

Upper South Long Lake Management Plan

**Upper South Long lake Improvement Association
Crow Wing County, Minnesota**

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Section 1

Introduction

Welcome to the Upper South Long Lake Management Plan! This plan had been developed by the Upper South Long Lake Improvement Association (USLLIA) to guide the management of water and land related resources in Upper South Long Lake and its surrounding watershed. Upper South Long Lake is located in the south central portion of Crow Wing County, approximately eight miles southeast of the City of Brainerd, Minnesota.

This plan has been organized into a three-part format. The organization of the plan is intended to help readers and users of the plan more quickly find the information they need. The three parts include:

- Volume 1 – Plan Background.
- Volume 2 – Strategic Policy Framework.
- Volume 3 – Plan Implementation.

This first section of Volume 1, Plan Background, provides an overview of the “Healthy Lakes” planning process sponsored by the Initiative Foundation, a brief history of development in the watershed, and a review of projects completed by the USLLIA to improve and protect the lake community’s resources.

A. Healthy Lake Partnership Program

The Initiative Foundation is one of six foundations established by the McKnight Foundation to serve the human and economic needs of greater Minnesota. It serves 160 communities in the 14-county area of central and east central Minnesota. The mission of the Initiative Foundation is to improve the quality of life for residents, families and communities in its service area through comprehensive and integrated community development. To meet this mission, it collaborates with a wide range of private, local, regional, state and national organizations and foundations including lake associations.

One of the programs established by the Initiative Foundation, which was utilized by the USLLIA, is the Healthy Lake Partnership Program (HLP). The HLP program builds the capacity of citizen leaders to develop and implement lake or river management plans through leadership training and grants.

Over the summer of 2001, nine citizens from the Upper South Long Lake area participated in two sessions to learn how to develop a locally shared vision, set measurable goals, and develop ways to measure their progress and outcomes. The Lake Management Plan for Upper South Long Lake has been developed to meet the requirements established by Initiative Foundation for additional grant funding through HLP.

B. Use and History of Upper South Long Lake

The Upper South Long Lake area is rich with cultural and natural historical accounts and events. Many of these are described in a document entitled, “The History of Upper South Long Lake”, written by Birney C. Wilkins and published by the USLLIA in 1984.

Over the past 100 or so years, there have been numerous events in and around the lake that have affected its character and use. The following table summarizes some of the more important events:

Table 1
Historical Events of the South Long Lakes Area

Year	Event
Up to the early 1800s	Dakota people use the north end of the lake for a seasonal hunting and fishing camp.
1890-1910	Logging around the lake.
1906	A mill pond was located on the north end of the lake. A small town was located around this area. The town had a creamery, store, flour mill and other small buildings.
1918	Two cabins were located on the lake.
1918	Two farms were located on the east and west side of the lake.
1930s	The first resort was started on the lake on the north side.
1930s-40s	Lakeshore was being developed. Paradise Shores was developed on the southeast shore.
1936	The dam was built on the outlet of the lake. The dam was built with stop logs and was manipulated at various levels.
1946	The stop logs were set in one place at 1.9 feet above the sill, which is what it is maintained at this time.
1950s	The north side of the lake had additional development.
1960s-70s	The west shore developed.
1970s	Lake owners started meeting and an association was developed the association bought a weed cutter and continues to cut weeds on the lake.
1980s-90s	The lakeshore continues to be developed.
1998	LAP study conducted on Upper South Long Lake.

Source: LAP Study, Wilkins, and USLLIA Board members.

Today, the shoreline surrounding the lake is used primarily for recreation and residential purposes. Although many of the lakeshore parcels are owned by seasonal residents, the trend over the past ten to twenty years has been changing to year round residents. It is not uncommon to find lakeshore property owners and families that have owned property on the lake for well over forty or more years.

