Lake Volney
Excess Nutrient TMDL
Implementation Plan

June 2011

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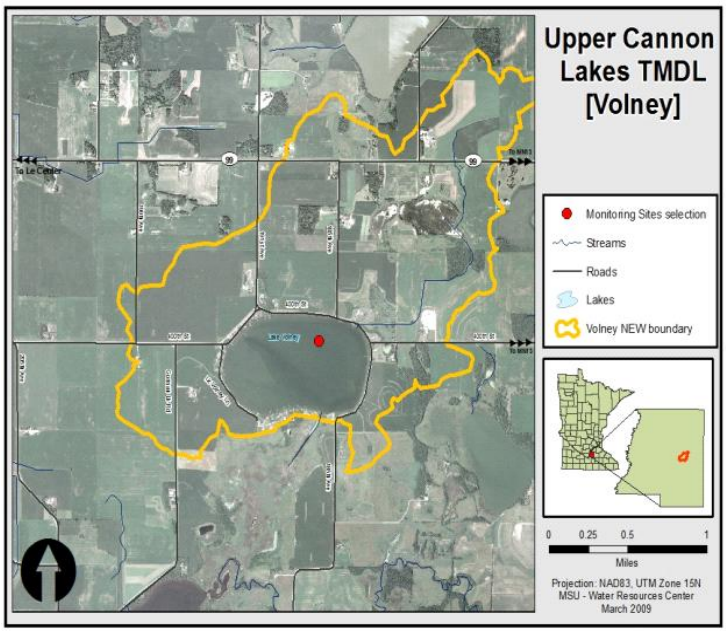


INTRODUCTION

1.1 Site Description

Lake Volney is a small lake at only 277 acres; however, Lake Volney has a maximum depth of 65 feet and a mean depth of 22.7 feet making it one of the deepest lakes in southern Minnesota. Lake Volney is located in Le Sueur County within the Cannon River Watershed (Figure 1.1A). Lake Volney is situated in a watershed that is comprised of moderate to steeply sloping hills that have been cleared primarily for agricultural purposes. The total acreage within the Lake Volney watershed is 2,017.1 acres; most of the watershed is dominated by agricultural land use. The watershed to lake ratio for Lake Volney is 7.3:1. Lakes with watershed to lake ratios less than 10:1 are typically easier to restore in comparison with lakes that have a ratio greater than 10:1 (Pers. Comm. Tim Hoyman, Certified Lake Manager, Onterra LLC). Lake Volney is a dimictic waterbody, meaning it has two periods of stratification and two periods where the lake mixes or "turns over" that occur annually. The stratification of this lake is highly beneficial to the water quality of this basin because a large percentage of the phosphorus load is retained within the hypolimnion during a majority of the sampling season. The combination of a small watershed-to lake ratio and the thermal stratification of the Lake Volney basin give this waterbody a better than average chance for restoration.

Fifty-four percent of Lake Volney's surface area is greater than 15 feet deep; therefore, approximately 46% of the surface area is within the littoral zone that is capable of supporting any type of plant growth. Although curly-leaf pondweed (CLP) has been found in Lake Volney, the growth of this species has not become overly problematic. Moderately dense stands of CLP were found in a small percentage of the lake in 2009. Steve McComas of Blue Water Science has found that the sediment within Lake Volney is not conducive to supporting extremely dense stands of CLP. The overall macrophyte community found in Lake Volney is extremely limited, a total of three species were found during the two point intercept surveys conducted in 2009. The absence of macrophytes within Lake Volney may partially explain the frequency by which algae blooms occur. The ample supply of nutrients in coordination with an absence of shading from macrophytes allows for algae to grow relatively uninhibited.

Several citizen complaints directed towards the MPCA were filed during the summer of 1985 by members of the Lake Volney Lake Association. This led to the first comprehensive study of the water quality in Lake Volney during the summer of 1986. Results from this study documented TP concentrations of 160 ug/L; which placed Lake Volney at the 92nd percentile in a sample of 1,028 Minnesota lakes (Wilson, 1987)

Lake Volney was placed on the impaired waters list in 2002; the pollutant/stressor was identified as excess nutrients that affected aquatic recreation. Lake Volney has historically served as a major focal point for recreation within Le Sueur County, and has served the needs of multiple user groups. Common recreational activities on Lake Volney include boating, angling, and swimming. The water quality of Lake Volney does not meet Minnesota standards set forth for lakes in the North Central Hardwood Forest (NCHF) ecorgeion, therefore, Lake Volney is not fully supportive of the aquatic recreation activities that this waterbody has historically provided.

