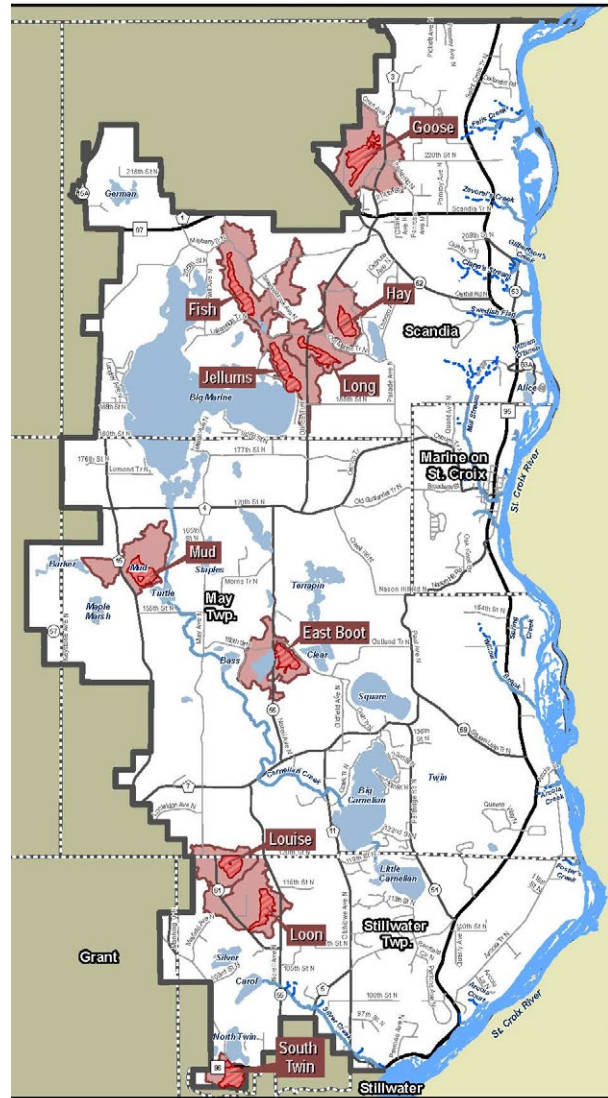


# Carnelian Marine Saint Croix Watershed District Multi-Lakes Total Maximum Daily Load

## Implementation Plan

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### List of Abbreviations:

CMSCWD	Carnelian Marine St. Croix Watershed District
BWSR	Board of Soil and Water Resources
MPCA	Minnesota Pollution Control Agency
NRCS	Natural Resources Conservation Service
DNR	Minnesota Department of Natural Resources

## TMDL IMPLEMENTATION PLAN SYNCHRONIZATION WITH CMSCWD WATERSHED MANAGEMENT PLAN

This Total Maximum Daily Load (TMDL) Implementation Plan is designed to act as a supplement to the [Carnelian-Marine-Saint Croix Watershed District \(CMSCWD\) Watershed Management Plan](#) and the [CMSCWD Multi-Lakes TMDL](#). The Watershed Plan is the primary source for implementation activities and are referenced (and not repeated) in this document.

