# Ann River Watershed TMDL Restoration Plan

**June 2013**

CLEAN WATER LAND & LEGACY AMENDMENT

wq-iw6-07c

# *ANN RIVER WATERSHED TMDL RESTORATION PLAN*


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***FUNDING PROVIDED BY THE CLEAN WATER FUND (FROM THE CLEAN WATER, LAND, AND LEGACY AMENDMENT)***

## *MPCA IMPLEMENTATION CHECKLIST*

| Requirement | Location in Document |
|---|---|
| a.1. Geographical extent of watershed (use HUC's, stream segments, etc.) | Page 3 |
| a.2. Measurable water quality goals | Page 6 |
| a.3. causes and sources or groups of similar sources | Page 4 |
| b.1. description of nonpoint source management measures | Page 17 |
| b.2. description of point source management | Page 17 |
| c.1. estimate of load reductions for nonpoint source management measures listed in b.1 | Page 9 |
| c.2. estimate of load reductions for point source management measures listed in b.2 | Page 9 |
| d.1. estimate of costs for nonpoint source measures | Page 2 |
| d.2. estimate of costs for point source measures | N.A. |
| e. information/education component for implementing plan and assistance needed from agencies | Page 16 |
| f.1. schedule for implementing nonpoint source measures | Page 17 |
| f.2. schedule for implementing point source measures | N.A. |
| g. a description of interim measurable milestones for implementing management measures | Page 17 |
| h. adaptive management process-that includes set of criteria-to determine progress toward attaining nonpoint source reductions | Page 12 |
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# Executive Summary

Along with a Total Maximum Daily Load Study (TMDL) that is approved by the US Environmental Protection Agency (EPA), the Minnesota Pollution Control Agency (MPCA) requires a Implementation (Restoration) Plan that outlines the steps associated with projects designed to improve water quality to meet the State water quality standards. The Ann River Watershed currently has two lakes and one stream that are on the EPA's 303(d) Impaired Waters List; these lakes (Ann and Fish) are impaired for Excess Nutrients (phosphorus), while the stream (Ann River) is impaired for Bacteria (*E. coli*) and Biotic Integrity. Within this document, we will outline some of the steps that can be taken to restore the impaired lakes to meet water quality standards. The Ann River Watershed TMDL study can be found at http://www.pca.state.mn.us/aj0r9f3.

## Load Reduction Strategy

The TMDL study quantified the amount of phosphorus entering the lakes and the amount that would need to be reduced in order to meet the State water quality standards. These reductions are quantified below by impairment type.

Lake restoration activities can be grouped into two main categories: those practices aimed at reducing external nutrient loads, and those practices aimed at reducing internal loads. The focus of restoration activities will depend on the lake's nutrient balance and opportunities for restoration. However, it is always important to first target sources of external nutrient loads to lakes to prevent the accumulation of phosphorus in the sediments, which contributes to future internal loading, and to ensure long-term stability of in-lake restoration efforts.

**Table 1. Phosphorus Reductions Needed for Ann Lake and Fish Lake**

| Lake | Phosphorus Reductions Needed (lb/yr) | | | | Primary Reduction Strategy |
|---|---|---|---|---|---|
| | Total | Watershed | In-lake | Upstream Lakes | |
| Ann Lake | 4,758 | 662 | 4,096 | NA | Internal Reductions |
| Fish Lake | 5,262 | 3,415 | 1,167 | 680 | Watershed Reductions |

The Ann River Bacteria (*E. coli*) restoration activities will be based on targeting different flow zone events and the watershed practices that help achieve those reductions. Table 2 shows the necessary watershed reductions by flow zone to help target the specific activity affecting the Ann River, as well as the practices needed to address the activity identified.

**Table 2. Bacteria Reductions Needed for Ann River**

| Ann River: 07030004-511 | Flow Zones | | | | | Primary Reduction Strategy |
|---|---|---|---|---|---|---|
| | Very High | High | Mid-Range | Low | Dry | |
| Total Loading Capacity | 638.6 | 146.5 | 51.3 | 27.0 | 15.8 | Watershed Reductions |
| Percent Violation by Flow Zone | 33% | 56% | 88% | 66% | 67% | |

The Ann River Biota TMDL was developed based on information that was presented in the Ann River Stressor Identification Report (Stressor ID) that was done by the Minnesota Pollution Control Agency in 2011. The Stressor ID report used a weight of evidence approach to analyze the possible stressors in the Ann River Watershed. While there were several stressors identified, the primary stressor affecting the aquatic community is bedded sediment. After further evaluation it was determined that the source of this bedded sediment were the streambanks along the impaired reach. Overall, a 910 tons/yr or 44% reduction in sediment loading from streambanks are necessary to achieve the TMDL, and improve the biotic community.

While no TMDLs were developed for them, the secondary stressors identified in the Stressor ID and the TMDL will be equally important to help restore the biotic community. The secondary stressors that were identified include:

- Loss of Habitat
- Dissolved Oxygen
- Altered Riparian Corridor
- Loss of Connectivity-Impoundments and Flow Alteration

## Cost

The costs to implement water quality practices are hard to quantify without exact designs. Therefore, using literature and known local estimates, we were able to estimate a watershed-wide approximate cost to improve water quality in the impaired and protection lakes. These watershed cost estimates will aid funding grant applications to complete these projects at the watershed scale. Exact costs on a per waterbody project basis will be determined through additional feasibility and design studies. However, a reasonable estimate to implement this plan is around $6-8 Million.

Overall, there are multiple impairments in the Ann River Watershed; however the actions to restore and improve them overlap. Activities that reduce bacteria from the watershed could also reduce sediment and nutrients as well. One example of this is Cattle Exclusion or Flash Grazing. Limiting or restricting cattle access to the Ann River will help reduce the bacteria loading from manure they leave behind, which also limits the phosphorus entering the river to the downstream lake, as well as helps re-stabilize and re-vegetate the streambanks to keep them from eroding. This is only one example of the many efforts that will be worked on throughout the watershed.

# 1 Watershed Description

## 1.1 Ann River Watershed

The Ann River Watershed covers just over 86 square miles, and is located in Kanabec and Mille Lacs Counties (Figure 1). This watershed is part of the larger Snake River watershed, which is located in the St. Croix Basin. The watershed includes two major lakes, Ann Lake and Fish Lake. Ann Lake is the headwater of the Ann River, which starts at the outfall of the dam of Ann Lake and then flows southeast toward the City of Mora, where it enters Fish Lake. The outlet of Fish Lake is a short distance northeast of the confluence with the Ann River and flows into the Snake River. The upper watershed is drained by the Little Ann River, Camp Creek, Spring Brook and several smaller tributaries which drain to Ann Lake.

Ann Lake and Fish Lake are both reservoirs created by dams on Ann River. Both of these lakes are shallow, with maximum depths of 17 feet in Ann Lake and 10 feet in Fish Lake. Ann Lake has a surface area of 653 acres, while Fish Lake's is 407 acres.