The lake has been a good fishery for not only lakeshore residents but also many people from the surrounding area including some well-known fishing celebrities from the

Brainerd area. The fishery has been good to excellent in the past years. Both Upper and Lower South Long lakes are known for their excellent large mouth bass. In addition, the lakes support a good walleye population. The increase in the nutrients coming into the lake from the surrounding watershed is negatively impacting the fishery, thus the desired use of the lakes by the residents could be reduced in the future.

Many of the lake property owners are bird watchers and enjoy the many perching birds that live along the shoreline. The lakes have a number of loons that nest and bring up their young on the lakes. Osprey and eagles are frequently seen on both lakes during the summer months.

Upper South Long Lake is used for many boating activities such as sailing, canoeing, skiing, and just cruising around the lake enjoying the sights and sounds. The lake is also heavily used for swimming and other water sports by many of the residents and visitors. Any increases in undesirable aquatic plants and algae blooms will take away the pleasures that the lake residents and visitors have when using the lakes.

The primary concern facing the lake association and its citizens is that the increased use of the lake and increased development and land use activities in the surrounding watershed are going to impact water quality. This will impact the use and enjoyment of the lake and area residents, visitors, and area businesses. The challenge facing the community is to protect the water quality.

C. Upper South Long Lake Improvement Association (USLLIA)

The Upper South Long Lake Improvement Association (USLLA) officially became a non-profit corporation on May 21, 1980. As stated in Article III, in its Articles of Incorporation, “The purpose of this corporation shall be to provide a means whereby the membership of this corporation may promote, preserve and protect, rehabilitate and enhance, the quality generally, of Upper South Long Lake.”

The Articles of Incorporation, as well as the by-laws of Upper South Long Lake Association are included in **Appendix 1**.

D. Completed Lake Association Projects

Lake water quality has been a primary concern for many of the lake residents for many years. The USLLIA has been working to maintain and improve the water quality in the lake for many years. Some of the major efforts that have been completed by the lake association to protect the water resource include:

Table 2
Completed Lake Association Projects

Year	Project/Description
Late 1970s	Larger scale applications of copper sulfate are placed in Upper South Long Lake to treat for algae blooms.
1980s	Aerial infrared photographic survey of the lake completed.
1990s	The Upper and Lower South Long Lake associations distributed a septic survey to all residences on both lakes.
1996	MN DNR Division of Fisheries completed the Fisheries Lake Management Plan.
1998	The Lake Assessment Program (LAP) study for Upper and Lower South Long Lakes was completed.
2000	The Upper and Lower South Long Lake associations applied for a grant from the MPCA through the Clean Water Partnership/Federal 319 program but did not receive the grant.
2000	Water quality sampling for phosphorus from the Nokasippi River and three other inlets that flow into the lake.
2000	Started ongoing measurements of water clarity of the Nokasippi River.
June 2001	Board members attend the “Healthy Lakes Partnership” training sessions sponsored by the Initiative Foundation held at Central Lakes College.
August 2001	Over 90 people attended the Visioning Session held at the Green Lantern Tavern and provided input and priorities for the lake management plan. In response to the aquatic vegetation problems and the need for a new weed harvester, \$9,300 was raised at the Visioning Session.
December 2001	The USLLIA Board received a planning grant from the Crow Wing County Water Plan program to develop the lake management plan.
January 2002	The MN DNR and USLLIA Board complete and approve the Vegetation Management Plan.
October 2002	The USLLIA Board acquired a modern weed harvester.

Source: USLLIA members.

Section 2

Public Input

Public input is critical to the successful development and implementation of a good lake management plan. One of the principal ways that HLP lake management plans gather public input is through the visioning process. This section provides a summary of the results from the visioning session for the Upper South Long Lake community held on August 18, 2001. A more detailed description of the methods and procedures used at the visioning session are provided in the Visioning Session Report for Upper South Long Lake (see **Appendix 2**).