### CMSCWD Watershed Management Plan and CMSCWD Multi-Lakes TMDL: The Foundation for this Implementation Plan

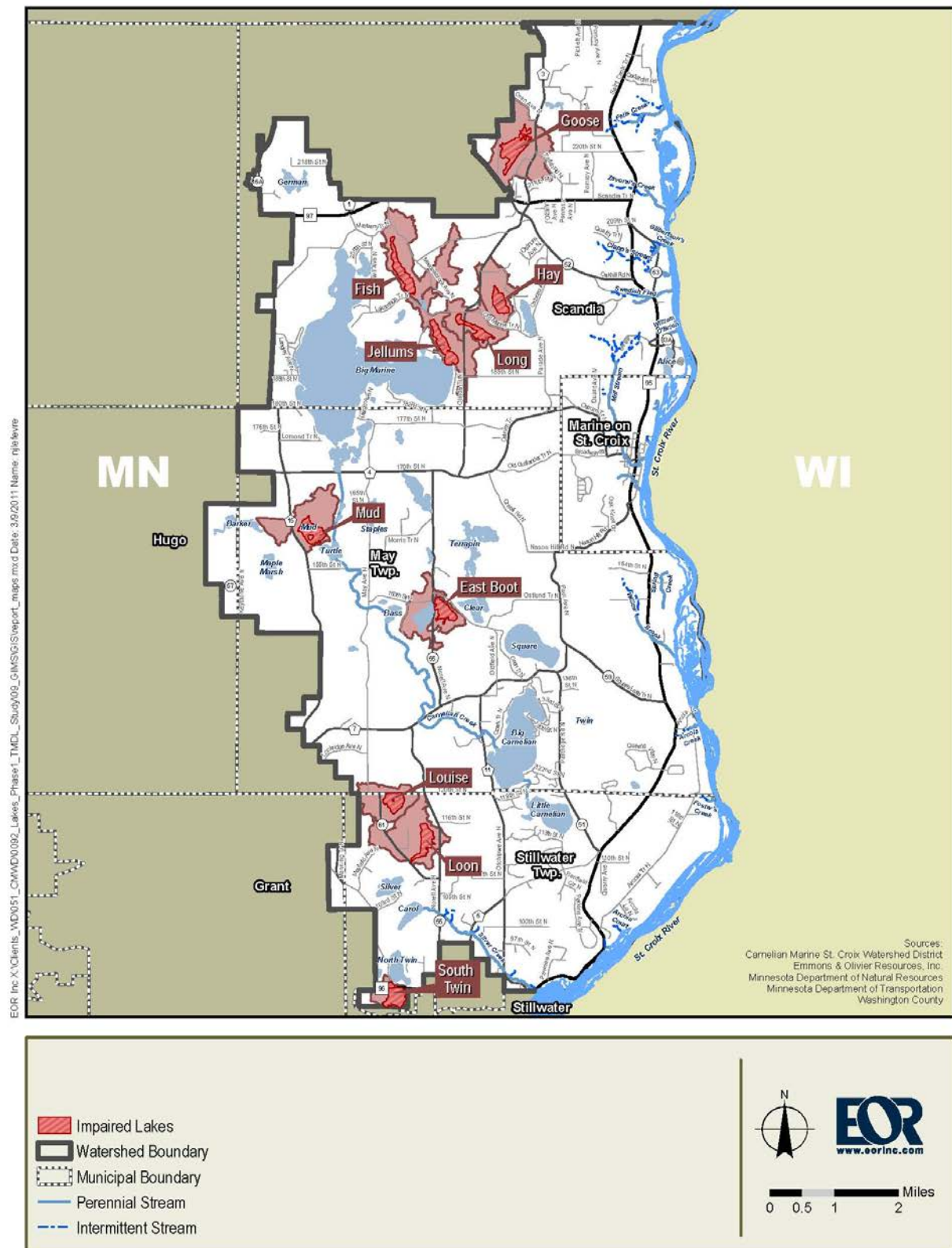


## LOCATION OF IMPLEMENTATION PLAN REQUIREMENTS

MPCA Requirement	Location in Document
Geographical extent of watershed	Page 5-6, Figure 1 and Figure 2
Measurable water quality goals	Page 7-8
Causes and sources or groups of similar sources	Page 7-8
Description of source management measures	Pages 11-15
Description of point source management	Page 15
Estimate of load reductions for nonpoint source management measures listed in b.1	Table 16
Estimate of load reductions for point source management measures listed in b.2	Page 15
Estimate of costs for nonpoint sources	Page 17
Estimate of costs for point sources	N/A
Information/education component for implementing plan and assistance needed from agencies	Page 10
Schedule for implementing nonpoint source measures	Page 16, Table 4
Schedule for implementing point source measures	N/A
A description of interim measurable milestones for implementing management measures (point sources and nonpoint source)(by measure if needed)	Page 16, Table 4
Adaptive management process-that includes set of criteria-to determine progress toward attaining nonpoint source reductions	Page 9
Monitoring component	Page 10







