

# **A Sustainable Water Quality Management Plan for Spring and Prior Lakes, Scott County, Minnesota**

**February 2004**

## **FORWARD**

This plan focuses on managing the water quality of Spring and Prior Lakes. For information on lake level management see the Prior Lake-Spring Lake Watershed District (PLSLWD) *Water Resources Management Plan* (as amended in 2003), and the *Prior Lake Outlet Channel and Lake Volume Management Study* recently completed by the PLSLWD in cooperation with numerous local and state partners. For recreational use management see the City of Prior Lake/Lake Advisory Committee Comprehensive Lake Management Plan dated June 2000. A separate planning effort is being completed for Fish Lake, and thus, Fish Lake management is not covered in this document.

This is a plan, not a technical document. Brief summaries of technical issues are included and Technical Memoranda are attached that develop phosphorus source budgets and assess alternatives. However, most of the technical analysis and diagnosis of water quality issues is completed in other documents. These documents are available at the PLSLWD office or the Prior Lake Public Library and include:

- The 1993 Clean Lakes Diagnostic/Feasibility Study
- PLSLWD Annual Report which include annual monitoring information
- Aquatic Plant Surveys for Spring and Upper Prior Lake for 2000, and Lower Prior Lake for 2002
- A draft Watershed Restoration Action Strategy developed by the PLSLWD in 2002.

## ACKNOWLEDGEMENTS

A number of people and organizations participated in the development of this plan.

### Organizations involved included:

Prior Lake Advisory Committee  
Prior Lake Association  
Spring Lake Homeowners Association  
City of Prior Lake  
Spring Lake Township  
Minnesota Department of Natural Resources  
Scott County  
Metropolitan Council  
Three Rivers Park District

### Individuals involved included:

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## INTRODUCTION AND PURPOSE

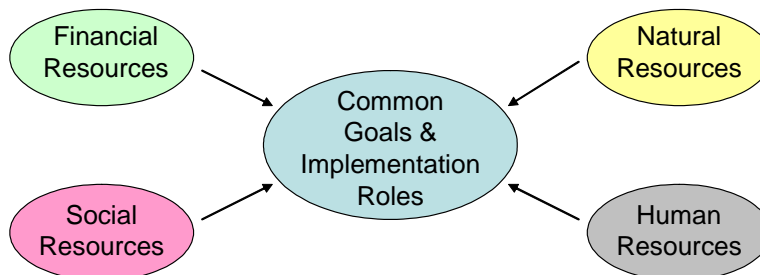
Minnesotans in general, and the Prior Lake-Spring Lake Watershed District residents in particular, love lakes. However, Spring and Upper Prior Lakes are impaired due to excess nutrients. These excessive nutrients lead to problems with nuisance algae blooms (i.e., microscopic plants) that turn the water green and scummy, limiting clarity of the water and detracting from recreational uses. A number of efforts have been made over the past decade to address these problems. However, additional work is needed, and management of lake water quality is fragmented between numerous organizations with limited resources. The primary purpose of this effort was to develop a plan that:

- 1) Sets common goals and objectives,
- 2) Blends the skills of all the groups involved (or having a stake) in lake management,
- 3) Identifies roles and responsibilities, and
- 4) Develops support networks and integrates/leverages the various types of community resources.

The plan is intended serve as a vehicle for a more organized approach to water quality management where, as shown in the following figure, the strengths and resources of various organizations are put to work toward common objectives.

**Figure 1. Purpose of the Plan**

### The Plan Organizes and Focuses Management Efforts and Resources



## BACKGROUND ABOUT THE LAKES

Before discussing the planning process, it is important to understand a bit about the history and status of Spring and Prior Lakes and the challenges they are currently facing.

Spring and Prior Lakes comprise a chain of recreational lakes located in Scott County, Minnesota, in the North Central Hardwood Forest Ecoregion. The lakes have the following characteristics:

Lake	Size (acres)	Average depth (feet)	Maximum depth (feet)	Watershed size (acres)
Spring	630	18	37	13,500
Upper Prior	340	8.0	43	3,430 direct (16,930 including Spring Lake)
Lower Prior	827	13.0	56	2,090 direct (19,020 including Spring Lake)

All three lakes are important recreational resources for the region, with amenities that include public boat launches and fishing piers. In addition, the community identity of the City of Prior Lake is tied closely to this chain of lakes.

The watershed for Spring Lake is primarily agricultural, while the direct watershed for Prior Lakes is urban/suburban. Spring Lake is the uppermost lake in the chain; its waters flow to Upper Prior Lake via a short channel through a residential neighborhood. The water quality challenges faced by Prior and Spring Lakes involve excess nutrients (primarily phosphorus) and the presence of exotic species. The following paragraphs provide a snapshot of the water quality status of the lakes.

### Spring Lake

Spring Lake is a highly nutrient rich lake. Like most lakes in this part of Minnesota, the growth of plants and algae in the lake are limited by the availability of phosphorus. Additions of phosphorus will therefore enhance the growth of plants and algae. Spring Lake's relatively large watershed has historically been a source of excess phosphorus and sediment, and there is enough phosphorus available in the lake to support excessive growth of aquatic plants and algae. This excessive algal growth affects the swimmability of the lake. In some years, toxic algae blooms pose a threat to the health of small animals, such as dogs. Finally, infestations of curlyleaf pondweed – an exotic aquatic plant – affect recreational boating. All of this means that the lake has been listed on the State of Minnesota's Impaired Waters List due to excess nutrients.

Significant efforts have been made over the last decade to reduce the amount of phosphorus flowing into Spring Lake. This work has included restoring wetlands, installing a ferric chloride treatment system, installing sanitary sewer and planting filter strips. Appendix A documents the effectiveness of one effort, the ferric chloride treatment system. However, due to the many years of watershed loading, the lake bottom is rich in phosphorus and is a large source of phosphorus to the lake (see Appendix B, which provides a lake phosphorus budget that illustrates the significant contribution from the lake's bottom sediments).

Spring Lake also exhibits an infestation of curlyleaf pondweed each spring, which affects water quality and recreation. In addition, a large population of carp creates problems by stirring up the bottom of this relatively shallow lake, sending even more phosphorus into the water and disturbing native plants. Recent lake management efforts have focused on carp removal and treatment/harvesting of curlyleaf pondweed.

#### Upper Prior Lake

Prior Lake is divided into two distinct basins, with very different water quality characteristics. Upper Prior Lake is a nutrient-rich lake that is also listed on the state's Impaired Waters List. Much of the phosphorus in the lake comes from Spring Lake, and also from the lake's sediments (see Appendix B). Curlyleaf pondweed is also found in this lake, and is becoming more of a problem each year. In addition, both Upper and Lower Prior Lakes are infested with Eurasian Water Milfoil, another exotic aquatic plant that crowds out native plants and forms surface mats that impede recreational boating.

#### Lower Prior Lake

Lower Prior Lake has the best water quality of the three lake basins. This is because the lake has a relatively small direct watershed, and the upper lakes in the chain (i.e. Upper Prior and Spring Lakes) act as "settling" basins, removing sediment and associated nutrients from the water before it enters Lower Prior Lake. As a result, Lower Prior Lake has moderate nutrient levels, and good conditions for recreational activities such as swimming. Like Upper Prior Lake, this basin also has Eurasian Water Milfoil.