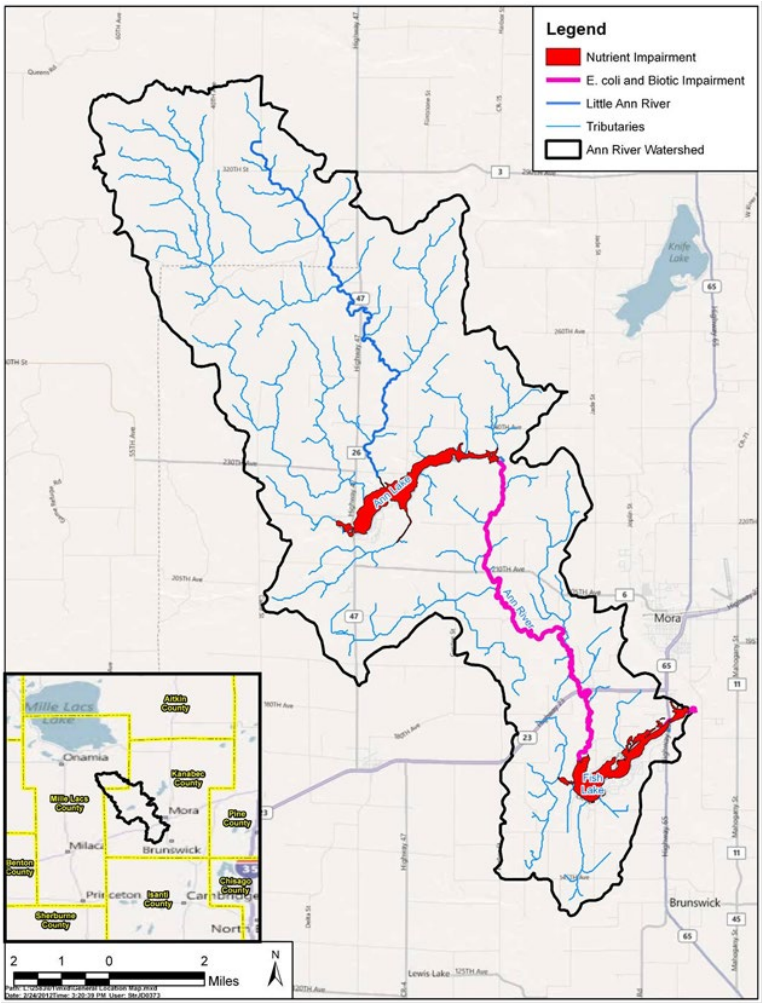


**Figure 1. Ann River Watershed and Impaired Waters**

### 1.1.1 Land Cover

The land cover in the Ann River Watershed is predominately Forest and Agriculture, as shown in Table 3 and Figure 2. While there are currently no communities in the watershed, the cities of Ogilvie and Mora are located just outside the watershed area to the east and west.

**Table 3. 2009 NASS Land Cover for the Ann River Watershed**

| Land Use | Area (acres) | Percent |
|---|---|---|
| Forest and Shrub land | 33,709 | 61% |
| Hay and Pasture | 13,206 | 24% |
| Wetlands and Open Water | 5,404 | 10% |
| Urban/Roads | 1,723 | 3% |
| Corn/Soybeans | 1,088 | 2% |
| Grains and other Crops | 300 | <1% |
| **TOTAL** | **55,430** | **100%** |

Included in Figure 2 are the Minnesota Department of Natural Resource (MN DNR) lands that reside within the Ann River Watershed. These areas include part of the Mille Lacs Wildlife Management Area (WMA), which is managed for wildlife management, hunting, trapping, and hiking, and includes the Dewitt Pool and Marsh. On the south side of Ann Lake, the Ann Lake WMA is managed for hunting and for wildlife viewing, as is the Tosher Creek WMA on the west side of Fish Lake.

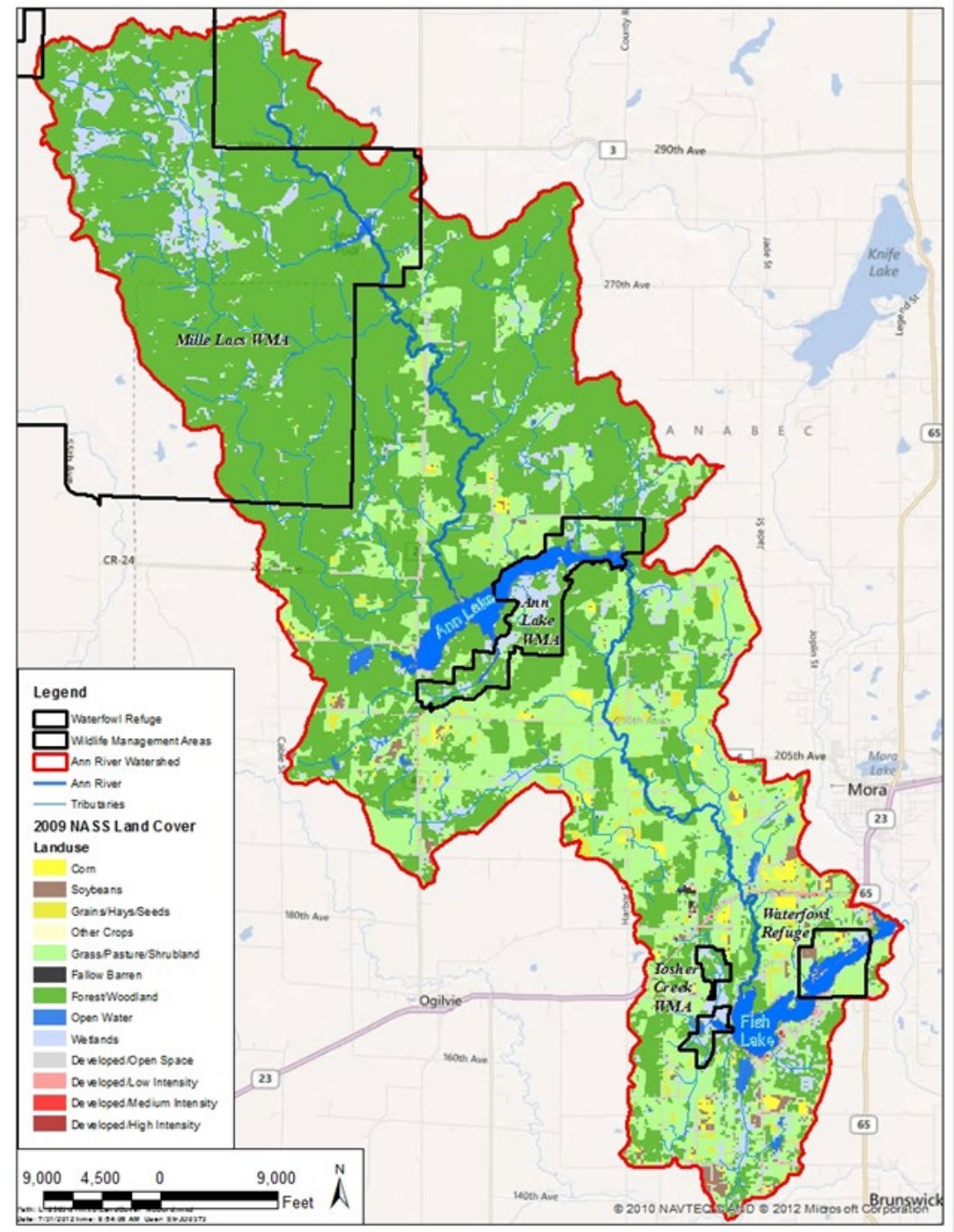


**Figure 2. Ann River Watershed Land Cover (2009 NASS)**

# 2 Watershed Problems and TMDLs

## 2.1 Problem Investigation

Starting in 2002, the Ann River (AUID 07030004-515) was monitored and assessed by the Minnesota Pollution Control Agency (MPCA). This assessment resulted in this reach being placed on the State of Minnesota's 303(d) impaired waters list for impaired biota (fish) based on bio-assessments completed in 1996 and 1998. Subsequent monitoring confirmed the fish impairment. In 2010, the Ann River was placed on the 303(d) list for impaired biota (invertebrate) based on bio-assessments completed in 1996 and confirmed by subsequent sampling. The Ann River was also listed in 2010 for excess *E. coli* concentrations. In 2004, Ann Lake (33-0040-00) and Fish Lake (33-0036-00) were both placed on the 303(d) list for nutrient (total phosphorus) impairment. Table 4 details those listings, which are shown on Figure 1.