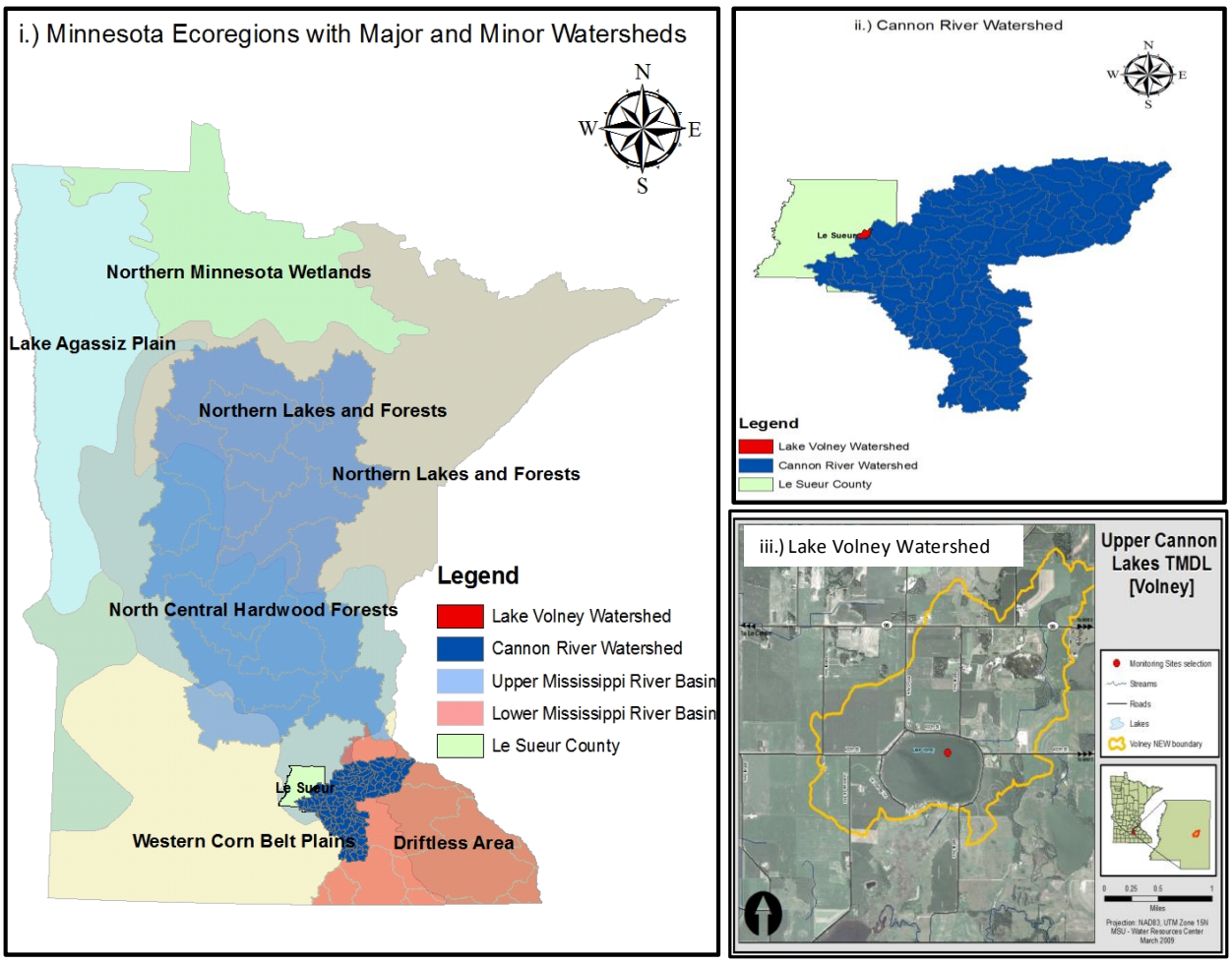


Figure 1.1 A: Geographical location of the Mississippi River Basin (i), Cannon River Watershed(ii) and Lake Volney Watershed (iii).

This implementation plan represents the final step of the TMDL process in Minnesota; the goal of the implementation plan is to document the activities necessary to successfully reduce phosphorus loading. The implementation plan uses findings from the TMDL study conducted on Lake Volney to guide the decision making process. Results from the TMDL study have located the largest sources of phosphorus to Lake Volney; this plan will outline the necessary steps, responsible parties, and timeline in which a reduction of phosphorus should occur.

2.0 TMDL Summary

The TMDL for Lake Volney was apportioned between the waste load allocation (WLA), the load allocation (LA), and a margin of safety. There are no waste water treatment facilities or industrial areas that lie within the Lake Volney watershed. Lake Volney and its surrounding watershed are not considered a part of a MS4 community under any condition and therefore have no WLA loading under the MS4 category. There are no wastewater treatment facilities or industrial facilities with permitted TP limits in the Lake Volney watershed. In this TMDL, the loading value attributed to wastewater treatment facilities and/or industrial facilities was also set to zero. A review of all permits over a 10 year period only revealed several permitted

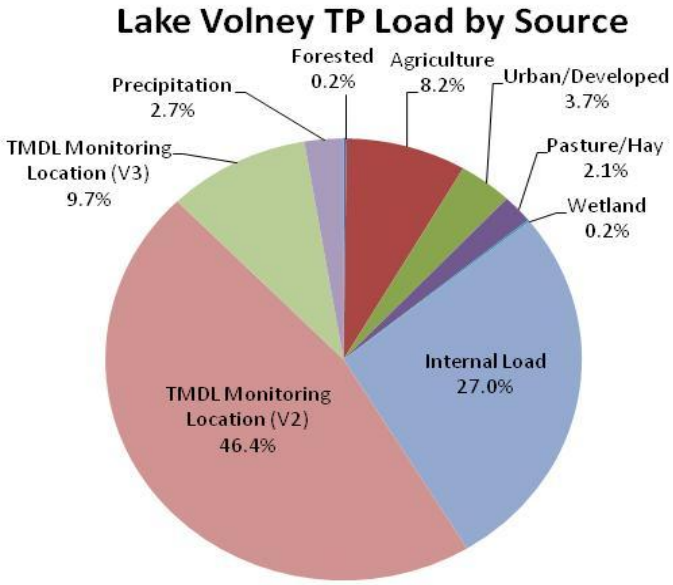
feedlots; however, a direct nutrient load cannot be assigned to feedlots. In order to avoid a zero allocation for construction, a 0.104% estimate was used to account for loading from construction (Pers. Comm. Mike Trojan, Stormwater Program MPCA). The 0.104% estimate assumes that no more than 0.104% of the total watershed (approximately 20 acres) will ever be under permitted construction at one time.

The load allocation can be subdivided into the following contributing sources: natural background nutrient loading, nutrient loading from monitored surface water inflow sites (V2 and V3), internal nutrient loading, overland runoff from the watershed, failing subsurface sewer treatment systems, and atmospheric loading.

For the purposes of this TMDL, an explicit 10% MOS was selected. Using the explicit 10% does not allocate any of the available loading capacity. Instead, the 10% MOS was used in modeling the standard in-lake TP concentration, meaning that 36 µg/L (40 – 10%) was the value used in this model. The MPCA uses the term "explicit standard" to reference water quality goals that are lower than the required ecoregion standard. A 10% MOS accounts for the uncertainty that the allocations set forth in this TMDL will result in Lake Volney meeting the required water quality standards.

2.0.1 PHOSPHORUS LOADING SOURCES

All data observed from monitored and non-monitored surface water inflow sites, land use values, watershed size, lake morphometry, precipitation/evaporation rates, and observed in-lake water quality conditions were used to develop the BATHTUB model. Results from this model were used to estimate the total current daily load as well as the total maximum daily load that would allow Lake Volney to meet standards set forth for the NCHF ecoregion. Loading of nutrients from external sources was not great enough to account for the observed water quality conditions on Lake Volney. Therefore, the remediation of Lake Volney will entail a reduction in nutrient sources from both internal and external sources. The proceeding chart highlights the phosphorus sources to Lake Volney.



2.0.2 Required Phosphorus Load Reduction

Calculations of the waste load and load allocation were based on standards set forth for deep lakes within the NCHF Ecoregion. Results from these calculations indicate that a 72.4% reduction in the TP load would be required for Lake Volney to reach the TP standard for the NCHF ecoregion.