#### Recent Management History

As indicated above, a number of actions have been taken over the last decade to improve the quality of Spring and Prior Lakes. A number of wetland acres have been restored in the Spring Lake watershed, and nearly 40 acres of filter strips have been installed on agricultural land. The ferric chloride treatment system was also completed in 1998, and is successfully removing a portion of the phosphorus from the main inflow to Spring Lake (see Appendix A). Efforts surrounding Prior Lakes have included the addition of storm water ponds and sediment-settling devices during street reconstruction, and shoreland restoration efforts on public and private lands.

Efforts to control exotic species have focused on the following:

- Controlling the carp in Spring Lake through winter seining (various dates since 1933, most recently in 2002)
- Early spring treatment of curlyleaf pondweed on Spring Lake to control infestation levels, encourage growth of native aquatic plants, and reduce the seedbed available for future growth (2002, 2003)
- Annual summer Eurasian water milfoil (EWM) treatment on Prior Lake to maintain boating lanes in infested areas (annually since 1990's)

It is important to note that with respect to aquatic plants, the goal has not been to eliminate aquatic plants from the lake – these plants are important to the overall health of the lake and they help maintain clear water – but rather to reduce and eliminate the extent of nuisance conditions of exotic aquatic plants. Curlyleaf Pondweed has received special attention over the past few years because it is especially harmful to lake water quality. This is because curlyleaf plants naturally die

back in early July, releasing a “pulse” of phosphorus that is quickly used by algae for growth and reproduction. In this way curlyleaf can contribute to late summer algae blooms or “green scums.”

All of these efforts have resulted in a decrease in the amount of phosphorus reaching the lakes. However, increased development, continued release of phosphorus from the lake sediments, and the continued presence of exotic species still contribute to lake water quality concerns. Additional efforts are needed by the community – including citizens, businesses and local and state government – to further improve the quality of these important lakes. But first a plan is needed, to specify the management goals for the lakes and effectively coordinate the many groups working to improve these resources. The following sections outline just such a plan for moving forward with the sustainable water quality management of Spring and Prior Lakes.

## ABOUT THE PLANNING PROCESS

The planning process was completed using three phases of small-group workshops as indicated below. Following each workshop, summaries were compiled and distributed to participants and interested parties. Copies of the workshop summaries and materials are available for review at the Watershed District office.

- **Phase 1: What do we have?** During this phase participants reviewed information about the lake resources, without much management discussion, to develop an understanding of current conditions and the factors affecting lake quality. This phase involved:
  - A ½-day **visioning session** where participants were invited to develop and express their understanding of the current and desired future conditions of the lakes.
  - **Workshop 1: Physical Setting and Economics.** Reviewed the physical characteristics of the lakes and watershed and discuss how these factors influence water quality. Explored the economic value of the lakes in terms of business income and jobs.
  - **Workshop 2: Lake Biology.** Reviewed available information on the aquatic plant and fisheries communities of the lakes and the influence of these communities (including exotic species) on water quality and vice versa.
  - **Workshop 3: Water Quality Dynamics.** Reviewed information from the previous workshops along with additional data to develop an overall picture of the lakes' water quality.
  
- **Phase 2: What do we want?** This phase was designed to develop common goals and objectives. This phase involved two workshops as follows:
  - **Workshop 4: Goals and Objectives.** Reviewed and discussed the goals and objectives, and the rationale, established by previous studies and plans.
  - **Workshop 5: Goals and Objectives.** Discussed goals and objectives for the current plan, and developed an overall management philosophy.
  
- **Phase 3: How do we get there?** This phase was designed to assess how to achieve the goals and objectives established in Phase 2, as well as review and modify draft plans.
  - **Workshop 6: Management Options.** Finalized specific numerical/measurable goals, reviewed current on-going management options, reviewed options for controlling internal phosphorus loads, and developed an overall management strategy.
  - **Workshop 7: Roles and Responsibilities.** Reviewed the management actions/strategies developed at previous workshop, and presented a framework for organizing roles and responsibilities of the various organizations, and stakeholders.
  - **Workshop 8: Roles and Responsibilities Continued.** Filled in the matrix of roles and responsibilities of community organizations for each action in the plan.
  - **Workshop 9: Finalizing the Plan.** Following the release of the draft Sustainable Water Quality Management Plan, participants convened to review the draft, fill in gaps, and sort through remaining questions regarding roles and responsibilities.

The final steps in this process involved sharing and discussing the plan with various entities and community organizations interested and involved in the planning process.

## **STRATEGIES AND GOALS**

An important purpose of this planning process was the development of updated strategies, goals and objectives for Spring and Prior Lakes. While a number of documents exist that identify water quality goals for the lakes, there was a need to revisit those goals to see if they still apply, and to integrate them into one plan for the future.

### **Current Status and Future Vision**

The first step in this goal-setting process involved discussing the current status of the lakes. At the Visioning Workshop, participants shared their view of the current condition of the lakes. The individual comments on the lake conditions were summarized as follows:

- *Spring Lake:* Spring Lake is a productive recreational lake with complex water quality issues that affect downstream water resources. These issues can be addressed by increased awareness, funding, and citizen involvement.
- *Prior Lakes:* Prior Lake is fully developed with suffering water quality and heavy weekend use. It needs increased agency cooperation including city, water management and law enforcement, as well as more landowner and boater education.

Following that discussion, participants also shared their visions for the future of the lakes. The common themes from that discussion included the following:

- *Spring Lake:* keeping and using the “natural” environment, shorelines and wetlands; controlling exotic species.
- *Prior Lakes:* keeping and using the “natural” environment, shorelines and wetlands; recognizing the multiple benefits of practices that help with lake level management and water quality.

### **Water Quality, Exotic Species and Education Strategies and Goals**

After sharing perceptions of the current conditions of the lake and their vision for the future, the participants in the planning process then learned about the current status of the lakes through the workshops described previously under the planning process. This included reviewing past goals and objectives developed for the lake, to determine if they still applied. This led to the development of the goals presented in Table 1.