**Table 4. Impaired Waters Addressed in the Ann River Watershed TMDL**

| Waterbody | Yr. Listed | AUID | Affected Use | Pollutant or Stressor | Target Start/Completion |
|---|---|---|---|---|---|
| Ann River – Ann Lake to confluence with Snake River | 2002 | 07030004-511 | Aquatic Life | Fish Bioassessment | 2008/2013 |
| Ann River – Ann Lake to confluence with Snake River | 2010 | 07030004-511 | Aquatic Life | Invertebrate Bioassessment | 2008/2013 |
| Ann River – Ann Lake to confluence with Snake River | 2010 | 07030004-511 | Aquatic Recreation | *E. coli* | 2008/2013 |
| Ann Lake | 2004 | 33-0040-00 | Aquatic Recreation | Excess Nutrients | 2008/2013 |
| Fish Lake | 2004 | 33-0036-00 | Aquatic Recreation | Excess Nutrients | 2008/2013 |

## 2.2 Water Quality Standards and Current Water Quality

### 2.2.1 Ann Lake and Fish Lake Water Quality

Table 5 compares the 2006 water quality data from Ann Lake and Fish Lake to the North Central Hardwood Forest (NCHF) Ecoregion Shallow Lake Standards. These standards are considered the water quality targets that each of the lakes must meet in order to be considered no longer impaired.

**Table 5. Lake Nutrient Standards and 2006 Assessment Data for Ann Lake and Fish Lake**

| Waterbody | Total Phosphorus (ug/L) | | Chlorophyll-a (ug/L) | | Secchi (m) | |
|---|---|---|---|---|---|---|
| | Standard | 2006 data | Standard | 2006 | Standard | 2006 |
| Ann Lake | <60 | 90 | <20 | 42 | ≥1.0 | 0.9 |
| Fish Lake | <60 | 162 | <20 | 64 | ≥1.0 | 0.8 |

### 2.2.2 E. coli

The *E. Coli* standard is explained as *"If the geometric mean of the aggregated monthly E. coli concentrations for one or more months exceed 126 organisms per 100 ml, that reach is placed on the 303(d) impaired list. Also, a water body is considered impaired if more than 10% of the individual samples over the 10-year period (independent of month) exceed 1,260 organisms per 100 ml (cfu/100 ml)".*

Figure 3 compares *E. coli* data from 2004 to present that was collected from four sites along the Ann River. These sites were then compared to the standards to depict times of the year that exceedances of the *E. coli* standard take place. Figure 4 shows the monitoring locations listed in Figure 3.