**Figure 2. CMSCWD TMDL Lakes and Watersheds**

## TMDL SUMMARY (EXCERPTED FROM TMDL REPORT)

The TMDL Report was approved by EPA on September 18, 2012. A copy of the report is available on the MPCA's website: <http://www.pca.state.mn.us/index.php/view-document.html?gid=18612>.

The TMDL addresses ten lake impairments within the Carnelian-Marine-St. Croix Watershed District (CMSCWD). The ten lakes are listed on the 2010 EPA's 303d list of impaired waters due to excess nutrients: East Boot, Fish, Goose, Hay, Jellum's, Long (in Scandia), Loon, Louise, Mud, and South Twin.

The following phosphorus sources were evaluated for each lake: watershed runoff, feedlots, subsurface sewage treatment systems (SSTS), loading from upstream lakes, atmospheric deposition, and internal loading. The phosphorus source inventory was then used to develop a lake response model for each lake, and these models were used to determine the phosphorus reductions needed for the lakes to meet water quality standards. The table below summarizes the TMDL load reduction goals for each lake.

### TMDL Summary Table

Table 1 (or table EX-11 from the TMDL Report) summarizes the TMDL and the load reduction goals for all lakes.

**Table 1. Summary of Loading Goals**

Lake	Phosphorus Source	Existing Annual TP Load (lb/yr)	Implementation Scenario Annual TP Load (lb/yr)	Percent Reduction
East Boot	Watershed	47	24	49%
	Atmospheric Deposition	12	12	0%
	Internal	134	130	3.0%
	<b>Total</b>	<b>193</b>	<b>166</b>	<b>14%</b>
Fish	Watershed	76	38	50%
	Atmospheric Deposition	17	17	0%
	Internal	113	82	27%
	<b>Total</b>	<b>206</b>	<b>137</b>	<b>33%</b>
Goose	Watershed	152	77	50%
	Atmospheric Deposition	23	23	0%
	Internal	171	129	25%
	<b>Total</b>	<b>346</b>	<b>229</b>	<b>34%</b>
Hay	Watershed	63	32	49%
	Atmospheric Deposition	11	11	0%
	Internal	63	48	24%
	<b>Total</b>	<b>137</b>	<b>91</b>	<b>34%</b>
Jellum's	Watershed	81	71	13%
	Atmospheric Deposition	17	17	0%
	Internal	124	69	44%
	<b>Total</b>	<b>222</b>	<b>157</b>	<b>29%</b>
Long	Watershed	52	26	50%
	Atmospheric Deposition	11	11	0%
	Internal	71	63	11%
	<b>Total</b>	<b>134</b>	<b>100</b>	<b>25%</b>

Loon	Watershed	107	54	50%
	Atmospheric Deposition	14	14	0%
	Internal	210	156	26%
	<b>Total</b>	<b>331</b>	<b>224</b>	<b>32%</b>
Louise	Watershed	51	26	49%
	Atmospheric Deposition	12	12	0%
	Internal	158	125	21%
	<b>Total</b>	<b>221</b>	<b>163</b>	<b>26%</b>
Mud	Watershed	27	14	48%
	Atmospheric Deposition	16	16	0%
	Internal	127	111	13%
	<b>Total</b>	<b>170</b>	<b>141</b>	<b>17%</b>
South Twin	Watershed	22	11	50%
	Atmospheric Deposition	15	15	0%
	Internal	73	63	14%
	<b>Total</b>	<b>110</b>	<b>89</b>	<b>19%</b>