**Table 1. Sustainable Lake Goals**

<b>Goals</b>	<b>Spring Lake</b>	<b>Upper Prior Lake</b>	<b>Lower Prior Lake</b>
Exotic Species	Control infestation of Curlyleaf Pondweed  Try to reduce carp population to 100 pounds/acre or less	Control infestation of Curlyleaf Pondweed, manage infestation of Eurasian Water Milfoil  Try to reduce carp population to 100 pounds/acre or less	Manage infestation of Eurasian Water Milfoil  Maintain diverse fishery
	<ul style="list-style-type: none"> <li>Reduce curlyleaf-dominated lake area from 180 acres to 90 acres or less.</li> </ul>	<ul style="list-style-type: none"> <li>Reduce curlyleaf-dominated lake area</li> </ul>	<ul style="list-style-type: none"> <li>Manage milfoil to allow continued recreation</li> </ul>
	<ul style="list-style-type: none"> <li>Enhance native plant dominated coverage to 30 to 40%</li> </ul>	<ul style="list-style-type: none"> <li>Manage milfoil to allow continued recreation</li> </ul>	<ul style="list-style-type: none"> <li>Increase native plant diversity</li> </ul>
	<ul style="list-style-type: none"> <li>Plan for (and continue efforts to avoid) potential future introduction of Eurasian Water Milfoil</li> </ul>	<ul style="list-style-type: none"> <li>Increase native plant diversity from one species to four or more</li> </ul>	
	<ul style="list-style-type: none"> <li>Continue carp removal efforts and evaluate effectiveness</li> </ul>	<ul style="list-style-type: none"> <li>Explore the potential for carp removal</li> </ul>	
Water quality	Reduce the number of days that the physical condition is “severe algal bloom” and increase the frequency of “some algae present” conditions.  Improve the recreational suitability to a “minor aesthetic problem” rating for most of the summer.	Reduce the number of days that the physical condition is “high algal color” and increase the frequency of “some algae present” conditions.  Improve the recreational suitability to a “minor aesthetic problem” rating for most of the summer.	Maintain current physical condition of “some algae present” and increase frequency of “crystal clear” conditions.  Improve recreational suitability from “minor aesthetic problem” to “beautiful.”
	<ul style="list-style-type: none"> <li>Achieve average summer clarity of 0.5 to 0.7 meters or better (1.6 to 2.3 feet)</li> </ul>	<ul style="list-style-type: none"> <li>Achieve average summer clarity of 1.5 meters or better (long term goal) = 4.9 feet</li> </ul>	<ul style="list-style-type: none"> <li>Maintain existing long-term summer average clarity of 2.2 meters or better (7.2 feet)</li> </ul>
	<ul style="list-style-type: none"> <li>Reduce average total phosphorus concentration to 70-90 µg/L*</li> <li>Reduce frequency of TP &gt; 90 µg/L conditions and related algae blooms</li> </ul>	<ul style="list-style-type: none"> <li>Work towards long-term goal of 40 µg/L or less of total phosphorus (summer average)*</li> </ul>	<ul style="list-style-type: none"> <li>Maintain summer average total phosphorus concentration of 30 µg/L or less</li> </ul>
	<ul style="list-style-type: none"> <li>Reduce soluble reactive phosphorus from 58% to 15%</li> </ul>	<ul style="list-style-type: none"> <li>Reduce Spring Lake loading to Upper Prior Lake</li> </ul>	<ul style="list-style-type: none"> <li>Reduce Spring and Upper Prior Lake loading to Lower Prior Lake</li> </ul>
	<ul style="list-style-type: none"> <li>Control internal recycling of phosphorus</li> </ul>	<ul style="list-style-type: none"> <li>Control internal recycling of phosphorus</li> </ul>	<ul style="list-style-type: none"> <li>Reduce direct watershed contributions of total phosphorus</li> </ul>
	<ul style="list-style-type: none"> <li>Reduce watershed total phosphorus by 900 kg/year</li> </ul>	<ul style="list-style-type: none"> <li>Reduce direct watershed contributions of total phosphorus</li> </ul>	

Goals	Spring Lake	Upper Prior Lake	Lower Prior Lake
Education & Awareness	<ul style="list-style-type: none"> <li>• Increase resident and business awareness of water quality issues</li> <li>• Increase community understanding of the roles of exotic species (e.g. Curlyleaf Pondweed, Eurasian Water Milfoil, and carp) in lake water quality, fisheries and recreation</li> <li>• Inform community about the dangers posed by exotic species, and how to prevent the introduction of exotic species in area lakes and streams</li> <li>• Increase participation in water quality improvement efforts such as Curlyleaf control, Lake Friendly project, public meetings</li> <li>• Improve resident's knowledge of and use of shoreline and lawn maintenance best management practices (BMPs)</li> <li>• Increase business use of BMPs for lower-impact development and storm water management before, during and after construction</li> <li>• Promote environmentally sustainable land management</li> <li>• Enable and demonstrate the efficacy of storm water runoff management on existing residential, shoreline and business property</li> </ul>		

\*TP: < 90 µg/L = partial support of primary contact recreation and aesthetics (Western Corn Belt Plains Ecoregion); <40 µg/L = full support  
<40 µg/L = full support of primary contact recreation and aesthetics (North Central Hardwood Forests Ecoregion)

## **ACTION PLAN**

Following the establishment of general and specific goals for the lakes, the discussions turned to how to reach those goals. A number of alternatives were discussed. Particular emphasis was given to options for controlling internal phosphorus cycling (i.e. reducing phosphorus inputs from the lake sediments), as this is a significant source of the phosphorus in Spring Lake and therefore of the phosphorus entering Prior Lakes from Spring Lake. Spring Lake became the focus of much of the discussion because it is the main source of phosphorus flowing into the Prior Lakes. However, actions to reduce phosphorus and sediment loading from the direct watershed of Prior Lakes were also identified and evaluated.