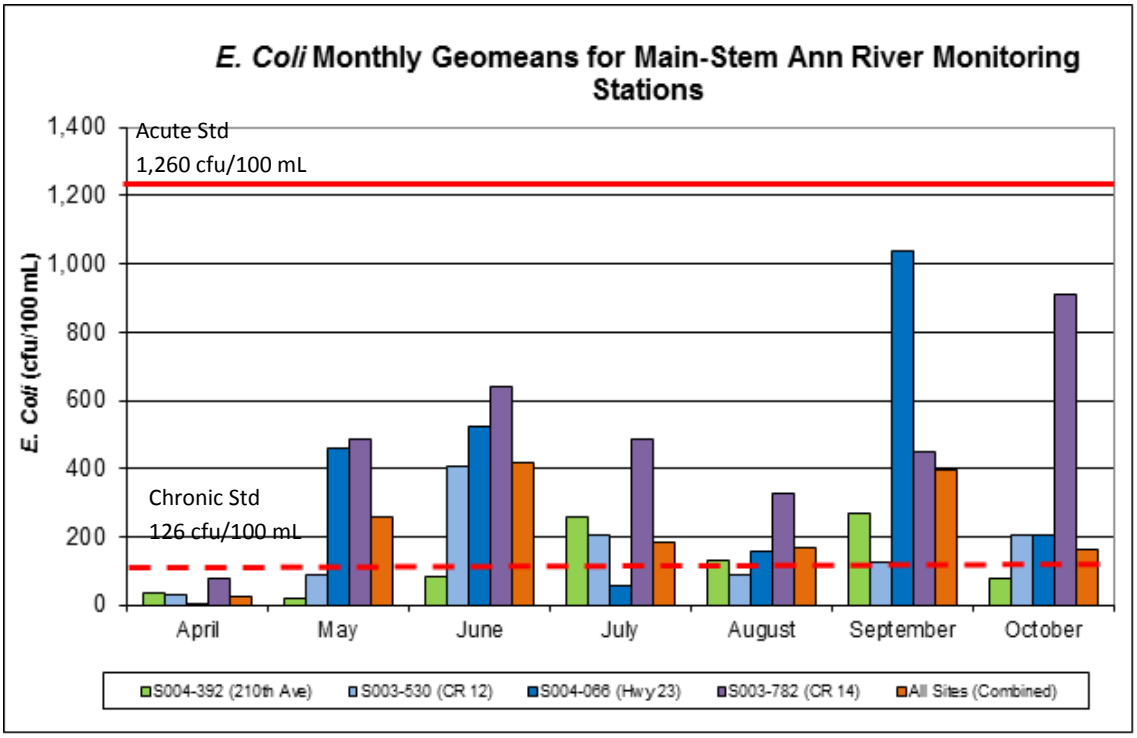


**Figure 3. Monthly *E. coli* Geometric means for each Monitoring Station in the Drainage of the Impaired Reach**

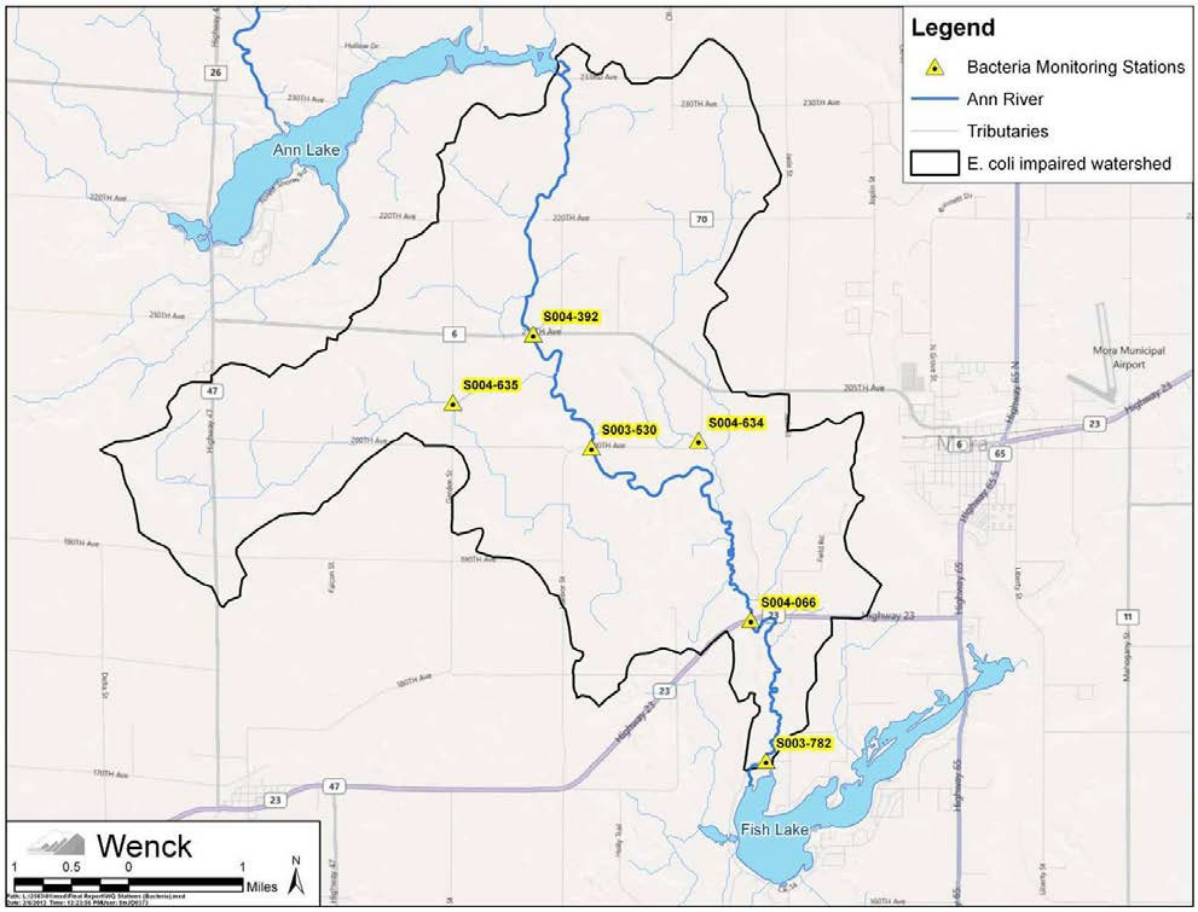


**Figure 4. Ann River Watershed *E. coli* Monitoring Locations**

### 2.2.3 Biotic Impairment

Minnesota's standard for biotic integrity is set forth in Minnesota Rules (MR) 7050.0150 (3) and (6). The standard uses an Index of Biotic Integrity (IBI), which evaluates and integrates multiple attributes of the aquatic community, or "metrics," to evaluate a complex biological system. Each metric is based upon a structural (e.g., species composition) or functional (e.g., feeding habits) aspect of the aquatic community that changes in a predictable way in response to human disturbance. Fish and macroinvertebrate IBIs are expressed as a score that ranges from 0-100, with 100 being the best score possible. The MPCA has evaluated fish and macroinvertebrate communities at numerous reference sites across Minnesota that has been minimally impacted by human activity, and has established IBI impairment thresholds based on stream drainage area, ecoregion, and major basin. A stream's biota is considered to be impaired when the IBI falls below the threshold established for that category of stream.

Table 6 compares the Fish and Invertebrate scores from the Ann River to the standards developed by the MPCA for assessment.

**Table 6. Index of Biotic Integrity Standards versus Ann River Data**

| Year | Station ID | Location | Fish IBI | | Invertebrate IBI | |
|---|---|---|---|---|---|---|
| | | | Standard | Score | Standard* | Score |
| 2006 | 06SC122 | Downstream of Hwy 23 | 69 | 71 | 39.5* | 24 |
| 1998 | 98SC019 | Upstream of CSAH 14 | 69 | 44 | 41.2 | 61 |
| 2006 | 06SC136 | Upstream of CR 12 | 69 | 67 | 41.2 | 43 |
| 1996 | 96SC021 | Downstream of CR 12 | 69 | N/A | 41.2 | 42 |

*The site downstream of Hwy 23 was evaluated against metrics for low-gradient streams; the other sites were evaluated based on metrics for high-gradient streams.

## 2.3 Ann River Watershed Total Maximum Daily Loads (TMDL)

In 2007, the MPCA and the Kanabec Soil and Water Conservation District (SWCD), Mille Lacs SWCD, and MN DNR started the process of developing the Stressor ID report and TMDL report for the Ann River Watershed. The early stages of the project can be primarily described as the data gathering and analysis of the project. Then, in 2011 the MPCA contracted with Wenck and Associates, Inc. to develop what is now called the Ann River Watershed TMDL. For more information on the TMDL, go to the following webpage: http://www.pca.state.mn.us/aj0r9f3

The TMDL report addresses the wide range of impairments in this watershed in one report. The tables below are taken from the TMDL report and represent the reductions necessary to meet the required TMDLs for the specific waterbody.

**Table 7. Ann River (AUID: 07030004-511) *E. Coli* TMDL**

| Ann River: 07030004-511 | | Flow Zones | | | | |
|---|---|---|---|---|---|---|
| | | Very High | High | Mid-Range | Low | Dry |
| | | *E. coli* Load (billions of organisms/day) | | | | |
| Total Daily Loading Capacity | | 638.6 | 146.5 | 51.3 | 27.0 | 15.8 |
| Margin of Safety (MOS) | | 31.9 | 7.3 | 2.6 | 1.4 | 0.8 |
| Wasteload Allocations | Permitted Point Source Dischargers | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MS4 Communities | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Load Allocation | Nonpoint source | 606.7 | 139.2 | 48.7 | 25.6 | 15.0 |
| **Value expressed as percentage of total daily loading capacity** | | | | | | |
| Total Daily Loading Capacity | | 100% | 100% | 100% | 100% | 100% |
| Margin of Safety (MOS) | | 5% | 5% | 5% | 5% | 5% |
| Wasteload Allocation | Permitted Point Source Dischargers | 0% | 0% | 0% | 0% | 0% |
| | MS4 Communities | 0% | 0% | 0% | 0% | 0% |
| Load Allocation | Nonpoint source | 95% | 95% | 95% | 95% | 95% |

**Table 8. Ann Lake Nutrient TMDL**

| Allocation | Source | Existing TP Load [1] | | TP Allocations (WLA & LA) | | Load Reduction[3] | |
|---|---|---|---|---|---|---|---|
| | | (lbs/year) | (lbs/day)[2] | (lbs/year) | (lbs/day)[2] | (lbs/year) | % |
| **Wasteload Allocation** | Construction & Industrial Stormwater | 115 | 0.3 | 115 | 0.3 | 0 | 0% |
| **Load Allocation** | Drainage Areas | 5,613 | 15.4 | 5,402 | 14.8 | 211 | 4% |
| | SSTS | 445 | 1.2 | 0 | 0.0 | 445 | 100% |
| | West Ann Lake | 209 | 0.6 | 203 | 0.6 | 6 | 3% |
| | Atmosphere | 185 | 0.5 | 185 | 0.5 | 0 | 0% |
| | Internal Load | 5,496 | 15.0 | 1,400 | 3.8 | 4,096 | 75% |
| **MOS** | | -- | -- | 384 | 1.1 | -- | -- |
| **TOTAL** | | **12,063** | **33** | **7,689** | **21.1** | **4,758** | **39%** |