## COLLABORATION

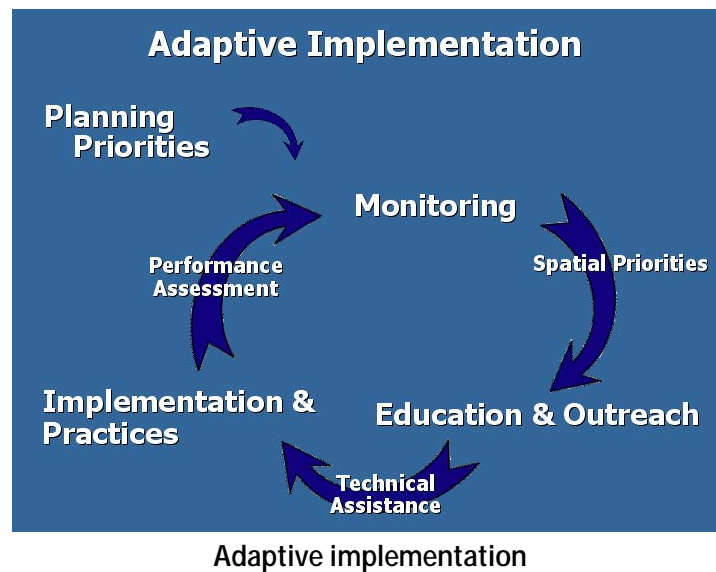
Impaired waters restoration is a collaborative effort between multiple agencies, organizations, groups, and residents. To date, the Washington Conservation District (WCD) exercised a leading role in the development of this plan and the coordination of related activities leading to approval. Funding and oversight was provided by the MPCA. CMSCWD has provided coordination between these entities, the main contractor, and the general public. Further prioritization and implementation will be directed and led by CMSCWD working with these entities as well as others:

<u>Organization/Entity</u>	<u>Role</u>
CMSCWD	Watershed Planning, Permitting, Funding, Monitoring, Prioritization, Education/Outreach, CIP, and Cost-Share
WCD	Monitoring Technical Assistance, Prioritization Support, Education/Outreach, and Best Management Practices (BMP) Design
Washington County	Technical Assistance, Funding, Education, and ISTS Program
BWSR	Funding and Technical Assistance
MPCA	NPDES Permitting and Funding
NRCS	Technical Assistance and Cost-Share
DNR	Permitting and Technical Assistance
Municipalities	TBD
Landowners	BMP Implementation, Access and Funding



## ADAPTIVE IMPLEMENTATION APPROACH

The CMSCWD Multi-Lakes TMDL Implementation Plan follows an adaptive approach to implementation (AI). Each implementation activity is discussed as part of the six major components of AI shown in the Figure below.



**Planning Priorities** set the scope and type of activities needed to achieve watershed goals – The TMDL and load reductions set the stage for all of the activities below.

**Monitoring** (supplemented by modeling) drives prioritization.

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**Prioritization** focuses outreach, technical assistance, and implementation activities

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**Outreach and technical assistance** drives demand for implementation of practices

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**Implementation** of priority practices and programs results in environmental benefits

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**Assessment** of implementation activities informs future monitoring, priorities, and implementation activities

All components of adaptive implementation are directed toward implementation that will result in a positive environmental outcome. The planning priorities stem from the TMDL report itself, which outlines pollutant load reduction goals. The process for reviewing and amending the TMDL Implementation Plan will occur on a recurring basis as part of the CMSCWD annual monitoring reporting and budgeting process. The foundation for adaptive implementation is based on an understanding of the receiving waters and requires a strategic monitoring regime to determine progress toward water quality goals.

## Monitoring Program

See [Section IV.C of the CMSCWD 2010 Watershed Plan](#) for specific monitoring details.