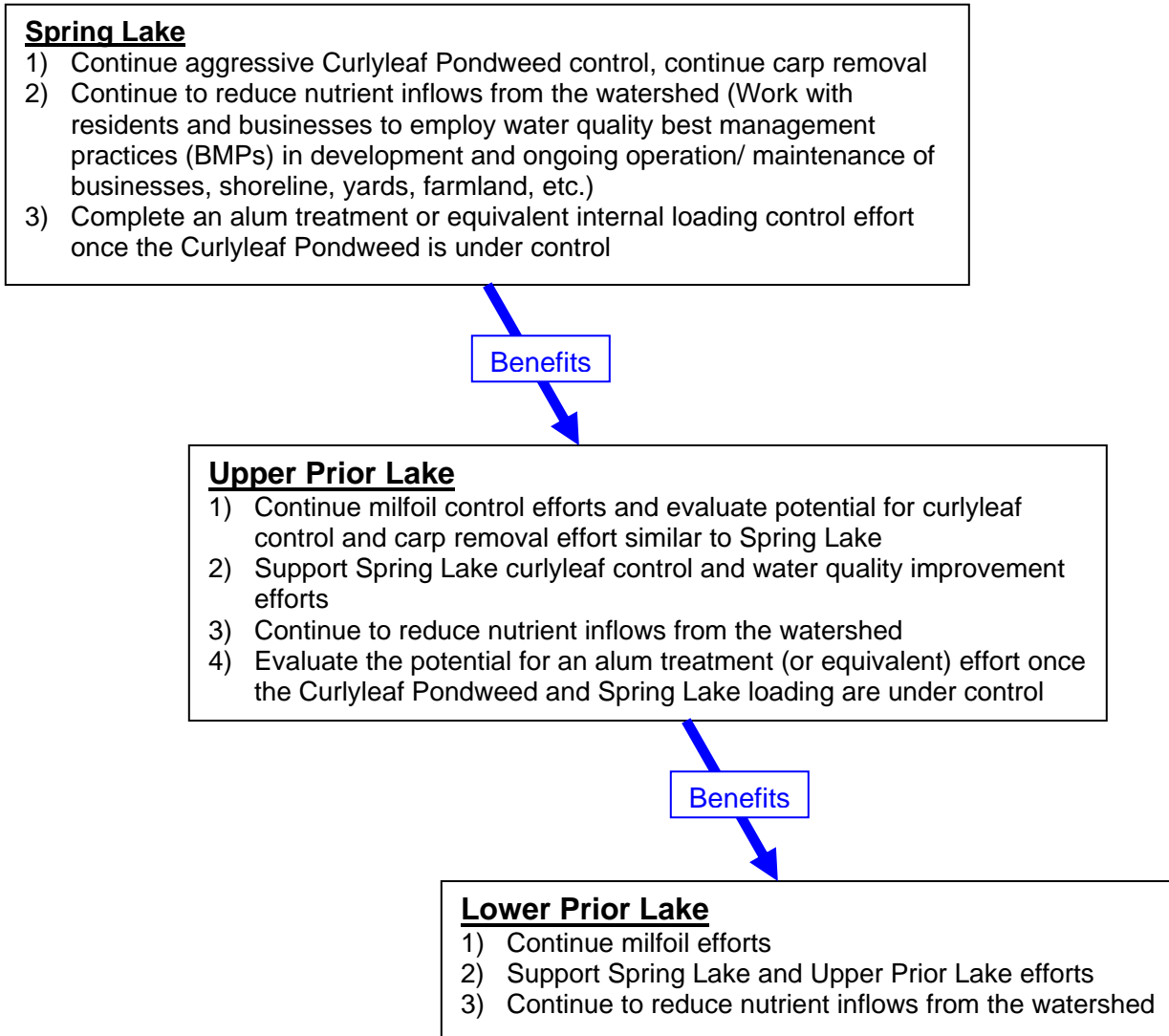
A key element of the discussion involved understanding the relationship between Curlyleaf Pondweed and internal phosphorus loading in Spring Lake, and the associated implications for controlling the internal phosphorus cycling. PLSLWD staff explained that the District had been planning to treat Spring Lake with alum, a chemical compound, to tie up the phosphorus in the sediment and make it unavailable to algae and plants. However, the introduction of Curlyleaf Pondweed threw a wrench in those plans, as researchers have found that the presence of Curlyleaf Pondweed decreases the long-term successfulness of an alum treatment. Because such a treatment is expensive, the PLSLWD put the alum treatment on hold, and has been concentrating on controlling the Curlyleaf Pondweed first.

### **Overall Sustainable Management Strategy**

Based on this understanding of the lake's management history, efforts at other lakes, and the identified goals for Spring and Prior Lakes, much of the group's discussions focused on options for controlling curlyleaf and the internal phosphorus cycling and the appropriate timeline or sequence for these actions. The group also acknowledged the need to continue to address phosphorus and sediment loading from the lakes' watersheds.

This led to the development of an overall management strategy that identified the primary management needs for each lake that must be met if the goals in Table 1 are to be achieved, and recognized the influence of the "upstream" lakes on "downstream" lake quality. Figure 2 below presents the sustainable lake strategy for each lake, and for the lake chain as a whole.

**Figure 2. Sustainable Lakes Strategy**



### **Implementation Actions**

Following the development of the overall strategy, specific implementation actions were identified and evaluated based on their feasibility and effectiveness in achieving the sustainable lake goals. Numerous activities were considered, ranging from carp removal, to alum treatment, to continued education efforts. Although some of the actions overlap somewhat, since they are important BMPs to consider they were included as separate items.

Particular attention was paid to options for controlling the internal phosphorus cycling in Spring Lake; these options were identified and evaluated in a Technical Memorandum completed during the planning process (see Appendix C). Table 2 below provides summary information about the actions considered. For each category, the overall purpose of the actions is also listed.

**Table 2. Implementation Actions Considered.**

<b>Action</b>	<b>Description</b>	<b>Outcome</b>	<b>Cost</b>	<b>Comments/Notes</b>
<b><i>Monitoring/Information-gathering – Purpose is to measure progress towards goals</i></b>				
Volunteer lake monitoring	Citizens provide water quality information through the CAMPs and Citizen Lake Monitoring programs.	Better understanding of lake quality, more involved and informed citizens	CAMPs: \$550/lake	
Detailed water quality monitoring	Detailed monitoring of surface and bottom conditions of lake.	Info. needed to track overall water quality and internal loading.	\$1,500-\$2,000/lake +staff time	May not need every year.
Watershed inflow/outflow monitoring	Measure inflow and outflow of water, phosphorus, sediment.	Information needed to develop water, sediment and P budgets, and track changes in watershed loading.	~\$1,000 per station, plus staff time & equipment	Required at main inflow to Spring Lake as part of FeCl treatment system permit.
Aquatic plant monitoring	Survey of composition of plant community and abundance of various species.	Info. needed to manage aquatic plants, evaluate control measures, plan for future actions.	\$1,800-\$2,400 per survey	May be possible for volunteers to conduct some monitoring; would require training.
<b><i>In-Lake Phosphorus (P) Controls – Purpose is to reduce phosphorus loading to achieve water quality goals</i></b>				
Alum treatment	Add aluminum sulfate to lake water to precipitate P and bind P in lake sediments.	Decreased sediment P loading, decreased algae growth, increased clarity.	\$522,000 (Spring Lake)	Increased clarity may stimulate aquatic plants, Curlyleaf can decrease long-term effectiveness.
Alum + lime	Add spent lime slurry to precipitate P and bind P in lake sediments.	Decreased sediment P loading, decreased algae growth, increased clarity.	\$662,000	May have added benefit of impacting Curlyleaf; may also impact other aquatic plants. Studies in progress.
<b><i>Exotic Species Management &amp; Control – Purpose is to manage exotic species, prevent new introductions and achieve water quality goals</i></b>				
Aquatic plant management plan	Develop a management plan (including goals) for addressing nuisance growth, controlling exotics & enhancing natives.	More stable plant community, fewer nuisance species and impacts on recreation. Provides foundation for plant mgmt.	~\$6,700 (includes plant survey)	This has already been completed for Spring Lake.
Chemical treatment	Targeted treatment of some or all of Curlyleaf or milfoil infestation.	Annual curlyleaf/milfoil control. If done in successive years, can deplete seedbed for curlyleaf and encourage native plants.	\$70,000 (\$390/acre), plus staff coord. time	Treatment limited to 15% of littoral area unless DNR allows a variance. Effectiveness studies are ongoing.