1. Overview

The visioning session was designed to provide property owners with a voice on what should be addressed in the lake management plan. Over 90 people met to discuss and share their concerns regarding Upper South Long Lake. Attendees discussed and prioritized specific areas in which they thought the lake association should focus on. Further, potential projects for each focus area were discussed. Citizens were asked to identify potential projects or actions that they thought were needed to be taken for each priority focus area. They were also asked to identify any available resources or persons that could help complete the proposed projects. Lastly, participants were provided opportunities to volunteer to work on one or more of these projects or actions.

a. Focus Areas

As established in the HLP visioning process, participants were provided with eight focus areas and asked to vote for up to two areas that they felt needed the most attention. From these eight, four priority focus areas were selected by the participants and then further discussed in depth. The priority focus areas included Aquatic Vegetation, Water Quality, Land Use and Zoning, and Fisheries Management. The table below lists the tallied results from the 80 persons who submitted their worksheets at the end of the visioning session.

Focus Area	# of Votes
1. Aquatic Vegetation	50
2. Water Quality	43
3. Land Use and Zoning	12
4. Fisheries Management Plan	10
5. Other Focus Areas	8
6. Managing Surface Water Use Conflicts	4
7. Exotic Species	3
8. Public Access	2
9. Wildlife	0

b. Issues and Concerns

Participants were divided into small groups and each group was given a focus area to discuss, along with worksheets to facilitate their discussions. Below is a summary list of specific issues and concerns raised in the small group discussions:

Aquatic Vegetation

- The weeds are getting worse and are twice as far out. They are covering more and more of the lake (curly leaf pondweed).
 - We cannot get boats through or water ski on the lake.
 - Where are the weeds coming from? Is it a cycle?
- Dead fish have been found, are the weeds causing this or are they just collecting them?
 - What does mowing and fertilizing do?
 - How can we manage the weeds and weed cutting?
 - Should we use chemicals for weed removal?
 - How much does the increased aquatic vegetation growth relate to water quality?
 - We need to do more weed harvesting.
 - Need to control the input of nutrients – upstream and the runoff.

Water Quality

- Algae blooms have become more of a problem.
- What are the impacts on water quality caused by septic systems? Feedlots? Runoff? Erosion? Land development?
- We want to keep up property values for future generations.
- How are water quality and aquatic vegetation interrelated?
- Is water quality weather related and how does the weather affect the watershed?
- What can we do as landowners?
- We need to continue to monitor water quality.

Land Use and Zoning

- There are failing or non-complying septic systems located around the lake.
- What are the County's zoning requirements?
- Why is enforcement of the current regulations not being done?

Fisheries Management

- Has there been enough fish stocking on the lake?
- Watch winter crappie fishing for over fishing.
- Fishing is important to us.
- There should be no stocking unless we ask for it.

c. Suggested Projects and Actions

Again in small groups, participants discussed possible actions that could be taken to improve and manage the issues within the focus areas. Each of the small groups proposed several potential projects for the problematic areas and are discussed below:

Aquatic Vegetation

- Find the source of the weeds.
- Find out what other lakes have done in terms of weeds.
- Consider chemical use versus mechanical use (weed cutter).
- Avoid the use of chemicals that encourage weed growth.
- Purchase a new weed cutter and cut weeds.
- Provide more information and education on aquatic vegetation management.
- Encourage landscaping that reduces stormwater runoff into the lake.

Water Quality

- Continue monitoring water quality, Secchi readings.
- Test farm runoff entering into the stream in the northwest corner of the lake.
- Educate landowners regarding chemical use on land.
- Remove debris by Paradise Shore.
- Open inlet and outlet for better flow.
- Make sure that large enough culverts are installed.
- Take aerial photographs of the lake to look for failing septic systems.
- Support the repair or replacing of failing septic systems.
- Provide watershed management education.
- Review the MPCA study to see how upstream areas are affecting the lake and the watershed.

Land Use and Zoning

- Regularly inform residents of the County's land use requirements and zoning through the newsletter.
- Talk to farmers about runoff and its affects on the watershed.
- Limit the amount of runoff from properties around the lake.
- Limit liquor permits.
- Limit signage.
- Support dust control on area roadways..
- Enforce the current septic system requirements.