Water monitoring is necessary to track changes in water quality and will help determine the effectiveness of implementation actions. In-lake monitoring will be conducted per the CMSCWD 2010 Watershed Management Plan. Under this plan, water quality and biological samples will be collected as part of “Level 3 – Impaired” monitoring and should include the collection of nutrient and chlorophyll-a samples, Secchi disk transparency, dissolved oxygen/temperature profiles, and pH from April through October each year. Collection of other data, such as macrophyte surveys and zooplankton samples, will be determined as needed for assessing implementation actions for each lake.

Estimated Cost: Approximately \$20,000/yr not including any special (above baseline) monitoring such as macrophyte and fish surveys. Fish surveys will be coordinated with DNR to reduce costs.

### **Spatial Priorities: Watershed-wide BMP Prioritization and Subwatershed Assessments**

A variety of tools and techniques exists to identify and prioritize locations in the watershed to implement best management practices (BMP). Recognition that there are multiple scales of prioritization is important. First, larger-scale prioritization will be used to identify priority areas for more focused assessment efforts. Modeling, monitoring, and prioritization criteria are all viable techniques for the first stage of prioritization. The next stage of prioritization will be focused assessments which will include a combination of modeling and field work. Implementation of a prioritized approach will occur for each of the impaired lake subwatersheds. The final component of the prioritization process includes a cost-benefit analysis. Prioritization efforts will also focus the location and extent of education and outreach efforts.

Regional, local, and site level prioritization have already occurred for Goose and Hay Lake as they are part of a comprehensive prioritization study underway in partnership between the MN Department of Agriculture, University of Minnesota, Barr Engineering, Washington Conservation District (WCD), and Carnelian-Marine-St. Croix Watershed District. This Priority Management Zone (PMZ) Project is using multiple models and a detailed field protocol to identify Critical Source Areas (CSA). In conjunction with this effort, Watershed and WCD staff have identified multiple project opportunities to address the loading sources identified in the TMDL.

Further, the CMSCWD has developed a targeting tool to prioritize implementation within the entire watershed. The model will be used for identification of priority areas for implementation and support identification of funding priorities for the CMSCWD board.

The CMSCWD will collaborate with the WCD and direct other contractors in utilizing state-of-the-art field protocols to efficiently identify additional potential projects and assess the cost-benefits of targeted BMPs.

Estimated Cost: \$8,000/lake.

## Education, Outreach, and Technical Assistance

See [Section IV.B of the CMSCWD 2010 Watershed Plan](#)

Education can be used to build awareness and support for watershed management and direct voluntary implementation efforts that result in measurable water quality benefits. There is a diverse range of educational activities that can build upon each other.

CMSCWD participates in the East Metro Water Resource Education Program (EMWREP), a collaboration of multiple watershed organizations, municipalities, WCD, and Washington County. EMWREP targets multiple audiences and includes activities such as newspaper articles, Blue Thumb workshops, and Stormwater U trainings. Additionally, CMSCWD staff and board members work to educate the residents of the watersheds about ways to improve their lakes. Continued involvement in these and other educational activities is anticipated in order to motivate more citizens to become involved and to request technical assistance. The WCD, in partnership with the NRCS, CMSCWD and others, provides additional educational support for rural and agricultural BMPs.

Estimated Cost: Approximately \$10,000/year for EMWREP and rural education activities.

## Technical Assistance

See [Section IV.D and H of the CMSCWD 2010 Watershed Plan](#)

Individual assistance from the CMSCWD, WCD, and others is needed to support design, implementation, and maintenance of BMPs. Technical assistance also serves as one-on-one education and training (e.g. site visits with landowners) to facilitate and promote water quality improvement activities. Technical assistance offerings must be paired with public education and outreach, commercial marketing, and social marketing approaches to motivate individuals to seek available assistance, such as voluntary cost-share assistance programs discussed below.

Technical assistance is provided by a variety of entities, including but not limited to the CMSCWD, WCD, Washington County, and NRCS.

Estimated Cost: Approximately \$10,000-20,000/year.