2.0.3 Allocations

Lake Volney and its surrounding watershed are not considered part of a MS4 community under any conditions, and therefore have no WLA loading under the MS4 category. Although stormwater runoff at construction sites that do not have adequate runoff controls can be significant sources of sediment and nutrients on a per acre basis (MPCA Stormwater web page, 2006), MPCA records indicate that no permitted construction permits have been issued in the past 10 years. A review of all permits over a 10 year period only revealed several permitted feedlots; however a direct nutrient load cannot be assigned to feedlots. In order to avoid a zero allocation for construction, we will use a 0.104% estimate (Mike Trojan, MPCA), assuming that no more than 0.104% of the total watershed (approximately 2.1 acres) will ever be under permitted construction at one time. The construction stormwater is then considered 0.104% of the total waste load allocation. The load allocation in this study includes all contributions from: natural background sources, TMDL monitored inflow locations, internal loading, urban and residential sources, failing septic systems, and atmospheric loading. Table 2.4 A provides the total maximum daily load for Lake Volney; table 2.4 B shows how this load is partioned amongst the major sources.

Table 2.4 A:Total phosphorus wasteload, load allocation, and TMDL daily and annual loads.

Lake	Wasteload Allocation (TP)		Load Allocation (TP)		Margin of Safety	Total Phosphorus TMDL	
	(lbs/day)	(lbs/yr)	(lbs/day)	(lbs/yr)	(lbs/day)	(lbs/day)	(lbs/yr)
Lake Volney	0.001867	0.68	1.7938	654.737	Explicit	1.796	655.43

Table 2.4 B: Current daily TP load and reduction needed to meet TMDL load seperated by the major sources to Lake Volney.

Lake	Allocation	Source	Current TP Load		TMDL TP Load		Load Reduction (lb/yr) (%)
			(lb/day)	(lb/yr)	(lb/day)	(lb/yr)	
Lake Volney	**Wasteload**	**Construction**	**0.00186**	**0.68**	**0.00186**	**0.68**	**0**
	Load	**Watershed (Nonpoint flow)**	**1.08**	**394.36**	**0.431**	**158.95**	**235 (59.67%)**
		Agricultural Land Use	0.6188	225.88	0.1732	63.246	163 (72%)
		Developed / Urban Land Use	0.2766	100.96	0.0755	28.27	73 (72%)
		Forested	0.0157	5.75	0.0157	5.75	0
		Pasture/Hay	0.157	57.463	0.157	57.463	0
		Wetland	0.01176	4.2911	0.01176	4.2911	0
		Internal Load	**0.9367**	**343.9**	**0**	**0**	**344 (100%)**
		Monitored Inflow (V2)	**3.546**	**1,294.3**	**0.957**	**349.43**	**945 (73%)**
		Monitored Inflow (V3)	**0.739**	**269.85**	**0.1275**	**72.858**	**197 (73%)**
		Atmospheric (Precipitation)	**0.203**	**74.07**	**0.203**	**74.07**	**0**
	Total Load		**6.513**	**2,377**	**1.797**	**656**	**1,721 (72.4%)**

3.0 Implementation Plan

3.1 Approach to Lake Volney Restoration

The restoration practices set forth within this implementation plan can be broken down into two main focal points. First, external sources will be targeted by focusing on areas within the watershed (Figure 3.1) that are contributing a disproportionate amount of the total phosphorus budget. The second focal area for this study will be controlling internal sources in Lake Volney. Results from in-lake water quality samples collected during the TMDL study have identified a potentially large source of internal nutrient loading; this implementation plan will identify the best means of achieving a reduction from all sources. The restoration practices recommended in this implementation plan contain results of a series of Technical Advisory Committee (TAC) and public stakeholder meetings organized by the Water Resources Center at Minnesota State University, Mankato, the Cannon River Watershed Partnership, and the Minnesota Pollution Control Agency. The cost associated with each implementation action are preliminary estimates based on current land values, and a review of costs associated with prior implementation efforts that are similar to those suggested under this plan.

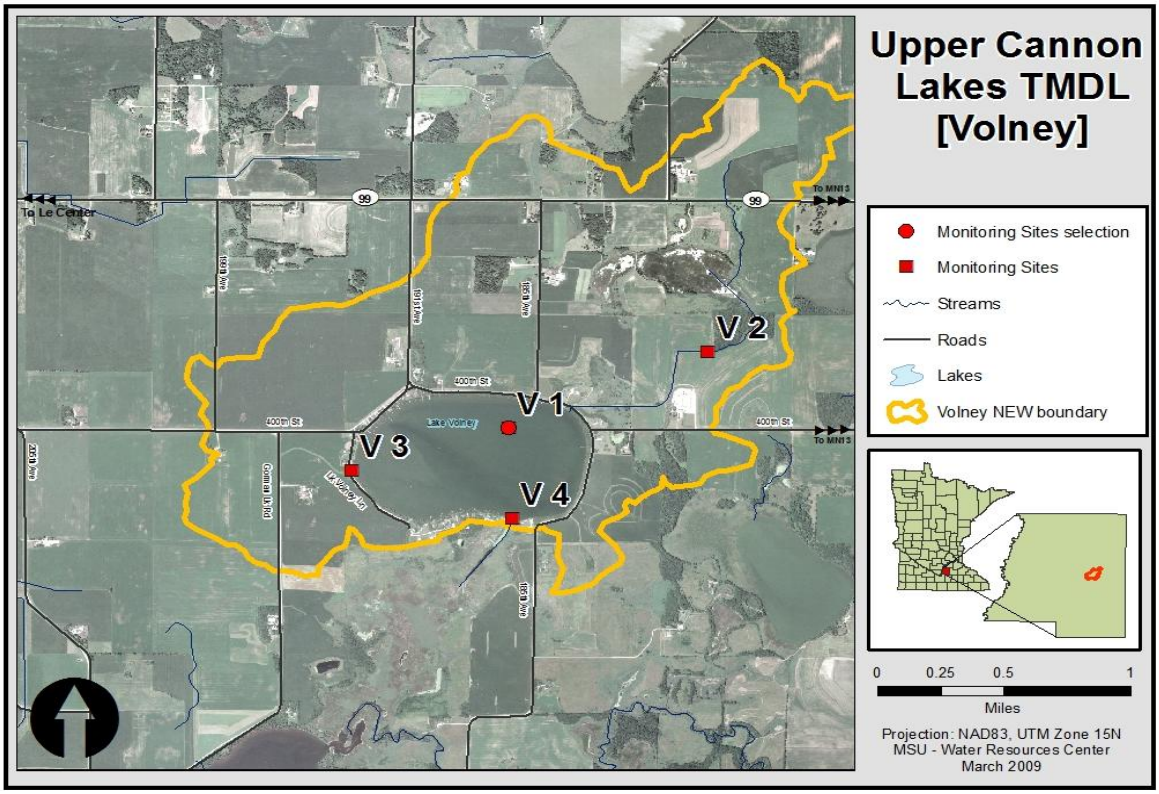


Figure 3.1. Surface water monitoring locations within the Lake Volney watershed included inflow sites V2 and V3 and outflow site V4. V1 represented the in-lake water quality monitoring location.