Fisheries Management

- None provided.

d. Suggested Indicators of Success

Near the conclusion of the visioning session, participants were asked to think ahead into the future, five to ten years or so, and asked, “What would be an indication that our efforts to improve the lake have been successful?”

The following is a list of statements that the participants identified as possible indicators of success in efforts to improve the overall lake community. These suggestions provide the planning committee with an excellent starting point to developing indicators of success (see Volume 3).

Water Quality

- Lower the levels of phosphorous in the lake.
- Have all septic systems around the lake comply with the County’s requirements.
- Have a Secchi reading of 15 feet.

Aquatic Vegetation

- Buy and operate a new weed cutter.
- There will be more volunteers working on projects beyond just the Board members.
- Part time residents will be involved.
- Residents will not have to rake the beach.
- Buffer areas will be constructed around the lake to protect the water quality.
- We will be able to troll for northern pike without getting caught in the weeds.

Exotic Species

- All exotic species will be eradicated.
- There will be no curly leaf pondweed on the lake in 5 years.
- No new exotics will enter the lake.

Land Use and Zoning

- There will be consistency with regulations between the County and residents.
- There will be fewer complaints from neighbors because of inconsistencies with other properties on the lake.
- Farmers and outside landowners will be more cooperative in protecting the lake.

Managing Surface Water Conflicts

- Residents and patrons will become more “lake” courteous.
- Pamphlets on regulations will be distributed at the resorts.

- Residents and visitors will better understand the relationship between water quality, aquatic vegetation and land use.

Section 3

Resource Inventory

Section 3 provides an inventory of the natural resources in the Upper South Long Lake area. The intent of the first portion of this section is to help the reader better understand the relationship between the lake and its watershed, the area of land that drains into the lake.

For purposes of this plan, the watershed for Upper South Long Lake will be called the “Lakeshed”, in order to help establish the significance of the land areas that drain into the lake. This section also provides useful background information on related land, surface water, and groundwater resources in the Lakeshed.

2. Watershed Context

What is a watershed? A **watershed** is the area within the geographic boundaries of land that drain into a surface water feature such as a stream, river, or lake and contributes to the recharge of groundwater. Areas of higher elevation cause the drainage of surface water within the watershed and essentially divide the watersheds. Further, watersheds come in different shapes and sizes. The quantity and quality of the water resources within a watershed are greatly influenced by the land that the water flows through.