**Table 9. Fish Lake Nutrient TMDL**

| Allocation | Source | Existing TP Load [1] | | TP Allocations (WLA & LA) | | Load Reduction[3] | |
|---|---|---|---|---|---|---|---|
| | | (lbs/year) | (lbs/day)[2] | (lbs/year) | (lbs/day)[2] | (lbs/year) | % |
| **Wasteload Allocation** | Construction & Industrial Stormwater | 121 | 0.3 | 121 | 0.3 | 0 | 0% |
| **Load Allocation** | Drainage Areas | 4,688 | 12.8 | 2,177 | 6.0 | 2,511 | 54% |
| | SSTS | 904 | 2.5 | 0 | 0.0 | 904 | 100% |
| | Upstream Lakes | 5,266 | 14.4 | 4,586 | 12.6 | 680 | 13% |
| | Atmosphere | 100 | 0.3 | 100 | 0.3 | 0 | 0% |
| | Internal Load | 1,425 | 3.9 | 258 | 0.7 | 1,167 | 82% |
| **MOS** | | | | 805 | 2.2 | -- | -- |
| **TOTAL** | | **12,504** | **34.2** | **8,047** | **22.1** | **5,262** | **42%** |

**Table 10. Ann River (AUID: 07030004-511) Bedded Sediment TMDL**

| Allocation | Source | Existing Bedded Sediment Load | | Bedded Sediment TMDL (WLA & LA) | | Load Reduction[2] | |
|---|---|---|---|---|---|---|---|
| | | (tons/year) | (tons/day)[1] | (tons/year) | (tons/day)[1] | (tons/year) | % |
| Wasteload Allocation | Construction & Industrial Stormwater | 2 | <0.1 | 2 | 0.0 | 0 | 0% |
| Load Allocation | Watershed | 763 | 2.1 | 763 | 2.1 | 0 | 0% |
| | Streambank | 1,317 | 3.6 | 407 | 1.1 | 910 | 69% |
| MOS | | | | 45 | 0.1 | | |
| **TOTAL** | | **2,082** | **5.7** | **1,217** | **3.3** | **910** | **44%** |

# 3 Monitoring Plan

Progress of TMDL implementation will be measured through regular monitoring efforts of water quality and total BMPs completed. This will be accomplished through the efforts of the cooperating agencies and groups discussed above. As long as sufficient funding exists, the following monitoring efforts below will be targeted. Since funding is limited for effectiveness monitoring, one avenue that could and may be used in this watershed is the Intensive Watershed Monitoring being conducted by the MPCA. This monitoring was conducted in the Snake River Watershed in 2007 and is expected to be monitored again in 2017 as part of the 10 year cycle. At a minimum this effort will help provide data at a larger scale that may not be available otherwise.

However, all efforts will be made locally to conduct, target and monitor, should funds and staff time be available.

## 3.1 Lakes Monitoring

Ann Lake and Fish Lake have been monitored by volunteers and staff over the years. This monitoring is planned to continue to keep a record of the changing water quality as funding allows. Lakes are generally monitored for chlorophyll-a, total phosphorus, and Secchi disk transparency.

In-lake monitoring will continue as implementation activities are installed across the watershed. These monitoring activities should continue until water quality goals are met. Some tributary monitoring has been completed on the inlets to the lakes and may be important to continue as implementation activities take place throughout the sub-watersheds.

The MN DNR will continue to conduct macrophyte and fish surveys as allowed by their regular schedule. Currently fish surveys are conducted every 5 years and macrophyte surveys are conducted as staffing and funding allow on a 10-year rotation, unless there are special situations

## 3.2 Bacteria Monitoring

River monitoring in the larger Snake River Watershed, which includes the Ann River Watershed, has been coordinated largely by the Snake River Watershed Management Board for the last 10 years as part of two Clean Water Partnership Grants, and local funds they have available. Monitoring is also being conducted on a smaller scale because of the Kanabec County Water Plan and the limited funds that are available.

Stream monitoring in the Ann River should at a minimum, continue at the most downstream site to continue to build on the current dataset and track changes based on implementation progress. At a minimum it is recommended that two *E. coli* samples be collected each month from May through September. As BMP practices are implemented throughout the watershed, it is also suggested that monitoring take place in those subwatersheds to track progress towards the TMDL.

## 3.3 Biological Monitoring

Continuing to monitor water quality and biota scores in the listed segments will determine whether or not stream habitat restoration measures are required to bring the watershed into compliance. At a minimum, fish and macroinvertebrate sampling should be conducted by the MPCA, MN DNR, or others every five to ten years during the summer season at each established location, until compliance is observed for at least two consecutive summers. It will also be important to continue to conduct streambank assessments before and after any major stabilization BMP is implemented to track if in-stream erosion is improving, or if more work is needed.

Tracking the installation of BMPs while continuing to monitor biological conditions in the watershed will be helpful in understanding the response of the biological community in the watershed. Doing so will aid local stakeholders and public agencies in determining the effectiveness of the implementation plan. If biota scores remain below the confidence intervals, further encouragement of the use of BMPs across the watershed through education and incentives will be a priority. It may also be necessary to begin funding efforts for localized BMPs such as riparian buffers and stream restoration.

## 3.4 BMP Monitoring

As BMPs are installed throughout the watershed and near impaired waters, it will be important to conduct monitoring before and after practice installation, to determine if the BMP chosen is working as expected. BMP monitoring will also help local implementer's understand how effective a specific BMP is in the watershed, since soils and other local factors can influence BMP effectiveness. This type of monitoring will need to be targeted and funding based.

## 3.5 Adaptive Management

The response of the waterbodies addressed in the Ann River Watershed TMDL will be evaluated as management practices are implemented. This evaluation will occur every five years after the commencement of implementation actions. Monitoring data will be evaluated and decisions will be made as to how to proceed for the next five years. The management approach to achieving the goals should be adapted as new information is collected and evaluated.

As best management practices are implemented, monitoring of water quality will continue throughout the watershed.

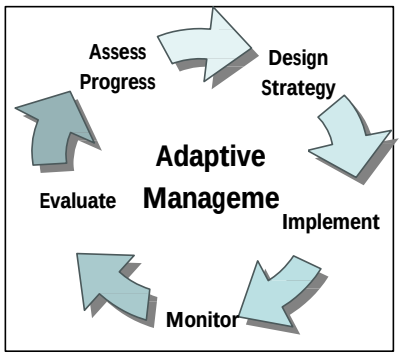


**Figure 5. Adaptive Management Process**

# 4 Restoration Targeting and Civic Engagement

## 4.1 Targeting and Prioritization

As part of any project, being able to target and prioritize activities and actions is necessary. By targeting and prioritizing areas for BMPs, allows organizations like the SWCD, NRCS, and others to precisely identify the major landowners or areas in the watershed that will result in the greatest reductions. The effort of prioritizing and targeting is not without its challenges. While you may find priority areas to target, getting the landowners to want to implement the change will be a challenge. This is why targeting and prioritizing is only one step in the process, and the stakeholder involvement piece is just one more step in the BMP installation process.

While there are many pieces of information that can be used for targeting and prioritization, only a few will be shown in this report. Examples of tools that are available and currently being used include LiDAR, land cover, crop cover, Board of Water and Soil Resources - Environmental Benefits Index (EBI), MN DNR's Watershed Assessment Tool (WAT), and even maps from the TMDL like the Average Annual Phosphorus Loading Map (Figure 6, Ann River Watershed TMDL pg. 4-22), and Monitoring location maps (Figure 7, Ann River Watershed TMDL). Copies and examples of available information are included below.