## Implementation

Implementation in an adaptive and prioritized program involves identification of many implementation activities. Lake TMDLs require both in-lake and watershed load reductions. As noted in Section \_\_\_\_ of the TMDL, in-lake reductions are required for all ten of the lakes and include sediment loading, fish, and/or macrophyte controls. The number of options for watershed load reductions are typically much more diverse than in-lake reductions and include the following six major implementation categories. Corresponding references to the CMSCWD 2010 Watershed Plan are also listed.

- Regulation – CMSCWD, MPCA NPDES and County ISTS Permits
- New development standards - See Section IV.F of the CMSCWD 2010 Watershed Plan
- Redevelopment standards - See Section IV.F of the CMSCWD 2010 Watershed Plan
- Public projects – See Section IV.H of the CMSCWD 2010 Watershed Plan
- Private projects -- See Section IV.D Cost-Share Program of the CMSCWD 2010 Watershed Plan
- Municipal operation and maintenance – Not a significant component of this TMDL Implementation Plan
- Education – See Section IV.B Education/Communication of the CMSCWD 2010 Watershed Plan

The percent load reduction expected from each category will vary based on many factors, such as the TMDL pollutant of concern, landscape characteristics, dynamics of the resource in question, and even demographics. The specific level of activity for each implementation category is shown in the Table on the next page.

<b>POLLUTANT (P) LOAD REDUCTION IMPLEMENTATION CATEGORIES</b>	
<b>Regulations</b> (feedlot, septic, etc)	<b>x%</b>
<b>New Development Standards</b>	<b>x%</b>
<b>Redevelopment Standards</b>	<b>x%</b>
<b>Public Projects</b> (CIP - Retrofits)	<b>x%</b>
<b>Private Projects</b> (Voluntary Retrofits)	<b>x%</b>
<b>Municipal O &amp; M</b>	<b>x%</b>
<b>Education</b>	<b>x%</b>
<i>% of Load Reduction for Activity Category Varies Depending on Pollutant, Landscape, and Demographics</i>	

Internal load reduction activities would be considered a Public Project (Capitol Improvement Project, CIP). To improve the chances of success of in-lake management, reductions in watershed loading shall first be completed for most of the lakes. In some cases where watershed load reductions are not feasible or may not be completed in a timely manner, then in-lake reductions will be pursued in parallel.

See Section 16.2 of the TMDL Report for more details

Table 2 and Table 3 summarize the Implementation Category and Approaches for each of the lakes. "Target Water Body" is a lake that is prioritized for implementation in years 1-5.