River Basins

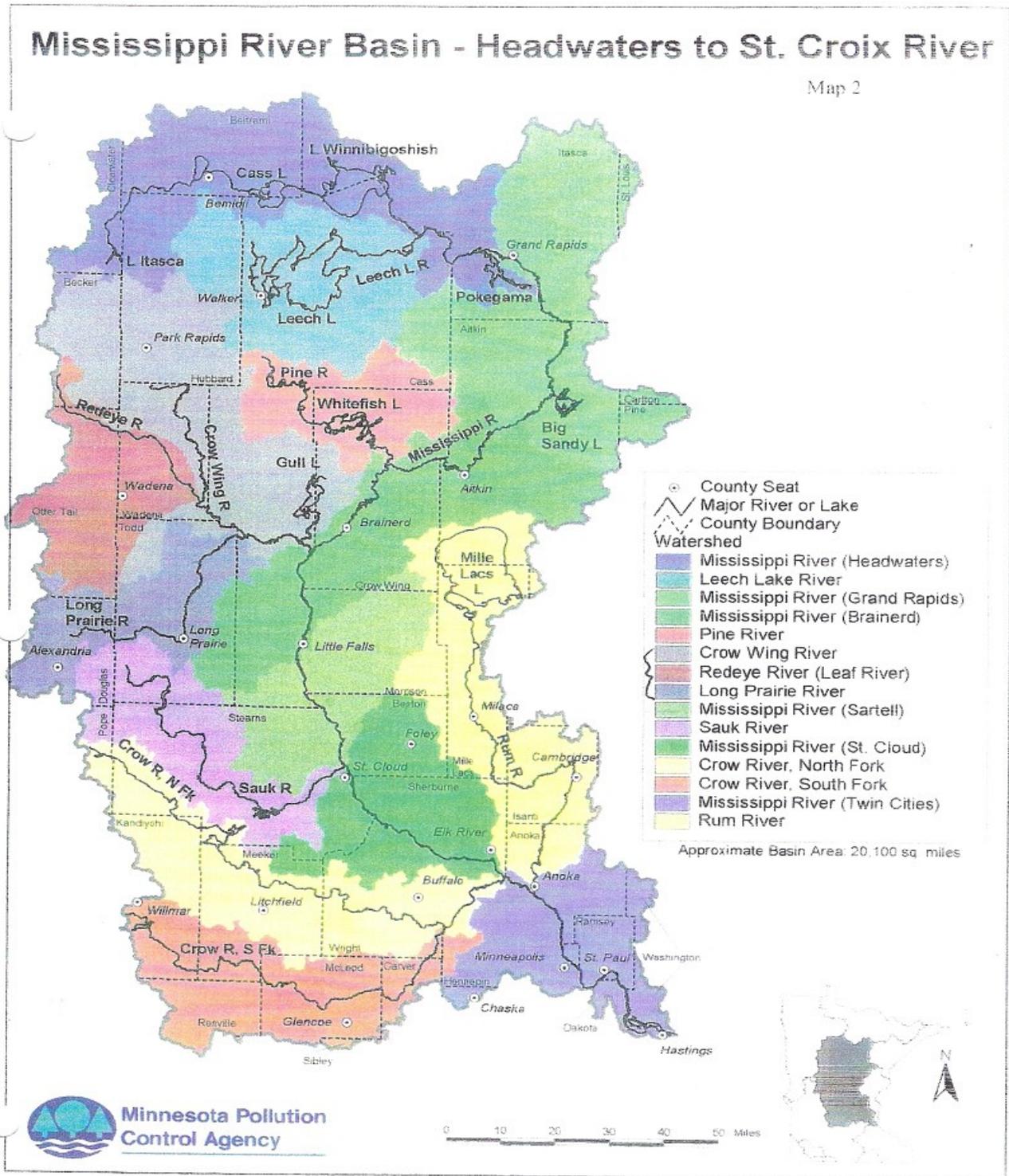
There are ten river basins in Minnesota. Crow Wing County is located entirely within the Upper Mississippi River Basin. Within this basin, there are 15 major watersheds. The Upper Mississippi Basin is the only river basin in Minnesota that is located entirely within the state. It covers 20,100 square miles, or 12,864,000 acres (see **Figure 1**).

Major Watersheds

Upper South Long Lake is located with the major watershed known as the Mississippi River – Brainerd major watershed. Its hydrologic unit code is 07010104. This watershed covers 1,656 square miles, or approximately 1,006,000 acres. It flows in a northeast to southwest direction and overlaps into four counties including Aitkin, Crow Wing, Morrison and Todd counties.

Some of the major rivers in this major watershed include Crow Wing, Little Elk, Nokasippi, Little Willow, and the Swan. Upper and South Long lakes are located near the middle portion of the Mississippi River – Brainerd major watershed along its eastern flank.