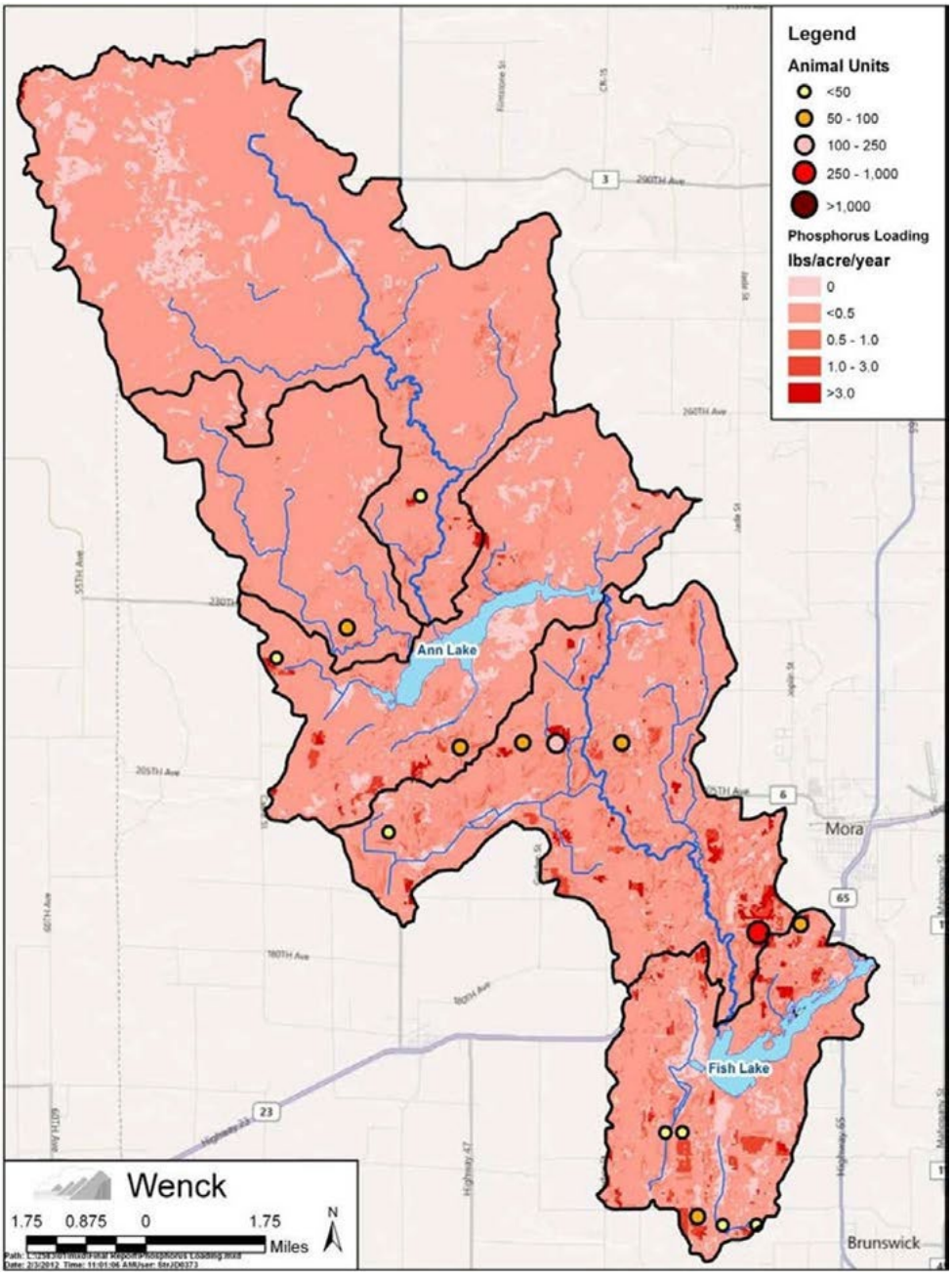


**Figure 6. Average Annual Phosphorus Loading and MPCA Registered Feedlots in the Ann River Watershed**

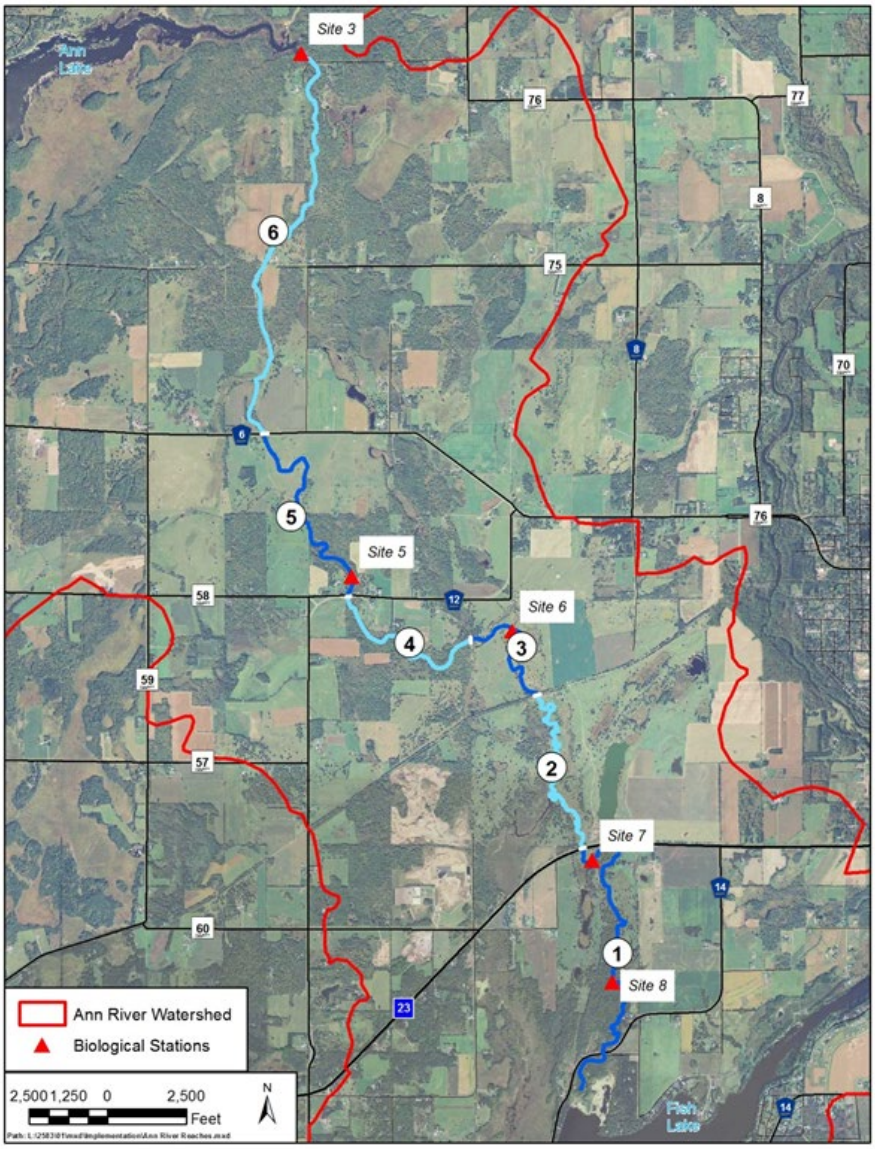


**Figure 7. Ann River Stream Reaches**

**Table 11. General Stream Restoration Improvements and Costs Recommended by Reach for Figure 6**

| Reach | Length (feet) | Recommended Improvements | Estimated Cost |
|---|---|---|---|
| 1 | 12,930 | Narrow the stream using coir logs or brush bundles. If necessary dredge fine sediment. Add rock, cobble and gravel to improve streambed. Selectively thin trees to provide dappled light, use harvested trees to add root wads and tree pins for woody substrate and narrow channel. | $100,000 |
| 2 | 8,968 | Establish native vegetation in an approximately 500 foot wide wetland meander belt. Plant trees and shrubs in buffer and allow stream to naturally meander. Fence along the belt and provide controlled animal access(es) to stream. | $250,000 |