3.1. A. Load Reduction Implementation Actions

The Lake Volney Lake Association (LVLA) and Le Sueur County's Department of Environmental services will work together to implement the necessary implementation efforts. The actions of this implementation plan can be subdivided into several groups by the source they are meant to reduce. The first set of actions are designed to reduce loading from external sources and include actions to reduce loading from the ditch systems at monitoring locations V2 and V3, as well as specific BMPs designed to address loading from agricultural and developed land uses. The second set of actions are designed to reduce loading from internal and or near-shore sources. This set of actions includes specific plans to address nutrient loading from the sediments of Lake Volney as well plans to re-establish native macrophytes that will compete with algae for available nutrients.

Actions identified for reducing loading from the ditch system at V2 include:

- Conducting a wetland rejuventation of the large wetland complex that outlets through the ditch system
- Restoring additional wetland acreage upstream/downstream of the existing wetland complex
- Exploring the potential for a two staged ditch design at monitoring location V2

Actions identified for reducing loading from the ditch system at V3 include:

- Conducting a wetland restoration of a wetland system adjacent to the stream at monitoring location V3.

Actions identified for reducing loading from agricultural lands:

- Identify and target highly erodible lands, promote BMPs, terraces, and conservation practices (no-till farming) in these areas.
- Promote nutrient management, crop residue management, and any other nutrient reducing best management practice to producers within the watershed.

Actions identified for reducing loading from developed lands:

- Identify lakeshore property owners that are willing to install rain gardens, complete a shoreline restoration, install a rain barrel or implement some type of stormwater BMP on their property. Install rain gardens, complete shoreline restorations, and promote the use of rain barrels throughout the watershed.
- Several holding ponds were created upstream of the V6 grab sample monitoring location in 1999. These ponds have likely filled in with sediments and nutrients since 1999 and therefore need to be dredged so that these ponds can continue to serve as nutrient retention basins.
- Identify and collect water quality samples from major storm water culverts and tile lines located in developed areas, implement BMPS accordingly. Determine the potential to redirect culverts through treatment ponds or through rain gardens before directly entering Lake Volney.

Actions identified for reducing loading from internal/near shore sources

- Re-establish native emergent and submergent vegetation along the shoreline. Lake Volney is nearly completely devoid of emergent vegetation; therefore, sediment near shore is more likely to be disturbed via wave action or through bio-turbation from fish (mainly carp).
- Continue commercial fishing efforts. Large amounts of common carp and bigmouth buffalo have historically been removed from Lake Volney. The removal of large volumes of these species should be continued.
- Determine the feasibility of alum treatments. If feasible, design an alum treatment that will reduce internal phosphorus loading. Expand a citizen lake monitoring program to collect water quality samples to test for effectiveness of alum treatments.

Table 3.1 A. Estimated Total Phosphorus Load Reduction from Proposed Actions by 2020.

Lake	In-Lake TP Concentration Standard (ug/L)	Load Reduction Goal (lbs TP By 2020)	Total Estimated Load Reduction From Proposed Projects (lbs TP By 2020)	Additional Load Reduction Required to Meet Goal (lbs TP By 2020)
Lake Volney	**40**	**1,721**	**1,735**	**None**

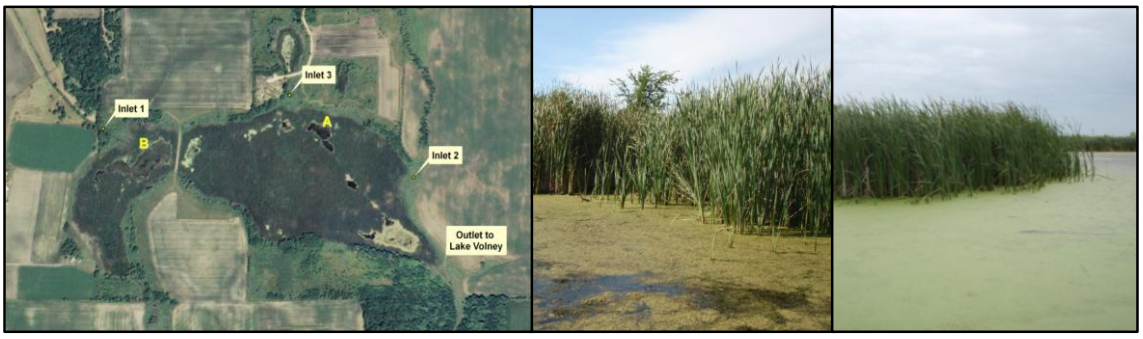
3.1 B Lake Volney External Sources

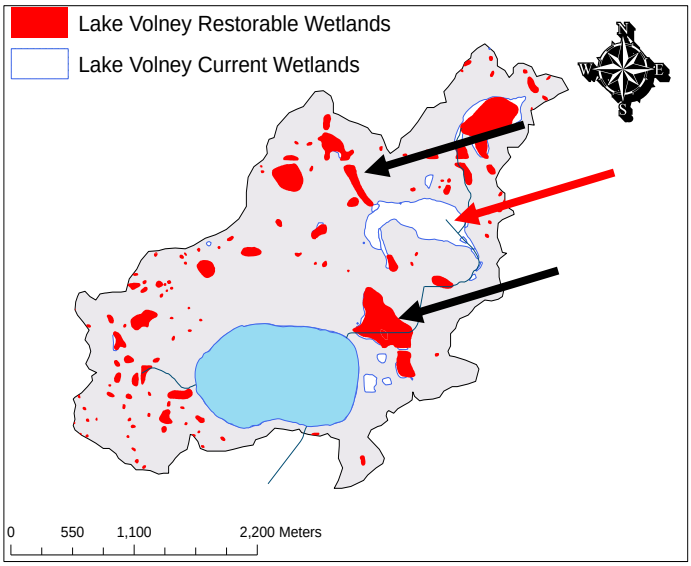
3.1 B.1 Reduce loading from monitoring location V2

Task 1. Work with landowners and appropriate agencies to conduct a wetland rejuvenation of the large wetland complex and to restore additional wetlands upstream/downstream of the large wetland complex. Restoring wetlands fits in with Le Sueur County's Water Management Plan Goal 3, objective 7 that aims to increase the number of wetland restoration contracts by 20% annually by 2015.