Action	Description	Outcome	Cost	Comments/Notes
Mechanical Harvesting	Mechanical harvesting of Curlyleaf or milfoil.	Annual curlyleaf/milfoil control. If done in successive years, can deplete seedbed for curlyleaf and encourage native plants.	\$76,000 (\$420/acre), plus staff time	Not limited to 15%, but harvester can't cut in < 5 feet of water, so immediate shoreline is not cleared.
Lime treatment	Addition of lime slurry to control Curlyleaf.	Control of Curlyleaf, subsequent re-establishment of native plants.	\$166,000 for Spring Lake	Effectiveness studies are ongoing, may impact other aquatic plants.
Lake drawdown	Draw down lake level to expose littoral area sediments to freezing.	Control of Curlyleaf through destruction of seedbed.	\$298,000 for Spring Lake	Concerns about downstream impacts, potential for a fish kill.
Carp removal	Remove carp through seining or other methods.	Decreased carp population, corresponding decrease in sediment and native plant disturbance; decrease in internal P cycling	\$1,000 mobilization + \$0.12/pound	Success is not assured; ongoing removal likely needed unless reintroduction can be stopped with fish barriers, etc.
<b>Watershed Management -- Purpose is to reduce phosphorus loading to achieve water quality goals</b>				
Wetland restoration	Restoration of drained or impacted wetlands to increase storage and water quality treatment.	Decrease in water, P and sediment loading to lakes.	Variable based on land & construction costs	Currently supported by PLSLWD.
Filter strip installation	Planting native grasses along waterways to provide a buffer.	Decreased transport of P and sediment from fields to ditches/streams and lakes; increased water storage.	\$200/acre/yr. incentive	Currently supported by PLSLWD and Scott SWCD.
Continued operation of ferric chloride system	Treat flow from CD13 with ferric chloride to remove phosphorus prior to entering Spring Lake.	Decreased P loading to Spring Lake.	Operating costs of ~\$7,500/year	Currently supported by PLSLWD.
Rules for new development	Implement PLSLWD and City of Prior Lake rules that require water quality treatment, rate and volume control on new and re-development.	Runoff maintained at pre-development rates, volume increases mitigated somewhat, sediment runoff and associated P captured/minimized.	Staff and outreach costs to City/WD	Most costs of treatment/meeting the rules and ordinances are borne by developers.
Sanitary Sewer	Extension of the sanitary sewer to areas currently served by individual septic systems.	Decreased loading of nutrients and bacteria to lake from any non-conforming septic systems.	Depends on size of project.	Costs assessed to property owners.

Action	Description	Outcome	Cost	Comments/Notes
Retrofit ponds and sediment traps (catch basins)	Retrofit existing neighborhoods and business areas to include water quality ponds and/or sediment-capturing devices in storm sewer catch basins.	Decreased nutrient and sediment loading to the lakes.	Variable	The City of Prior Lake is currently retrofitting areas adjacent to the lake as streets are re-done and their budget allows.
Rain gardens, buffers	Incorporate rain gardens and buffer areas into new and re-development (and lawn management).	Increased infiltration; decreased runoff of water, sediment and nutrients; increased wildlife habitat	Depends on scale, purpose, etc.	New development is required to meet PLSLWD infiltration and buffer rules. There is much opportunity to enhance existing neighborhoods, agricultural lands and business areas.
Homeowner & business runoff management	Various efforts to increase awareness and foster BMP adoption by homeowners and businesses.	Increased awareness, changes in behavior, decreased runoff and associated P and sediment loading from homes & businesses	Variable depending on project	Note that this overlaps with several other actions, including soil management, rain gardens/buffers, and shoreline restoration.
Soil management on new lots	Education effort to change practices leading to soil compaction during home building and raise new homeowners' awareness of soil management options & benefits.	Increased infiltration and turf establishment on new lots due to less compaction. Decreased erosion and fertilizer runoff.	Variable depending on effort	Costs would depend on "delivery" option for information – Workshops? Web info.? New homeowners' packets? Rules?
Manure management on hobby farms	Education of hobby farm owners on options for manure management and disposal.	Decreased nutrient and bacteria runoff from manure piles, better awareness of water quality concerns associated with manure management.	~\$500-\$1,000 to develop materials and host workshop (plus staff time)	
Shoreline restoration and erosion control	Return of native plants to shoreline areas.	Decreased erosion; decrease impacts to lakes from lawn maintenance, storm water runoff.	Variable depending on project	Generally includes landowner cost-share component.
Non-degradation and sustainable development	Encourage land management practices (including development, shoreline mgmt., agriculture) that maintain or improve existing quality and preserve resources for the future.	Increased infiltration and storage; decreased runoff of water, sediment & nutrients; greater understanding of connections between surface water, ground water, recreation, quality of life.	Variable	Should be included in some way in all the implementation actions.

Action	Description	Outcome	Cost	Comments/Notes
<b>Education/Behavior—Purpose is to change behaviors to reduce nutrient loading and help reach water quality goals</b>				
Continue the Lake Friendly Project	Continue project to conduct one-on-one visits with home and business owners to discuss runoff management practices.	Decreased runoff of water, sediment, nutrients and hazardous materials to storm sewers and lakes.	~\$5,000 per year for materials, incentives	Currently supported by a grant through August 2004.
Column in <i>Prior Lake American</i> , City of Prior Lake <i>Wavelength</i> newsletter	Topics include: economic benefits of clean water, keeping trash from lakes	Increased awareness of lake water quality issues, changes in behavior that reduce runoff of sediment & nutrients to the lakes.	Staff time	Could be a joint effort of PLSLWD, City of Prior Lake, Lake Associations and Lake Advisory Committee
Homeowner BMPs (P-free fertilizer, etc.)	Encourage homeowners to adopt practices that protect water quality.	Increased use of P-free fertilizer, decreased accidental and purposeful dumping in lake (leaves, fertilizer, trash from ice houses), increased awareness of homeowners' impacts on lake water quality.	Incorporated in other actions.	Lake Friendly, <i>Prior Lake American</i> articles, community meetings, etc. are all avenues for conveying this message.
Increase visibility of water quality protection efforts	Include information on web sites, City Council open forum, newsletters, etc.	Increased awareness of lake water quality issues and the efforts of various groups and individuals to improve water quality.	Staff time, cost of web programming	
Student projects and community meetings	Share water quality protection messages and BMPs through supporting student projects and attending community meetings.	Increased awareness of lake water quality issues, changes in behavior that reduce runoff of sediment & nutrients to the lakes.	Staff time, material costs for displays or brochures	
Communicate successes	Share success stories in protecting and improving water quality.	Increased awareness of what has been accomplished; understanding of what is possible; greater enthusiasm and support for improvement projects.	Staff time	Should become a component of all the implementation actions – i.e. the final step of each effort is to communicate the successes.

## Selection of Alternatives

During the development of Table 2, discussions surrounded the effectiveness, feasibility and desirability of each option. As noted in Table 2, some potential actions have greater uncertainty associated with them (for example, alum-lime treatment), and others are undesirable due to cost, potential adverse impacts, or stakeholder/citizen concerns. Still others, such as “nondegradation and sustainable development,” are concepts and approaches that should be incorporated into all of the actions that move forward. The most feasible options – those with the greatest likelihood of implementation and the greatest expected progress towards the sustainable lake goals – were carried forward to the next phase of the process. While these ideas received the most support and interest, many of them will require additional discussion and exploration prior to implementation.