| | | | |
|---|---|---|---|
| 3 | 4,929 | Establish native vegetation in a 50-100 foot wide buffer. Repair and stabilize eroded segments. Live stake outer bends. Use brush bundles, coir logs, and other natural materials to capture sediment and naturally narrow the stream. Fence where necessary and provide controlled animal access(es) to stream. | $250,000 |
| 4 | 6,480 | Periodically inspect this heavily wooded reach to manage deadfall and spot repair streambanks where necessary. | $25,000 |
| 5 | 8,691 | Establish native vegetation in a 50-100 foot wide buffer. Repair and stabilize eroded segments. Spot repair eroded segments. Live stake outer bends. Fence where necessary and provide controlled animal access(es) to stream. | $100,000 |
| 6 | 14,321 | Establish native vegetation in a 50-100 foot wide buffer. Repair and stabilize eroded segments. Spot repair eroded segments. Live stake outer bends. Fence where necessary and provide controlled animal access(es) to stream. | $125,000 |
| **TOTAL** | **56,319** | | **$850,000** |

## 4.2 Civic Engagement

A key prerequisite for successful strategy development and on-the-ground implementation is meaningful civic engagement. This is distinguished from the broader term 'public participation' in that civic engagement encompasses a higher, more interactive level of involvement. Specifically, the University of Minnesota Extension's definition of civic engagement is "Making 'resourceFULL' decisions and taking collective action on public issues through processes that involve public discussion, reflection, and collaboration." A resourceFULL decision is one based on diverse sources of information and supported with buy-in, resources (including human), and competence. Further information on civic engagement is available at: http://www1.extension.umn.edu/community/civic-engagement/

### 4.2.1 Accomplishments and Future Plans

- Continue the Civic Organizing work that has been going on within the SWCD offices, and look to expand it to other partners in the watershed.
- Continue to meet with watershed organizations (aka – Ann Lake Watershed Alliance, Fish Lake Association, Snake River Watershed Management Board (SRWMB), Citizens Advisory Committee (CAC) and the St. Croix Basin - Implementation Team.
- Improve and increase local trainings, educational and outreach events in the watershed including: grazing and rotational grazing workshop, rain garden / water infiltration basin workshop, nutrient and manure management, cover crops and reduced tillage workshops.