Current Condition of Wetland:

The Minnesota Pollution Control Agency Biological Monitoring Unit conducted a comprehensive study of the Lake Volney wetland. Results from this assessment suggested that the wetland complex was likely no longer serving as a nutrient retention basin. The lack of diversity amongst the flora and fauna present in the Lake Volney wetland suggest the wetland is severely degraded.





The black arrows represent restorable wetlands upstream and downstream of the current wetland that currently contributes the greatest phosphorus load to Lake Volney. The red arrow is the current wetland that exists. The MPCA conducted a comprehensive survey of this wetland in the summer of 2010. Results from this survey suggest that this wetland is significantly impaired and in need of restoration.

1.) Potential Contributors: Private landowners, Minnesota State University (MSU) Water Resource Center (WRC), Le Sueur County SWCD, MNDNR, Lake Volney Lake Association (LVLA).

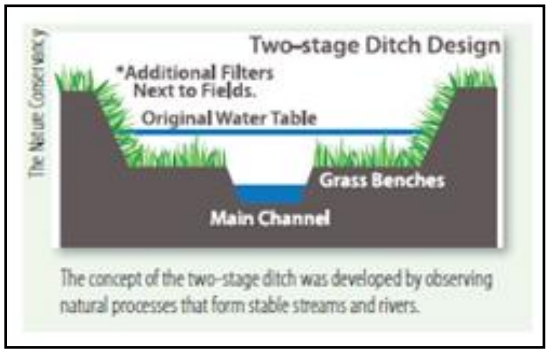
2.) Timeline: Short Term (2011-2016)

3.) Estimated Cost: $200,000
4.) Targeted TP Reduction: 500 lbs.

Task 2. Explore converting the ditch (or a portion of the ditch) at monitoring location V2 to a two staged ditch design.

Current Conditions: The ditch at monitoring location V2 has the potential to contribute a large nutrient load following storm events. The wetland upstream of this location is overburdened by nutrient loading and subsequently releases a large nutrient load to the ditch and eventually to Lake Volney. A two staged ditch would provide a great opportunity to filter nutrients prior to reaching Lake Volney especially during storm events.

Proposed Location



1.) Potential Contributors: Private landowners, Minnesota State University (MSU) Water Resource Center (WRC), Le Sueur County SWCD, MNDNR, Lake Volney Lake Association (LVLA).
2.) Timeline: Short Term (2011-2016)
3.) Estimated Cost: $100,000 (Highly Variable)
4.) Targeted TP Reduction: 250 lbs.

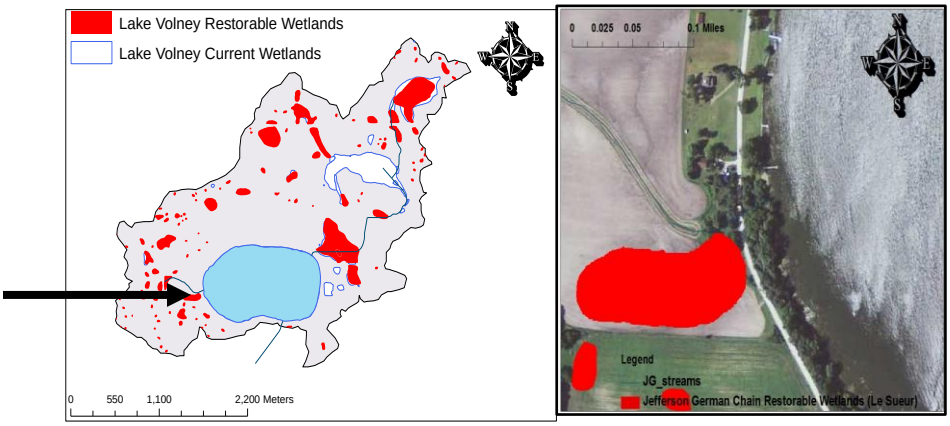
3.1 B.2. Reduce loading from monitoring location V3.

Task 1. Work with landowners and appropriate agencies to conduct a wetland restoration upstream or adjacent to the ditch at monitoring location V3 before it enters Lake Volney.

Current Conditions: The ditch at monitoring location V3 periodically rose out of its banks following snowmelt in the spring and after storm events throughout the summer. The surrounding floodplain was saturated with water during these events. Sediments

and nutrients from the stream bank were easily washed into Lake Volney during these high flow events.

Proposed Location

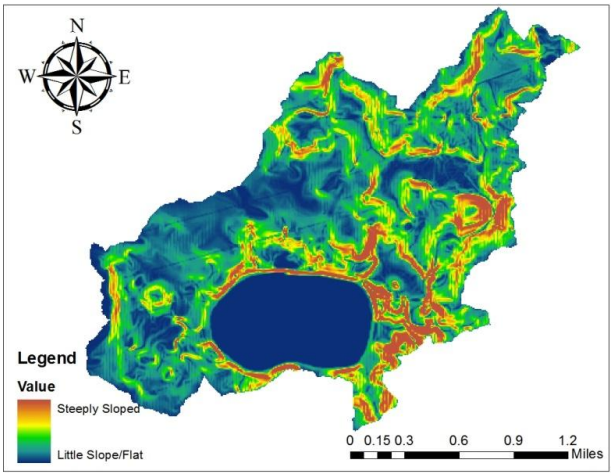


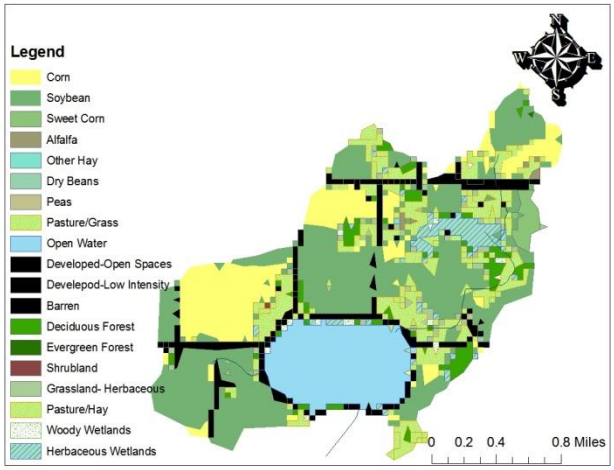
1.) Potentially Contributors: Minnesota State University (MSU) Water Resource Center (WRC), Le Sueur County SWCD, MNDNR, Lake Volney Lake Association (LVLA).
2.) Timeline: Short Term (2011-2016)
3.) Estimated Cost: $150,000
4.) Targeted TP Reduction: 200 lbs

3.1 B.3. Reduce loading from agricultural land uses

Task 1. Identify and target highly erodible lands, promote BMPs, terraces, and conservation practices (no-till farming) in these areas.