## Roles and Responsibilities

Once implementation actions were identified and selected, the next step was to determine which organization (or individuals) would undertake each action and what their role(s) would be. The following roles were identified for each implementation action:

- **Leader:** Initiates the action and coordinates the overall effort.
- **Builder:** Constructs the facility (note: this only applies to actions that require a facility, such as a treatment system, wetland restoration, etc.).
- **Funder:** Provides some or all of the funding for the action.
- **Enactor/Approver:** Provides the approval necessary for the action to move forward.
- **Operator/Maintainer:** Operates or maintains the project or facility.
- **Staffer:** Provides the staff or volunteer time necessary to implement the action.
- **Educator/Promoter:** Explains and supports the action in the broader community. Obtains the support necessary for the action to be accepted and implemented.
- **Monitor:** Measures the success of the action through direct measurement of the activity, and/or measuring the response of the lake(s).

Participants were asked to consider the roles of themselves and their organization(s) in implementing the actions that were identified for each lake. This led to the development of a “roles and responsibilities” matrix that is reproduced in Table 3. The table is grouped by “Spring Lake” actions, “Prior Lakes” actions, and actions that apply to “All Lakes.” The following abbreviations are used in the table:

<b>Organization</b>	<b>Abbreviation</b>
City of Prior Lake	City
Cities of Prior Lake and Savage	Cities
Minnesota Department of Natural Resources	DNR
Minnesota Pollution Control Agency	MPCA
Prior Lake-Spring Lake Watershed District	WD
Prior Lake Advisory Committee	LAC
Prior and Spring Lake Associations	LA or LAs
Scott Soil & Water Conservation District	SWCD
Spring Lake Township	SLT
Three Rivers Park District	3 Rivers
Not applicable or desirable	N/A

The information in Table 3 focuses primarily on the roles and responsibilities of local government, volunteer groups and individuals. It is important to note that there are also many resources available from non-local sources, particularly state and federal agencies. These include the Department of Natural Resources, Pollution Control Agency, Board of Water and Soil Resources, Metropolitan Council, and federal Environmental Protection Agency. Local governments, volunteer organizations and citizens in the watershed rely on these federal and (especially) state sources for technical assistance, educational materials, and financial support.

**Table 3. Roles & Responsibilities.**

	<b>Cost</b> (see details in Table 2)	<b>\$ still needed ?</b>	<b>Timeframe</b> (see details in Table 4)	<b>Lead</b>	<b>Fund<sup>1</sup></b>	<b>Enact/ Approve</b>	<b>Operate/ Maintain</b>	<b>Staff</b>	<b>Educate/ Promote</b>	<b>Monitor</b>
<b>Spring Lake</b>										
<b>Monitoring/Information-gathering</b>										
Volunteer lake monitoring	\$550/ lake		Annually	WD	WD, Met. Council	WD, Met. Council	WD maintains equip.	Volunteers	Volunteers, LAs, WD, City, SLT	Volunteers
Detailed water quality monitoring	\$1,500-\$2,000/lake +staff time	X	Annually (?)	3 Rivers, WD	(3 Rivers, WD, City)	(3 Rivers, WD)	N/A	3 Rivers, w/ WD help	3 Rivers, WD, City, SLT, LAs	3 Rivers, WD
Watershed inflow/ outflow monitoring	~\$1,000/ station, +staff & equip.		Annually	WD	WD	WD	N/A	WD	WD, City, SLT, 3 Rivers, LAs	WD
Aquatic plant monitoring	~\$1,800 per survey (2/yr)	X	Annually	WD	Spring LA, WD, City	(WD, City)	N/A	WD (coord) consultant, volunteers?	WD, City, 3 Rivers, SLT, LAs	3 Rivers
<b>In-Lake Phosphorus (P) Inactivation</b>										
Alum treatment	\$522,000	X (additional \$?)	2006	WD	WD (City, grants)	DNR, MPCA, WD	N/A	WD	WD, City, SLT, 3 Rivers, LAs	3 Rivers
<b>Exotic Species Control/Management</b>										
Aquatic plant mgmt. plan	<u>Completed in 2001</u>									
Chemical treatment of curlyleaf	\$70,000 (\$390/acre), plus staff coord. time	X to treat all 180 acres	Annually for 3-6 years (depends on success)	WD & Spring LA	WD, residents, (Spring LA, City)	DNR	N/A	WD (coord.), consultant	Residents, City, WD, SLT, LAs	3 Rivers
Watch for Eurasian Water Milfoil	Minimal (plus education efforts)		Ongoing	Spring LA, lake users	N/A	N/A	N/A	Spring LA, lake users	LA, lake users, WD, City, DNR	Spring LA, lake users

<sup>1</sup> Where funding source is not yet determined or additional funding is needed, potential funding sources are indicated in parentheses.

	<b>Cost</b> (see details in Table 2)	<b>\$ still needed ?</b>	<b>Timeframe</b> (see details in Table 4)	<b>Lead</b>	<b>Fund<sup>1</sup></b>	<b>Enact/ Approve</b>	<b>Operate/ Maintain</b>	<b>Staff</b>	<b>Educate/ Promote</b>	<b>Monitor</b>
Carp Removal	\$13,000 for 100,000 lbs	X (beyond 2004)	Annually	WD	City, WD, (Spring LA, fish. clubs)	DNR	N/A	Commerc'l fishermen	LAs, WD, City, SLT, 3 Rivers	3 Rivers
<b>Watershed Management</b>										
Rules for new development	Staff and outreach costs		Ongoing	WD, City, SLT, County	WD, City, SLT, County, Develop.	WD, City, SLT, County	WD, City, SLT, County	WD, City, SLT, County	WD, City, SLT, County, LAs	WD, City, SLT
Wetland restoration	Varies depending on project		Ongoing, as opportunities are available	WD	WD	WD, SLT	WD, landowner	WD	WD, City, SLT, LAs, landowners	WD
Filter strip installation	\$200/acre/yr. incentive (WD)		Ongoing, as opportunities are available	WD & SWCD	WD & SWCD	WD & SWCD	Landowner	Landowner , WD, SWCD	Landowner, WD, SLT, SWCD	Landowner , WD, SWCD
Rain gardens, buffers	Depends on scale, purpose, etc.	X (add'l needed for retrofits)	Ongoing	WD, City, SLT, County	WD, City, SLT, County (private)	WD, City, SLT, County	WD, City, SLT, County	WD, City, SLT, County	WD, City, SLT, County, LAs	WD, City, SLT
Soil management on new lots	Varies based on effort	X	Develop in 2004/2005	City, SLT	City, SLT, WD	City, SLT	Home- owners	City, SLT, WD	City, SLT, WD, LAs	City, SLT
Shoreline restoration & erosion control	Depends on scale, projects		City has \$20,000 for projects on lakeshore	City, SWCD	City, SWCD, agencies, land- owners	City, SWCD	Landowner	City, SWCD, Landowner	City, SWCD, SLT, Landowner, LAs, WD	City, SWCD, WD
Retrofit ponds and sed. traps	Variable		Ongoing	SLT, City	SLT, City	SLT, City, WD	SLT, City	SLT, City	SLT, City, WD	SLT, City
Sanitary Sewer	Variable		As areas are annexed and opportunities are avail.	City, SLT, Met. Council	City, SLT (via assess- ments)	City, SLT	City, SLT	City, SLT	City, SLT	City, SLT
Continued operation of ferric chloride system	~\$7,500/year , plus maintenance		Ongoing	WD	WD	WD, DNR, MPCA	WD	WD	WD, LAs, City, SLT	WD

