3291 livestock operations. To achieve a 65% reduction, the estimated cost is \$1.1 million.

4. Manure Application. A second prerequisite for sound manure management is adequate equipment. Based on Minnesota Department of Agriculture estimates, approximately one-third of all livestock producers in Minnesota require upgrades in their manure application equipment, at an average cost of \$20,000. Applying this estimate to

Table 12: Estimated Cost of Key TMDL Implementation Measures

Measures	Elements	Cost Estimate (2004 – 2014)
Pasture Management	60 grazing plans/year Ave of 60 acres @ \$60/a	Tech Assistance: \$100K/yr Installation Cost: \$216,000/yr Total Cost: \$3.2 M
Feedlot Runoff	3,600 Feedlots < 300 animal units, with pollution hazard. Tech Asst. -- \$500K/yr additional	1200 low-cost @ \$5K ea = \$6M 1200 med-cost@\$20K ea = \$24M 1200 high-cost@\$40K ea = \$48K Total Cost: \$83 M For 65% reduction: \$55M
Manure Mgmt Planning	Feedlots 300-999 au: 1154 Smaller: Of 8358, 2000 Total Plans Needed: 3291	3291 Plans @ \$500 ea. = \$1.6 M For 65% reduction: \$1.1 M
Manure Application	Est. 1/3 need equipment upgrade @ \$20K	Total Cost: \$64 M For 65% reduction: \$41.6M
Nonconforming Septic Systems	20,000 nonconforming	Total Cost: \$120 M For 65% reduction: \$78M
Undersewered Areas	104 undersewered areas, ave. population 100 20 corrections underway 30 more needed for 65% reduction <ul style="list-style-type: none"> ○ 10 centralized ○ 10 cluster ○ 10 on-site 	10 centralized @ \$1M = \$10M 10 individual @ \$6K = \$2.4M 10 cluster @ \$12K = \$4.8M For 65% reduction: \$17.2M

5. the Lower Mississippi River basin, it would cost an estimated \$64 million to upgrade manure handling equipment on 3200 livestock operations. To achieve a 65% source reduction would cost an estimated \$41.6 million.
6. Nonconforming Septic Systems. Of the 45,000 estimated individual sewage treatment systems (ISTS) in the basin, 20,000 are estimated to be nonconforming. At an average cost of \$6,000 each, it would cost an estimated \$120 million to bring these systems into compliance. To achieve a 65% source reduction would cost an estimated \$78 million.
7. Undersewered Areas . There are an estimated 104 undersewered areas in the basin. In 20 of these communities, efforts are underway to provide adequate sewage treatment. The goal of the Southeast

Minnesota Wastewater Initiative, a 319-supported project, is to help an additional 30 communities get similar efforts underway in the next three years, with solutions implemented within 10 years to achieve a 65% source reduction. It is estimated that 10 of communities will require centralized treatment at an average cost of \$1 million, another 10 will use cluster systems, and the remaining 10 will simply upgrade existing onsite systems. If the average community has a population of 100, household size is 2.5 persons, and the cost per household for onsite systems averages \$6,000, and for cluster systems \$12,000, then the total cost of providing wastewater treatment in the 30 communities will be \$17.2 million.

Table 15: Total Cost Estimate Summary	
Measure	Est. Cost of 65% Reduction
Pasture Management	\$3.2M
Feedlot Runoff	\$55.0M
Manure Management Planning	\$1.1M
Manure Application Equip Upgrade	\$41.6M
Nonconforming Septic Systems	\$78M
Undersewered Areas	\$17.2M
TOTAL ESTIMATED COST: 194.1 M	

8. References

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