Current Conditions: There are certain areas of the watershed that are both steeply sloped and under agricultural production. The areas with the steepest slopes (red/orange) should be the highest priority locations.

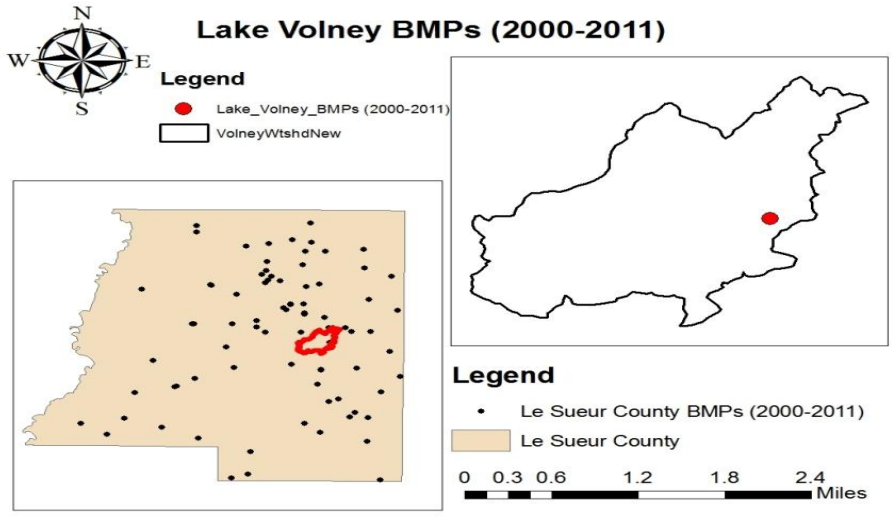




1.) Possible Contributors: Private Landowners, MSU WRC, Le Sueur County SWCD, MNDNR, LVLA.
2.) Timeline: Long term (2011-2020)
3.) Estimated Cost: $30,000
4.) Targeted TP Reduction: 100 lbs

Task 2. Promote nutrient management, crop residue management, and any other nutrient reducing best management practice to producers within the watershed.

Current Conditions: According to BWSR's Elink list of agricultural BMPs, only one BMP has been implemented within the Lake Volney watershed since 2000. Below is a map highlighting BMPs that have occurred in Le Sueur County (Left) and within the Lake Volney watershed (Right) since 2000. Although progress has been made, there is an obvious need to further implement BMPs within the watershed.
1.) Potential Contributors: Private Landowners, Le Sueur County SWCD, Le Sueur County Department of Environmental Services (DES). Get a minimum of two producers within the watershed to participate in a nutrient or crop residue management plan.
2.) Timeline: Long term (2011-2020)
3.) Estimated Cost: $7,500
4.) Targeted TP Reduction: 75 lbs



3.1 B.4. Reduce Loading from Developed Land Uses

Task 1. Identify lakeshore property owners that are willing to install rain gardens, complete a shoreline restoration, install a rain barrel or implement some type of stormwater BMP on their property. Install rain gardens, complete shoreline restorations, and promote the use of rain barrels throughout the watershed.

Current Conditions: Members of the Lake Volney Lake Association have already begun the process of conducting shoreline restorations and installing rain gardens. A significant amount of time and effort has gone into the planning and installation of these rain gardens; however there is still work to be done. Priority areas include those portions of the lake that are located nearest to roadways and/or stormwater culverts where runoff from the surrounding watershed may quickly enter the lake.

1.) Potential Contributors: Private Landowners, LVLA, Le Sueur County SWCD, MSU WRC, Le Sueur County DES, CRWP.

2.) Timeline: Long Term (2011-2020)

3.) Estimated Cost: $80,000

4.) Estimated Potential TP Reduction: 100 lbs.

Degraded Shoreline	Restored Shoreline
	
• Does not capture runoff from impervious surfaces. • No value to wildlife. • Vulnerable to erosion. • No aesthetic value • <u>Decreased Property Value!</u>	• Captures a large portion of the runoff from impervious surfaces. • Provides habitat for frogs, fish, butterflies and other wildlife. • Can reduce erosion if properly installed. • Great aesthetic value. • <u>Increased Property Value!</u>

Task 2. Several holding ponds were created upstream of the V6 grab sample monitoring location in 1999. These ponds have likely filled in with sediments and nutrients since 1999 and therefore need to be dredged so that these ponds can continue to serve as nutrient retention basins.

1.) Potentially Involved Parties: LVLA, Private Contractor, Le Sueur County DES
2.) Timeline: Short Term (2011-2016)
3.) Estimated Cost: $7,000
4.) Estimated Potential TP Reduction: 50 lbs.

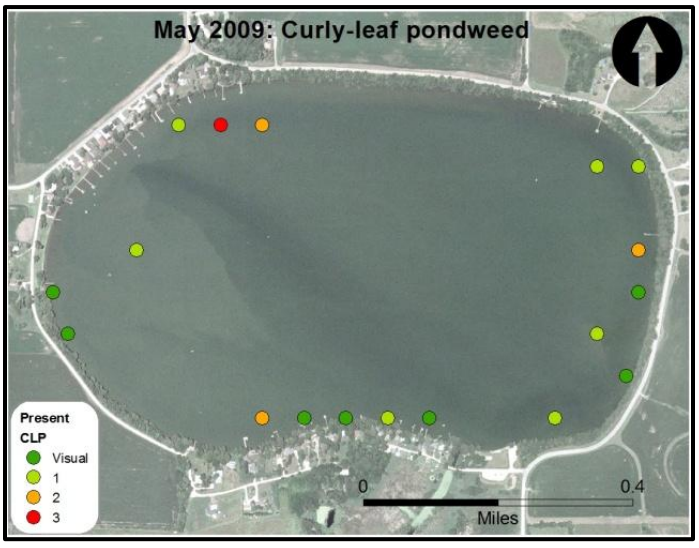
Task 3. Identify and collect water quality samples from major storm water culverts and tile lines located in developed areas, implement BMPS accordingly. Determine the potential to redirect culverts through treatment ponds or through rain gardens before directly entering Lake Volney.
1.) Potentially Involved Parties: LVLA, Le Sueur County, MSU WRC, MPCA
2.) Timeline: Short Term (2011-2016)
3.) Estimated Cost: $2,500 for initial studies, $20,000 for installation of rain gardens, treatment ponds, wetlands.
4.) Estimated Potential TP Reduction: 100 lbs.