	<b>Cost</b> (see details in Table 2)	<b>\$ still needed ?</b>	<b>Timeframe</b> (see details in Table 4)	<b>Lead</b>	<b>Fund<sup>1</sup></b>	<b>Enact/ Approve</b>	<b>Operate/ Maintain</b>	<b>Staff</b>	<b>Educate/ Promote</b>	<b>Monitor</b>
Manure management on hobby farms	\$500-\$1,000 for materials & workshop (+ staff time)	X	Develop in 2005?	?	? (City, WD, County, grants)	?	N/A	?	SLT (NPDES Phase II), City, WD, LAs	?
<b>Prior Lakes</b>										
<b>Monitoring/Information-gathering</b>										
Volunteer lake monitoring	\$550/ lake		Annually	WD	WD, Met. Council	WD, Met. Council	WD maintains equip.	Volunteers	Volunteers, LAs, WD, City, LAC	Volunteers
Detailed water quality monitoring	\$1,500-\$2,000/lake +staff time		Annually (?)	WD-WQ City-bacteria, chloride	WD, City	WD	N/A	WD	WD, City, LAs, LAC	WD
Watershed inflow/ outflow monitoring	~\$1,000/ station, +staff & equip.		Annually	WD	WD	WD	N/A	WD	WD, City, LAs, LAC	WD
Aquatic plant monitoring	~\$2,400 per survey (2/yr)	X	Annually	WD	(Prior LA, WD, City/ LAC)	WD, City	N/A	WD (coord) consultant, volunteers?	WD, City, 3 Rivers, LAs, LAC	Consultant, volunteers?
Zebra mussel monitoring	Minimal (volunteer)		Annually	Prior LA	Prior LA, state	N/A	N/A	Prior LA volunteers	Prior LA	
<b>In-Lake Phosphorus (P) Inactivation (Upper Prior)</b>										
Evaluate need	?	X	2005 or 2006	WD	(WD, City)	WD, City, DNR, PCA, community	N/A	WD, City	WD, City, LAs, LAC	WD
Alum treatment, or Alum + lime	?	X	2008	WD	(WD, City)	WD, City, DNR, MPCA	N/A	WD	WD, City, LAs, LAC	WD
<b>Exotic Species Control/Management</b>										
Aquatic plant management plan	~\$8,000-\$10,000	X	2004	WD, City	(WD, City/LAC)	DNR, WD, City/LAC, residents & users	WD, City	WD, City	City, WD, LAC, LAs, 3 Rivers, DNR, sports clubs	WD

	<b>Cost</b> (see details in Table 2)	<b>\$ still needed ?</b>	<b>Timeframe</b> (see details in Table 4)	<b>Lead</b>	<b>Fund<sup>1</sup></b>	<b>Enact/ Approve</b>	<b>Operate/ Maintain</b>	<b>Staff</b>	<b>Educate/ Promote</b>	<b>Monitor</b>
Chemical treatment (Curlyleaf pondweed)	2003: \$1.59/linear foot shoreline, \$298/acre open areas	X	2005-2008 (depends on plant mgmt plan)	WD	(Prior LA, residents, City/LAC WD)	DNR	N/A	WD (coord.), consultant	Residents, City, WD, LAs, LAC, sports clubs	WD, potential for volunteers?
Chemical treatment (Eurasian Water Milfoil)	~ \$1,500/yr		Ongoing, annual	City/LAC	City/LAC (milfoil fund), DNR	DNR	N/A	City/LAC (coord.), consultant	City, LAC, WD, Prior LA, residents	Prior LA
Lime treatment	<u>Evaluate further if this becomes a viable option (based on studies now underway)</u>									
Carp Removal	\$1,000 mobil. Plus \$0.12/lb	X	Evaluate feasibility in 2004	WD (coord.), LA	(City/LAC WD, Prior LA, fishing clubs)	DNR	N/A	Commercial fishermen	LAs, WD, City, fishing clubs	Volunteers ?
<b>Watershed Management</b>										
Rules for new development	Staff and outreach costs		Ongoing	WD, Cities	WD, Cities, Developers	WD, Cities	WD, Cities	WD, Cities	WD, Cities, LAs	WD, Cities
Wetland restoration	Varies depending on project		Ongoing, as opportunities are available	WD	WD, City	WD, City	WD, landowner	WD	WD, City, LAs, landowners	WD
Rain gardens; buffers	Depends on scale, purpose, etc.	X (add'l needed for retrofits)	Ongoing	WD, City, SLT, County	WD, City, SLT, County (private)	WD, Cities	WD, Cities	WD, Cities	WD, Cities, LAC, LAs	WD, Cities
Soil management on new lots	Variable depending on effort	X	Develop in 2004/2005	Cities	Cities	Cities	Home-owners	Cities	Cities, WD, LAC, LAs	Cities
Shoreline restoration & erosion control	Depends on scale, projects		City has \$20,000 for projects on lakeshore	City, LAC, SWCD	City, WD, state agencies, land-owners	City, WD, LAC input	Landowner	City, WD,	City, WD, LAC, LAs	City, WD

	<b>Cost</b> (see details in Table 2)	<b>\$ still needed ?</b>	<b>Timeframe</b> (see details in Table 4)	<b>Lead</b>	<b>Fund<sup>1</sup></b>	<b>Enact/ Approve</b>	<b>Operate/ Maintain</b>	<b>Staff</b>	<b>Educate/ Promote</b>	<b>Monitor</b>
Retrofit ponds and sediment traps	Variable		Ongoing	Cities	Cities, County	Cities, County, WD	Cities	Cities	Cities, WD, County, LAs, LAC	Cities
<b>All Lakes – Education/Behavior</b>										
Homeowner BMPs (no-P fertilizer, etc.)	Incorporated in other actions		Ongoing	Cities, WD, Scott Co.	Cities, WD, Scott Co.	Cities, WD, Scott Co.	N/A	Cities, WD	All	Cities, WD, LAs
Water quality column in <i>Prior Lake American</i> , City of Prior Lake <i>Wavelength</i>	Staff time		Begin in 2004, ongoing	WD, City	WD, City	WD, City, editors	N/A	WD, City Prior LA (help)	WD, City, LAC, LAs	N/A
Continue Lake Friendly Project	~\$5,000 per year for materials, incentives		Ongoing	WD	WD	WD	N/A	WD, LAs, participants	WD, Cities, LAC, LAs, Scott Co., SWCD	WD, participants , LAs
Increase visibility of water quality protection issues	Staff time, web costs		Ongoing	WD	Variable	N/A	N/A	Variable	All	
Student projects and community meetings	Staff time, displays or brochures		Ongoing	Variable	Variable	Depends on funding		Variable	All	
Communicate successes	Staff time		Ongoing	WD	All	N/A	N/A	All	All	

It is important to note that each of the actions identified above will require additional discussion and refinement, and the development of a detailed plan for implementation. For example, to implement the “shoreline restoration” action the lead organizations must first determine how to fund the action, who to work with (homeowners? businesses?), and how many restorations to target each year. Then a plan must be developed for identifying interested landowners and facilitating the restoration work. Finally, the project must be implemented and tracked. To ensure that the details around each action item are explored and developed, an Implementation Team made up of volunteers from the original planning group will meet at least annually to develop a work plan for the upcoming year (see “Implementation Process” below). This will help ensure the ongoing implementation of this plan, and, therefore, the ultimate success of these efforts.