# 5 Restoration Strategies Table

| Waterbody and Location | | Parameter (incl. non-pollutant stressors) | Water Quality | | Strategies | Estimated Scale of Adoption Needed | Governmental Units with Primary Responsibility | | | | | | | | Timeline - project start | Interim 10-yr Milestones |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Waterbody (ID) | Location and Upstream Influence Counties | | Current Conditions | Goals / Targets | | | Kanabec SWCD | MPCA | MN DNR | NRCS | SRWMB | Kanabec County | Mille Lacs SWCD | Mille Lacs County | Lake Association | |
| All | **All** | - | - | - | NPDES point source compliance | | | * | | | | | | | | 20 years | 5 year reissuance |
| | | | | | Civic Engagement | Watershed-wide civic engagement activities necessary to move this plan forward | * | | | * | | | * | | * | 20 years | Civic Training to be completed. This strategy will be on-going |
| | | | | | Landowner Education | The SWCD will work with partners to provide important outreach and education for landowners and the public, through newsletters, news articles and radio announcements | * | | | * | * | * | * | | * | 20 years | This strategy will be on-going |
| | | | | | Watershed Marketing | | * | | | * | * | * | * | | * | 20 years | |
| | | | | | Technical Assistance | The SWCD will work to secure funds to inventory targeted areas of high potential phosphrus loading, based on figure 6 in the Implem. Plan | * | | | * | | | * | | | 20 years | Top areas targeted and restoration underway |
| | | | | | Adaptive Management | Ongoing as implementation moves forward. | * | | | * | * | * | * | * | * | 20 years | Strategies in this document revisited and possible revised |
| Ann River (07030004-511) | **Kanabec,** Mille Lacs | TSS/Bedded Sediment | 2,082 tons/year of sediment (1,317 tons/yr from streambank, 763 tons/yr from watershed, and 2 tons/yr from CSW & ISW) | 910 tons/year, or 44% Reduction | Installation or Enhancement of Buffers and Riparian Vegetation | We plan to have 50% of the unprotected riparian areas in stream reaches 1 through 6, restored with vegetative buffers, including implementing cattle - fence exclusions, heavy use protection - stream crossing areas, alternative watering sources and rotational grazing methods, where needed | * | | | * | * | | * | | | 20 years | 15 of these BMP's to be completed |
| | | | | | Streambank/Channel Restoration | We plan to have 75% of the unprotected streambanks and in - stream channel areas, restored with bioengineering methods in stream reaches 1 through 6 | * | | * | * | * | | * | | | 20 years | 10 of these BMP's to be completed |
| | | | | | Conservation Easements | The SWCD will explore the options and interests with local partners and landowners regarding conservation easements | * | | * | | * | | | | | 20 years | This strategy will be on-going |
| | | | | | Roadside Erosion Control | We plan to have 50% of the road crossings (particularily gravel roads with culverts) over tributaries protected, by implementing erosion control measures at culvert inlets and outlets | * | | | | | | * | | | 20 years | 6 of these BMP's to be completed |
| | | | | | Sediment Basins | We plan to have 50% of the high eroded cropland areas, protected by implementing erosion control practices including: sediment and water control structures and basins, cover crops, conservation tillage methods, grassed waterways, lined waterways and channels, in the watershed | * | | | * | * | | * | | | 20 years | 15 of these BMP's to be completed |
| | | | | | Limit Animal Access / Exclusions | | * | | | * | * | | * | | | 20 years | |
| | | | | | Heavy Use Crossings | | * | | | * | * | | * | | | 20 years | |
| | | | | | Cover Crops | | * | | | * | * | | * | | | 20 years | |
| | | | | | Conservation Tillage Systems | | * | | | * | * | | | | | 20 years | |
| | | | | | Grass Waterways | | * | | | * | * | | | | | 20 years | |
| | | | | | Lined Waterway | | * | | | * | * | | | | | 20 years | |
| | | | | | Water and Sediment Control | | * | | | * | * | | | | | 20 years | |
| | | | | | Field Windbreaks | | * | | | * | * | | | | | 20 years | |
| | | E. coli Load (billions of organisms/day) | >126 cfu/100mL standard violated in 5 of the 6 months, and 9% of the individual values from all sites exceeded the 1,260 cfu/100 mL acute standard. | Very High: 638.6 High: 146.5 Mid: 51.3 Low: 27.0 Dry 15.8 | Manure / Nutrient Management | We plan to have 50% of the cropland areas managed | * | | | * | | | | | | 20 years | 10 of these BMP's to be completed |
| | | | | | Filter Strips | We plan to have 75% of the farmsteads needing treatment and control of manure runoff and manure storage in compliance by implementing feedlot runoff treatment and control methods and manure storage facilities | * | | | * | * | | * | | | 20 years | 10 of these BMP's to be completed |
| | | | | | Grass Waterways | | * | | | * | * | | | | | 20 years | |
| | | | | | Rotational Grazing | | | | | * | | | | | | 20 years | |
| | | | | | Manure storage facility | | * | | | * | | | * | | | 20 years | |
| | | | | | Heavy Use Crossings | | * | | | * | | | * | | | 20 years | |
| | | | | | Cattle Exclusion | | * | | | * | * | | * | | | 20 years | |
| | | | | | Composting | | * | | | * | | | | | | 20 years | |
| | | | | | Alternative Watering Systems | | * | | | * | | | * | | | 20 years | |
| | | | | | SSTS Inventory and Inspection | 100% of all septics in the shoreland area in compliance | | | | | | * | | * | * | 20 years | Upgrades through Point of Sale |
| | | | | | SSTS Upgrades in the shoreland area | | | | | | | * | | * | * | 20 years | Upgrades through Point of Sale |
| | | Altered Riparian Corridor | Secondary Stressor | NA | Forestry Planning | NA | * | | | * | | | * | * | | 20 years | 10 Forestry Plans Developed |
| | | | | | Easements | Intrests will be explored. | * | | | | | | * | | | 20 years | This strategy will be on-going |
| | | Loss of Habitat | Secondary Stressor | NA | Conservation Easements | The SWCD will explore the options and interests with local partners and landowners regarding conservation easements | * | | * | | * | | | | | 20 years | This strategy will be on-going |
| | | | | | Shoreline Restoration | We plan to have 75% of the unprotected streambanks and in - stream channel areas, restored with bioengineering methods in stream reaches 1 through 6 | * | | * | * | * | | * | | * | 20 years | 10 of these BMP's to be completed |
| | | | | | Forestry Planning | NA | * | | * | * | * | | * | | | 20 years | 10 Forestry Plans Developed |
| | | Loss of Connectivity - Impoundments and Flow Alteration | Secondary Stressor | NA | Dam Assessments and Retrofits | There are currently 2 dams in this system, and the MN DNR is responsible for them. | | | * | | | | | | | 20 years | Review and assess current Dams |
| | | | | | Culvert Inventory/Upgrade | The SWCD plans to coordinate with DNR on a stream / culvert crossings inventory at all tributaries, to assess problem sties that need improvement and replacement | * | | * | | | * | | * | | 20 years | Complete Inventory |
| | | | | | Wetland Restoration | NA | * | | | * | * | | | | | 20 years | Possible sites for restoration identified |
| Ann Lake (33-0040) | **Kanabec**, Mille Lacs | TP | TP 90 ug/L (2006) | 4,758 lbs/yr, or 39% Reduction | In-Lake Treatment | Will address 90+% of internal, but a large amount of funds will be needed. | * | | | | * | | | | * | 20 years | Look for possible funding |
| | | | | | In-Lake Treatment Feasiblity Study | | * | | | | * | | | | * | 20 years | |
| | | | | | Cover Crops | 50% of highly erodable land areas managed | * | | | * | | | | | | 20 years | Up to 10 of these BMPs installed |
| | | | | | Filter Strips | | * | | | * | | | | | | 20 years | |
| | | | | | Grass Waterways | | * | | | * | | | | | | 20 years | |
| | | | | | Shoreline Restoration | | * | | | * | * | | | | | 20 years | |
| | | | | | Sediment Basins | | * | | | * | | | * | | | 20 years | |
| | | | | | Conservation Tillage | | * | | | * | * | | | | | 20 years | |
| | | | | | Manure / Nutrient Management | | * | | | * | | | * | | | 20 years | |
| | | | | | Manure storage facility | | * | | | * | | | * | | | 20 years | |
| | | | | | SSTS Inventory and Inspection | 75% of all septics inspected and upgraded | | | | | | * | | * | | 20 years | Upgrades through Point of Sale |
| | | | | | SSTS Upgrades in the shoreland area | | | | | | | * | | * | | 20 years | Upgrades through Point of Sale |
| Fish Lake (33-0036) | Kanabec | TP | TP 162 ug/L (2006) | 5,262 lbs/yr, or 42% Reduction | In-Lake Treatment | Will address 90+% of internal, but a large amount of funds will be needed. | * | * | * | | * | | | | * | 20 years | Look for possible funding |
| | | | | | In-Lake Treatment Feasibility Study | | * | * | * | | * | | | | * | 20 years | This project to be completed |
| | | | | | Cover Crops | 50% of highly erodable land areas managed | * | | | * | | | | | | 20 years | Up to 10 of these BMPs installed |
| | | | | | Filter Strips | | * | | | * | * | | | | | 20 years | |
| | | | | | Grass Waterways | | * | | | * | * | | | | | 20 years | |
| | | | | | Shoreline Restoration | | * | | | | * | | | | | 20 years | |
| | | | | | Conservation Tillage | | * | | | * | * | | | | | 20 years | |
| | | | | | Sediment Basins | | * | | | * | * | | | | | 20 years | |
| | | | | | Manure / Nutrient Management | | * | | | * | * | | | | | 20 years | |
| | | | | | Manure storage facility | | * | | | * | * | | | | | 20 years | |
| | | | | | SSTS Inventory and Inspection | 75% of all septics inspected and upgraded | | | | | | * | | | | 20 years | Upgrades through Point of Sale |
| | | | | | SSTS Upgrades in the shorelands area | | | | | | | | | | | 20 years | |

# 6 Ongoing Restoration Activities

Since the start of the TMDL project and even before, restoration activities have been ongoing. Local organizations like the SWCD's and Snake River Watershed Management Board (SRWMB) have been funding BMP projects for years. Below are some examples of projects that have been installed in the Ann River Watershed.

## 6.1 Wetland Restoration on Tributary of Ann River

This wetland project in combination with the heavy use – cattle crossing in the following picture, was located on the same tributary. The combined projects resulted in 3.6 tons/year of sediment reductions and 3.6 lbs./year in phosphorus reductions. The total project cost was $14,808. Project support was provided through state clean water funds and local funds. The project also included 2,000 lineal feet of fence exclusion for cattle, to keep them back and away from the tributary.

## 6.2 Heavy Use – Cattle Crossing on Tributary to Ann River


## 6.3 Shoreland Buffering and Vegetation on Fish Lake

Picture on the left is the bank before the project was installed, and the one on the right is after. The project resulted in approx. 18 tons/year of sediment reductions and 18 lbs./year of phosphorus reductions. The project length was 140 lineal feet. The total project cost was $1,375.00. Project support was provided through state clean water funds and local funds.

## 6.4 Roadside Erosion and Runoff Control - Ann Lake

The picture on the left is Forest Shores Road before, and the picture on the right is the road shoulder after the project was started. The project length was 400 lineal feet. The third picture is a picture of the sediment basin at the end of the project area that will now catch and hold the sediment coming down the road ditch before it enters Ann Lake. This project resulted in approx. 27 tons/year of sediment reductions and 27 lbs/year of phosphorus reductions. The total project cost was $20,410.

Project support was provided through state clean water funds and local funds.

## 6.5 Ann Lake Boat Landing Rain Garden and Infiltration Project

In 2010, the MN DNR in cooperation with the Kanabec SWCD, Ann Lake Watershed Alliance and the Snake River Watershed Management Board (SRWMB), improved the boat access to Ann Lake. The project included paving the parking lot, adding better parking, and treating the runoff through the use of a rain garden for infiltration instead of sending the runoff right to Ann Lake.