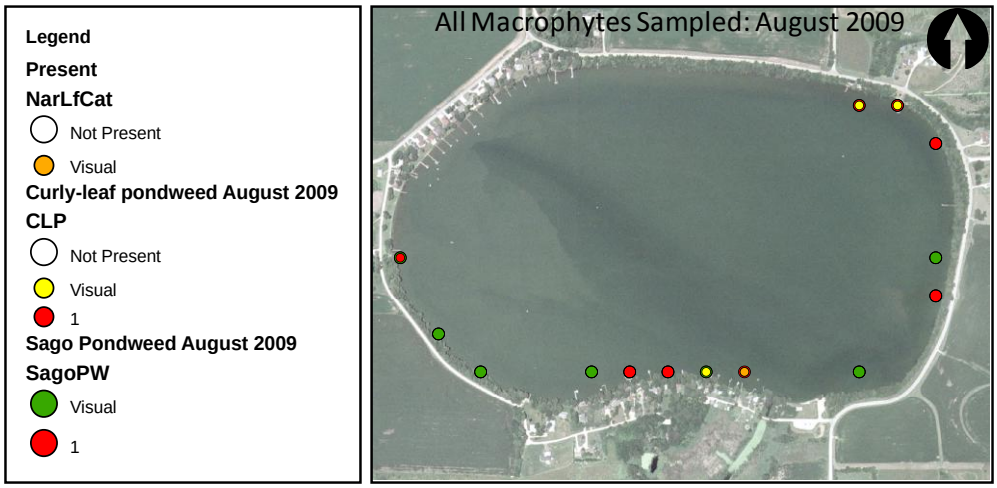
3.1 B.5. In-Lake/Near Shore Source Reduction/Enhancement of Biological Integrity

Task 1. Re-establish native emergent and submergent vegetation along the shoreline. Lake Volney is nearly completely devoid of emergent vegetation; therefore, sediment near shore is more likely to be disturbed via wave action or through bio-turbation from fish (mainly carp). This project would consist of installing a temporary barrier to allow native emergent species such as bulrushes to begin growing. Native emergents would be transported in from surrounding area lakes, purchased from local native plant nurseries, and/or grown from seed. The barrier would be removed once the plants had become established (2-3 years). If the initial phase was successful, this project could be expanded to a larger scale to include native submergent species growing at deeper depths.

Current Conditions:

The native plant community in Lake Volney is extremely limited. Curly-leaf pondweed was the only submergent macrophyte found during the May 2009 survey, while a total of three species of macrophytes (curly-leaf pondweed, narrow-leaf cattails, and sago pondweed) were found during the August 2009 survey. In the absence of native submergent macrophytes, the algal community is allowed to grow relatively uninhibited.





1.) Potentially Involved Parties: LVLA, WRC at MSU, MNDNR, Le Sueur County DES
2.) Timeline: Long Term (2011-2020)
3.) Estimated Cost: $15,000
4.) Estimated Potential TP Reduction: 50 lbs.

Task 2. Continue commercial fishing efforts. Large amounts of common carp and bigmouth buffalo have historically been removed from Lake Volney. The removal of large volumes of these species should be continued.
1.) Potentially Involved Parties: LVLA, Commercial Fishing Operator, MNDNR
2.) Timeline: Short Term (2011-2016)
3.) Estimated Cost: $0
4.) Estimated Potential TP Reduction: 10 lbs.

Task 3. Determine the feasibility of alum treatments. If feasible, design an alum treatment that will reduce internal phosphorus loading. Expand a citizen lake monitoring program to collect water quality samples to test for effectiveness of alum treatments.
1.) Potentially Involved Parties: LVLA, MNDNR
2.) Timeline: Long Term (2016-2020)
3.) Estimated Cost: Expensive, $200,000 or more.
4.) Estimated Potential TP Reduction: 300 lbs

4.0 Implementation Plan Summary

Table 4.0.A Summary of Proposed Implementation Actions:

Lake Volney	Total Initial Investment	V2		V3	Agricultural		Developed			In-lake / Near Shore		
	$803,835	Wetland rejuvenation/ Wetland restoration	Two-Staged Ditch Design	Wetland Restoration	Identify and restore highly erodible lands to native grasslands/prairies.	Promote and Implement Nutrient/Crop Residue Management	Reduce loading from developed lands , install rain gardens, implement stormwater BMPs.	Re-dredge holding ponds located in the northern portion of the Lake Volney watershed.	Collect water quality samples from major storm water culverts/tile lines located in developed areas, implement BMPS accordingly.	Re-establish native emergent and submergent vegetation along 30% of shoreline.	Continue commercial fishing efforts.	Determine the feasibility of alum treatments. Implement if all other options fail to reduce in-lake TP concentrations.