## IMPLEMENTATION SCHEDULE

The actions listed in Table 3 present a detailed approach for moving forward to improve and protect the water quality of Spring and Prior Lakes. However, not all of the actions can be accomplished at once. As discussed earlier, some will need to be sequenced to enhance the potential for success, while the timing for others will reflect budgeting and staff time needs and constraints. Table 4 presents a five-year schedule for implementing each of the action items.

It is difficult to predict the expected response of the lakes over the five-year implementation timeline. A successful alum treatment on Spring Lake will result in a dramatic, and immediate, improvement in water quality, but it is hard to know how long the improvement will last, or how quickly a response will be seen in Prior Lakes. Controlling Curlyleaf Pondweed will help ensure the long-term effectiveness of an alum treatment; that is why it is important to address this problem before an alum treatment. The completion of studies currently in progress on other metro-area lakes will also provide more information to help predict future responses in Spring and Prior Lakes.

### Annual Reporting and Planning

It is important that this Sustainable Water Quality Management Plan be a “living” plan that can be refined and updated as we learn more about the responses of Spring and Prior Lakes to management actions, and as new tools and new information about existing management tools becomes available. To ensure that implementation of the Plan is continuing and that progress is being made towards the sustainable lake goals, an annual report will be completed each year that includes the following:

1. A discussion of the actions initiated and completed during the past year, including what worked well and what didn't work as well.
2. Analysis of progress made towards the sustainable lake goals.
3. A discussion of any changes needed to the plan to ensure continued implementation and success.
4. A description of the actions planned for the next year, including lead organizations/ individuals, funding source(s), and a more detailed timeline (i.e. an annual work plan).

Note that as indicated in the previous section, for each action item a number of steps will be needed for implementation. This will require the ongoing involvement of the various individual groups that participated in developing this Sustainable Water Quality Management Plan. To ensure continued coordination in implementing this plan, it is anticipated that the “Sustainable Lakes” group will re-convene at least once each year to review the annual report, take stock of the progress made to date and the efforts planned for the upcoming year, and to make any necessary adjustments to the plan. The outcome of this meeting will be an annual Work Plan that reflects the Management Plan, and that details the efforts of the participating individuals and groups over the next year.

This annual work plan process will help to ensure that the Sustainable Water Quality Management Plan is translated into action. In addition, it will provide a means for updating the Plan to reflect new information and opportunities. The five-year revision schedule provides a mechanism for revising the plan to reflect new goals or strategies for the lakes. This all helps to achieve the

ultimate goal of coordinating the various local and regional water quality management efforts focused on Spring and Prior Lakes to achieve the community's water quality goals.

Future Revisions to the Sustainable Lakes Management Plan

It is important that this Sustainable Water Quality Management Plan be a “living” plan that can be refined and updated as we learn more about the responses of Spring and Prior Lakes to management actions, and as new tools and new information about existing management tools becomes available. At a minimum, the Plan should be updated annually during the annual reporting and planning process to reflect the previous year's progress and information, and the entire Plan, including the goals and strategy, should be re-visited every five years.

**Table 4: General Implementation Schedule (details to be added via annual Work Plan).**

Year	2004				2005				2006				2007				2008			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>Spring Lake</b>																				
<b>Monitoring/Information-gathering</b>																				
Volunteer lake monitoring		—	—			—	—			—	—			—	—			—	—	
Detailed water quality monitoring	—	—	—		—	—	—		—	—	—		—	—	—		—	—	—	
Watershed inflow/ outflow monitoring(level of detail varies)	—	—	—		—	—	—		—	—	—		—	—	—		—	—	—	
Aquatic plant monitoring		▲	▲			▲	▲			▲	▲			▲	▲			▲	▲	
<b>In-Lake Phosphorus Controls</b>																				
Alum treatment											▲									
<b>Exotic Species Control/Management</b>																				
Chemical treatment of curlyleaf		—				—				—				—	-?					
Watch for Eurasian Water Milfoil and educate to avoid introduction	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Carp Removal (depends on \$)				—				—				—				—				—
<b>Watershed Management</b>																				
Rules for new development	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Wetland restoration	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Filter strip installation	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Rain gardens, buffers			—	—			—	—			—	—			—	—			—	—
Soil management on new lots				Develop				Implement				Implement								
Shoreline restoration & erosion control	Develop program	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Retrofit ponds and sediment traps	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sanitary Sewer	As annexation moves forward and opportunities are available.																			
Continued operation of ferric chloride system	—				—				—				—				—			
Manure mgmt. on hobby farms					Develop	—	—	—	Implement	—	—	—	—	—	—	—	—	—	—	—

Year	2004				2005				2006				2007				2008			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>Prior Lakes</b>																				
<b>Monitoring/Information-gathering</b>																				
Volunteer lake monitoring		—	—			—	—			—	—			—	—			—	—	
Detailed water quality monit.	—	—	—		—	—	—		—	—	—		—	—	—		—	—	—	
Watershed inflow/outflow monit.	—	—	—		—	—	—		—	—	—		—	—	—		—	—	—	
Aquatic plant monitoring		▲	▲							▲	▲							▲	▲	
<b>In-Lake Phosphorus Controls</b>																				
Evaluate need (Lower Prior)					—	—	—													
Alum treatment, or Alum + lime (depending on studies)																▲	(or 2008, depending on funding)			
Carp Removal (depends on \$)					—				—				—				—			
<b>Exotic Species Control/Management</b>																				
Aquatic plant management plan		—	—											—						
Chemical treatment of Curlyleaf					—				—				—							
Chemical treatment of EWM	—																			
Lime treatment	Depends on timing and results of current research																			
<b>Watershed Management</b>																				
Rules for new development	—																			
Wetland restoration	—																			
Rain gardens, buffers		—	—																	
Soil management on new lots					Develop	—	—	—	Implement	—	—	—	—	—	—	—				
Shoreline restoration & erosion control	Develop program	—																		
Retrofit ponds and sed. traps	—																			
<b>All Lakes – Education/Behavior</b>																				
Homeowner BMPs	—																			
Column in <i>Prior Lake American</i>	—																			
Continue Lake Friendly Project	—																			
Increase visibility of water quality protection issues	—																			
Student projects, commun. mtgs.	—																			
Communicate successes	—																			
<b>Annual Reporting &amp; Planning</b>				▲				▲				▲				▲				▲

## **Appendices**

Appendix A: County Ditch 13 Wetland and Ferric Chloride System Sediment and Phosphorus Removal Performance Assessment

Appendix B: Spring and Upper Prior Lakes External and Internal Phosphorus Load Modeling

Appendix C: Feasibility Analysis for Controlling Internal Phosphorus Loads in Spring Lake