Insert Figure 1 – Basin Map



Minor Watersheds

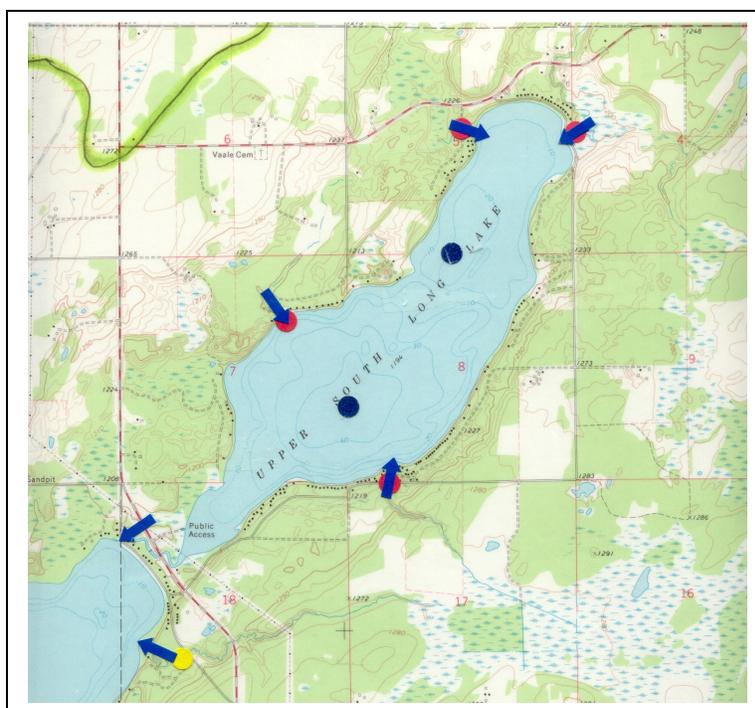
The Minnesota Department of Natural Resources (MN DNR) has further divided major watersheds in smaller units known as minor watersheds. Within the Mississippi River – Brainerd major watershed, there are 135 minor watersheds. They range in size from 5 to 38 square miles, or 3,200 to 24,000 acres.

The Upper and South Long Lakeshed

Upper and Lower South Long lakes are considered flowage lakes in that they have streams that flow both into and out of the lakes. The two lakes are a part of the half dozen or so lakes that are connected by the flow of the Nokasippi River.

There is one major inlet (Nokasippi River), three secondary inlets, and several ephemeral inlets flowing into Upper South Long Lake. **Figure 2** illustrates the locations of the River and the three inlets to Upper South Lake.