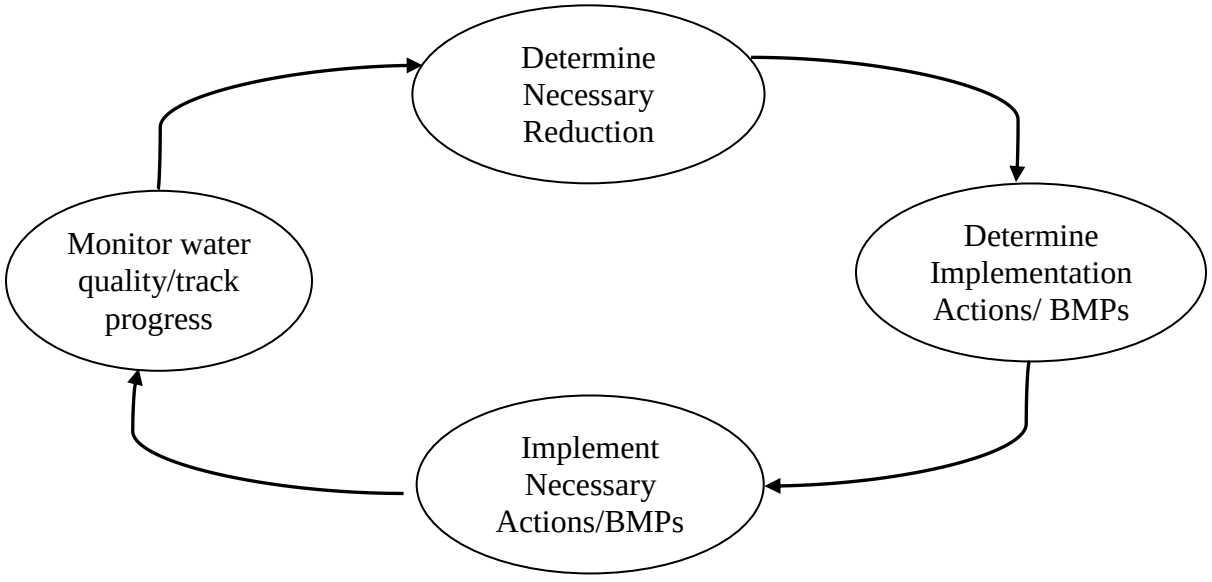
Table 4.0.B. Implementation Timeline and Estimated Budget.

Implementation Step	Potentially Involved Parties	Implementation Planned Year	Anticipated Budget	Estimated TP Removal (lbs)
Wetland Restoration (V2 watershed)	Private Landowners, MSU WRC, Le Sueur County SWCD, MNDNR, Lake Volney Lake Association (LVLA)	(2011-2016)	$200,000	500
Two Stage Ditch Installation (V2 watershed)	Private landowners, MSU WRC, Le Sueur County SWCD, MNDNR, LVLA.	(2011-2020)	$100,100	250
Wetland Restoration (V3 watershed)	Private Landowners, MSU WRC, Le Sueur County SWCD, MNDNR, Lake Volney Lake Association (LVLA)	(2011-2016)	$150,000	200
Identify and restore highly erodible lands	Private Landowners, MSU WRC, Le Sueur County SWCD, MNDNR, LVLA.	(2011-2020)	$30,000	100
Promote and Implement Nutrient/Crop Residue Management	Private Landowners, Le Sueur County SWCD, Le Sueur County Department of Environmental Services (DES)	(2011-2020)	$7,500	75
Reduce loading from developed lands, Install rain gardens, Implement stormwater BMPs. Shoreline restoration	Private Landowners, LVLA, Le Sueur County SWCD, MSU WRC, Le Sueur County DES, Cannon River Watershed Partnership (CRWP).	(2011-2020)	$80,000	100
Re-dredge holding ponds located in the northern portion of the Lake Volney watershed	LVLA, Private Contractor, Le Sueur County DES	(2011-2016)	$7,000	50
Collect water quality samples from major storm water culverts/tile lines located in developed	LVLA, Le Sueur County, MSU WRC, MPCA	(2011-2015)	$12,500	100

areas, implement BMPS accordingly. Determine the potential to redirect culverts through treatment ponds or through rain gardens before directly entering Lake Volney.				
Re-establish native emergent and submergent vegetation along 30% of shoreline	LVLA, WRC at MSU, MNDNR, Le Sueur County DES	(2011-2020)	$15,000	50
Continue commercial fishing efforts	LVLA, Commercial Fishing Operator, MNDNR	(2011-2015)	$ 0	10
Determine the feasibility of alum treatments. Implement if all other options fail to reduce in-lake TP concentrations	LVLA, MNDNR	(2015-2020)	$200,000	300
Totals			**$ 803,835**	**1,735lbs**

5.0 Monitoring Success/Tracking Progress (Adaptive Management)

The tasks set forth under this implementation plan will result in a decrease in the total phosphorus (TP) load to Lake Volney. The estimated TP reduction incurred through this implementation plan may not reflect the actual reduction that takes place within Lake Volney. There may or may not be a cumulative effect that results from the implementation of the aforementioned practices. A continued effort must be made to monitor improvements to water quality following the implementation of these practices. If persistent, statistically significant trends towards improved water quality are found, recommendations can be made to continue the implementation of BMPs designed to reduce loading from the major sources to Lake Volney. If the implementation of management practices fails to bring an improvement in observed water quality, the implementation approach should be re-evaluated and a new course of action determined so that physical water quality improvements can be fully realized.



5.1 Monitoring Plan/Funding

Monitoring related to TMDLs should include at least three components. In order to effectively track the progress the monitoring plan should include tracking the adoption of implementation activities, monitoring the effectiveness of individual and/or sets of implementation measures, and resource monitoring for evaluating impairment. An aquatic plant survey should be conducted on Lake Volney every five years to determine changes in the abundance of curly-leaf pondweed and/or changes in the native plant community. An analysis of the zooplankton and phytoplankton community should also occur annually with a focus placed on phytoplankton sampling during algae blooms given the historical presence of Aphanizomenon spp. and Microcystis spp. in this waterbody.

Potential Funding Sources

Potential funding sources for any implementation measures for this TMDL include:

- 319 TMDL implementation grant through MPCA http://www.pca.state.mn.us
- Carl and Verna Schmidt Foundation (507) 285-2517
- Lessard-Sams Outdoor Heritage Council http://www.lsohc.leg.mn/
- Clean Water Amendment funds http://www.bwsr.state.mn.us/cleanwaterfund/

5.2 Education

Currently, there is no single party responsible for educating landowners within the Lake Volney watershed. However, the Lake Volney Lake Association (LVLA) is a very active lake association that has made a conscious effort to educate landowners within the watershed. The LVLA was designated as Minnesota Water's Lake Association of the Year in 2011 and has agreed to continue educating members of the public. Currently, the LVLA uses several types of media to reach landowners. The LVLA maintains an updated website, conducts multiple public meetings, and communicates with landowners in the watershed. Furthermore, Le Sueur County's Department of Environmental Services has taken the initiative to continue to educate landowners within the watershed. The county and the lake association have partnered together in the past to improve Lake Volney. Most recently, the two groups worked together to renovate the public beach on the southern shore of Lake Volney. The beach renovation helped to address an erosion problem and improved the usability of the beach. Both groups have agreed to continue their efforts towards restoring Lake Volney and educating landowners within the watershed.

6.0 References for cost estimates

Carver County Land and Water Services. (2010). South Fork Crow River Lakes Excess Nutrients TMDL Report.

Pioneer- Sarah Creek Watershed Commission (2007). Lake Independence TMDL Implementation Plan.