**Table 2. Implementation Categories for the CMSCWD TMDL Lakes**

Lake	Dominant Land Covers	Primary Load Sources and Issues	Internal Load Reduction Needed (lb/yr)	Watershed Load Reduction Needed (lb/yr)	Percentage of Watershed Load Reduction by Implementation Category							Implementation Approach
					Regulations	New Development standards	Redevelopment Standards	Public Projects	Private projects	Municipal O&M	Education	
East Boot	Ag 20% Park 17% Undeveloped 55%	In-lake Feedlot 53% Stormwater 19%	4	23					100		*	Monitor lake to see if improving trend continues and if Ag BMP was adequate to address loading issues. Fish and curly-leaf pondweed management are the main internal load reduction strategies.
Fish	Ag 27% Undeveloped 62%	hypereutrophic Stormwater 73% Feedlots, unregistered	31	38					100		*	Work with landowners to develop lake-owner-led effort. Assess following five years of implementation in targeted water bodies. Fish management is the main internal loading reduction strategy.
Goose	Ag 31% SFR 18% Undeveloped 45%	In-lake; SSTS 19% Stormwater 68% Feedlots, unregistered	42	75		5		5	90		*	Target water body. Assess in-lake load reduction options after WS load reductions are achieved. Fish and curly-leaf pondweed management are the main internal load reduction strategies.
Hay	Ag 28% SFR 27% Undeveloped 35%	Very shallow lake Stormwater 67% SSTS 18% Feedlots, unregistered	15	31					100		*	Target water body. Assess in-lake load reduction options after WS load reductions are achieved. Fish management is the main internal loading reduction strategy.
Jellum's	Ag 36% Undeveloped 44%	Stormwater 57% Long Lake 19% Feedlots, unregistered	55	10					100		*	Work with landowners to develop lake-owner-led effort. Assess following five years of implementation in targeted water bodies. Fish management is the main internal loading reduction strategy.
Long	Ag 32% Undeveloped 54%	Stormwater 66% SSTS 17% Feedlots, unregistered	8	26					100		*	Work with landowners to develop lake-owner-led effort. Assess following five years of implementation in targeted water bodies. Minor in-lake practices will be necessary to meet the TMDL.
Loon	Ag 33% Park 29% SFR 14% Undeveloped 19%	Inlake; SSTS 18% hypereutrophic Stormwater 70% Feedlots, unregistered	54	53					20		80	Work with landowners to develop lake-owner-led effort. Assess following five years of implementation in targeted water bodies. Sediment disturbance management and fish management are the main internal load reduction strategies.
Louise	Ag 40% Park 12% Undeveloped 33%	In-lake; SSTS 14% Stormwater 67% Feedlots, unregistered	33	25				10	90		*	Target water body. Assess in-lake load reduction options after WS load reductions are achieved. Curly-leaf pondweed management is the main internal loading reduction strategy.
Mud	Ag 44% Undeveloped 47%	In-lake; SSTS 2% Stormwater 60% Feedlots, unregistered	16	13					100		*	Work with landowners to develop lake-owner-led effort. Assess following five years of implementation in targeted water bodies. Vegetation enhancement and cattle exclusion are the main internal load reduction strategies.
South Twin	Ag 45% SFR 35% Undeveloped 20%	In-lake Stormwater 43% SSTS 16% Feedlots, unregistered	10	11				50	50		*	Target water body. Assess in-lake load reduction options after WS load reductions are achieved. Curly-leaf pondweed management is the main internal loading reduction strategy.

\* Education is an implementation activity that will occur for all water bodies. Quantification of the percentage of load that will directly result from education is difficult, so a number is not assigned for most of the lakes.

**Table 3. Implementation Approaches for the CMSCWD TMDL Lakes**

Watershed Load Reduction Opportunities*		Internal Load Reduction Opportunities
East Boot	Education, livestock exclusion, feedlot runoff management, road runoff management	Curly-leaf pondweed management, hypolimnetic aeration/iron additions/alum
Fish	Education, ag runoff management, iron enhanced BMPs	Fish management
Goose	Education, ag nutrient management, livestock management, ravine stabilization, turf management, buffer enhancement, ponds, road runoff management, iron enhanced BMPs, bioretention, septic system improvements	Fish and weed management, hypolimnetic aeration/iron additions/alum
Hay	Education, ag nutrient management, turf management, buffer enhancement, ponds, iron enhanced BMPs, bioretention, septic system improvements	Fish management
Jellum's	Education, ag runoff management, iron enhanced BMPs, septic system improvements, buffer enhancement, turf management	Fish management (harvesting or kill)
Long (Scandia)	Education, ag runoff management, iron enhanced BMPs, septic system improvements, septic system improvements	Minor in-lake practices will be necessary to meet the TMDL
Loon	Education, ag runoff management, iron enhanced BMPs, septic system improvements, buffer enhancement	Fish management dredging (10 feet of soft sediment)
Louise	Education, ag runoff management, buffer enhancement, iron enhanced BMPs, septic system improvements	Curly-leaf pondweed management, aeration
Mud	Education, livestock exclusion, manure management, ag runoff management, buffer enhancement	Fish management (harvesting or kill)
South Twin**	Education, road runoff management (City of Stillwater), septic system improvements, buffer enhancement	Curly-leaf pondweed management

\* Specific watershed load reduction activities for each lake will be identified and ranked through the Prioritization Protocols described above.

\*\*A portion of the South Twin watershed is located within the City of Stillwater, the only Municipal Separate Storm Sewer System (MS4) within this TMDL.

#### Implementation Sequencing and Timeline

Each of the ten lakes in the TMDL were evaluated and ranked (on a scale of 1-5) to determine the sequence of implementation activities. The ranking was based on the following criteria and results are shown in Table 4 below.

- Water Quality Trend/Need: Trend in water quality indicates prompt implementation is needed.
- Achievability: Causes of phosphorus loading can be addressed in the short term. Weighted score ( $x * 1.5$ ).
- Public Support: Landowner group and/or local leader in place.
- Public Access/Public Ownership: Public boat launch or access from public land.
- Multiple Landownership: Multiple landowners with vested interest in the water body.
- Downstream Impacts: Potential for water body to adversely affect downstream water bodies.
- Habitat Value: Aquatic habitat value and/or unique plant or animal specials present.

The load reduction targets in the table below are estimations for workload and budgeting purposes. Actual load reductions achieved on an annual basis will depend on a variety of factors including climate, funding, capacity, project sequencing, and landowner willingness.

#### MS4 Waste Load Allocation (WLA)

The City of Stillwater has a WLA for South Twin Lake. Three (3) of the 11 pound load reduction is anticipated to come from projects completed in collaboration with the City.

Estimated Costs: See Table 4.

**Table 4. 2013 - 2030 Load Reduction Plan and Cost Estimate per Year**

Lake	Rank	Watershed Load Reduction Needed (lb/yr)	Internal Load Reduction Needed (lb/yr)	Pounds Per Year Reduction Target																		
				2013 Target	2014 Target	2015 Target	2016 Target	2017 Target	2018 Target	2019 Target	2020 Target	2021 Target	2022 Target	2023 Target	2024 Target	2025 Target	2026 Target	2027 Target	2028 Target	2029 Target	2030 Target	Totals
Goose	1	75		10	20	20	15	10														75
			42							10		12		10		10						42
South Twin	2	11		5		6																11
			10					5		5												10
Hay	3	31			10	10	11															31
			15								10		5									15
Louise	4	25					5	10	10													25
			33										10		10		13					33
East Boot	5	23						10	13													23
			4									4										4
Jellum’s	5	10							10													10
			55										15		20		20					55
Loon	5	53								14	8	8	10	13								53
			54													20		20		14		54
Long	6	26										10	5	5		6						26
			8													4		4				8
Mud	7	13										5		4		4						13
			16													10		6				16
Fish	8	38												5		10	5	10	5	3		38
			31																15		16	31
				15	30	36	31	35	33	39	27	55	24	53	34	68	20	25	18	14	16	573
Cost Estimates				\$45,000	\$90,000	\$108,000	\$93,000	\$94,000	\$99,000	\$62,000	\$72,200	\$72,600	\$72,000	\$71,000	\$71,200	\$65,400	\$38,000	\$31,000	\$21,000	\$11,200	\$12,800	\$1,129,400



### Performance Assessment

In addition to monitoring the impaired water bodies, assessment of the performance of implementation activities is needed to gauge success over time. Performance assessment can occur at multiple scales, depending on the data requirements, and includes the following:

- Subwatershed/catchment monitoring – pre- and post-BMP installation
- Site level monitoring – pre- and post-BMP installation
- BMP performance monitoring/assessment

Estimated Cost: Approximately \$10,000-20,000/year.

**Table 5. CMSCWD Implementation Plan Overall Cost Summary**

Activity	Estimated Total Cost to Achieve TMDL Goal by 2030
Monitoring	\$401,000.00
Prioritization	\$64,000.00
Education	\$214,000.00
Technical Assistance	\$300,000.00
Implementation	\$1,129,400.00
Performance Assessment	\$300,000.00
<b>Total Cost:</b>	<b>\$2,408,400.00</b>