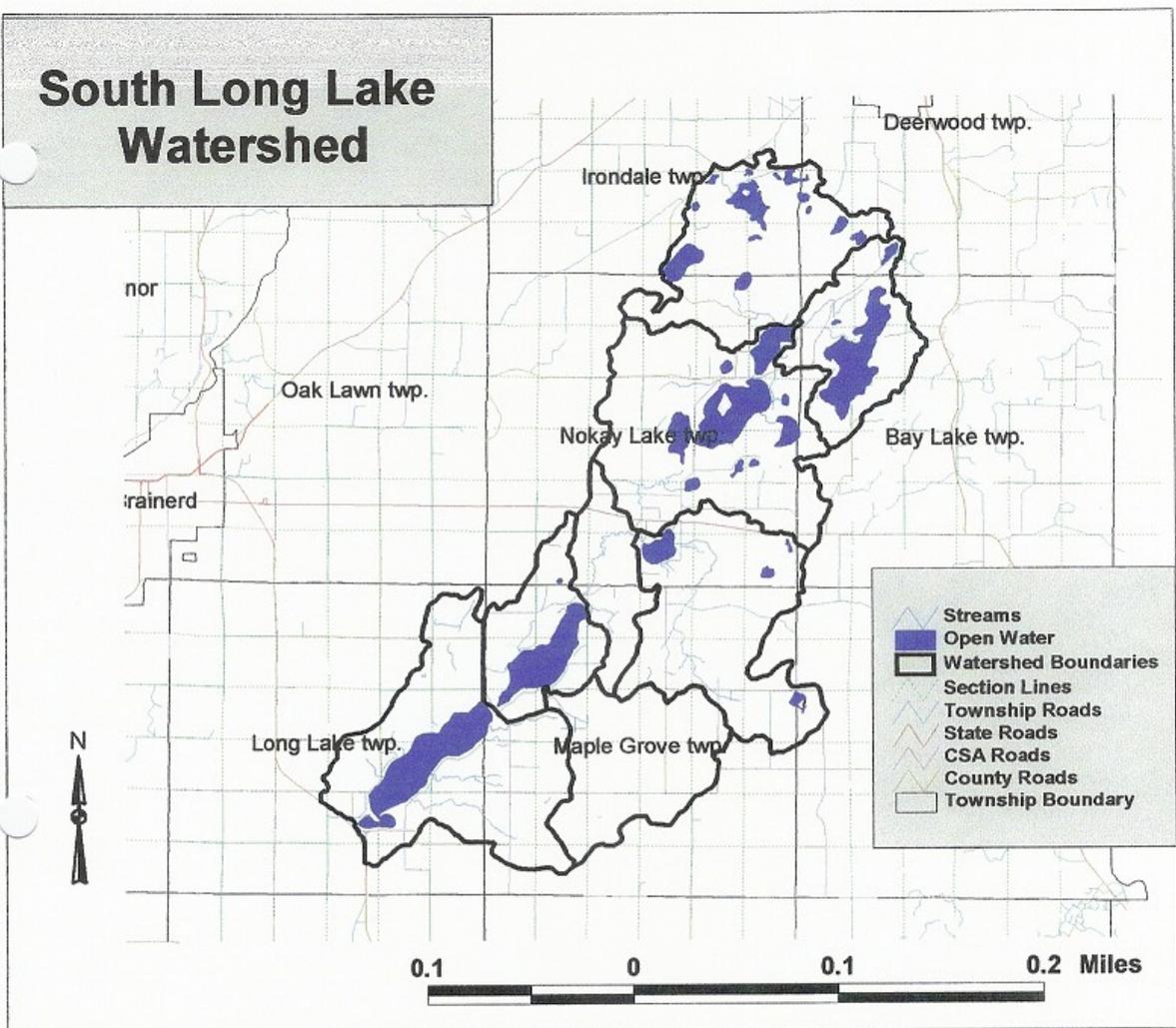
Figure 2
Drainage System Map



Note: The Nokasippi River flows into the northeastern side of the lake.

The land area that drains via the River and the inlets into the Upper and Lower South Long lakes is referred to as its “lakeshed”. Within the Lakeshed, there are 7 minor watersheds. The Lakeshed covers 46,855 acres, or just over 72 square miles. **Figure 3** illustrates the boundaries of the minor watersheds in the Lakeshed. The figure also highlights the boundaries of the local units of government and major roadways.

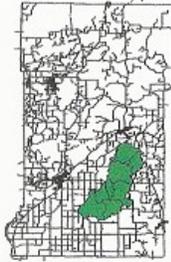
Insert Figure 3 – Lakeshed Map



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Watershed Location in
 Crow Wing County

UPPER SOUTH LONG LAKE MANAGEMENT PLAN 2002
CROW WING COUNTY, MINNESOTA

Base Map
 Source:
 MN DOT Roads
 DNR Lakes, Streams,
 Townships, Sections

3. Resource Inventory

Land Resources

Geology

The bedrock geology found in the Mississippi River – Brainerd major watershed typically consists of Precambrian crystalline rocks. The surficial geology consists of siliceous glacial deposits associated with the Superior Lobe and Rainy Lobe associations. In some areas of the major watershed, the glacial deposits are up to 600 feet deep.

The landforms in the area surrounding South Long Lakes (Upper and Lower) are typically till plain, ground moraine, outwash plains, and drumlins. The Nokasippi River corridor consists of primarily surficial outwash plains created from the Superior Lobe.

Topography

The topography in the Mississippi River - Brainerd major watershed is generally flat to gently rolling. Areas with steeper slopes, generally over 12 to 15 percent, are located around the lakes and along streams and rivers.

The landscape of the Lakeshed generally drop in elevation from the northeast to a southwest direction with the highest elevations in the Lakeshed located in the hilly areas surrounding Clearwater Lake approximately 1,330 feet above sea level. The elevation of the outlet on Lower South Long Lake is 1,190 feet. **Figure 4** illustrates the topography in the South Long Lakeshed.

Slopes around Upper South Long Lake are generally moderate to moderately steep with the steepest areas located on the west side of the lake near the Rognaldson property. In this area the elevation rises over 50 feet in less than 200 to 300 feet. The eastern side of the lake rises 50 to 70 feet in elevation over a distance of 1,000 feet and more.

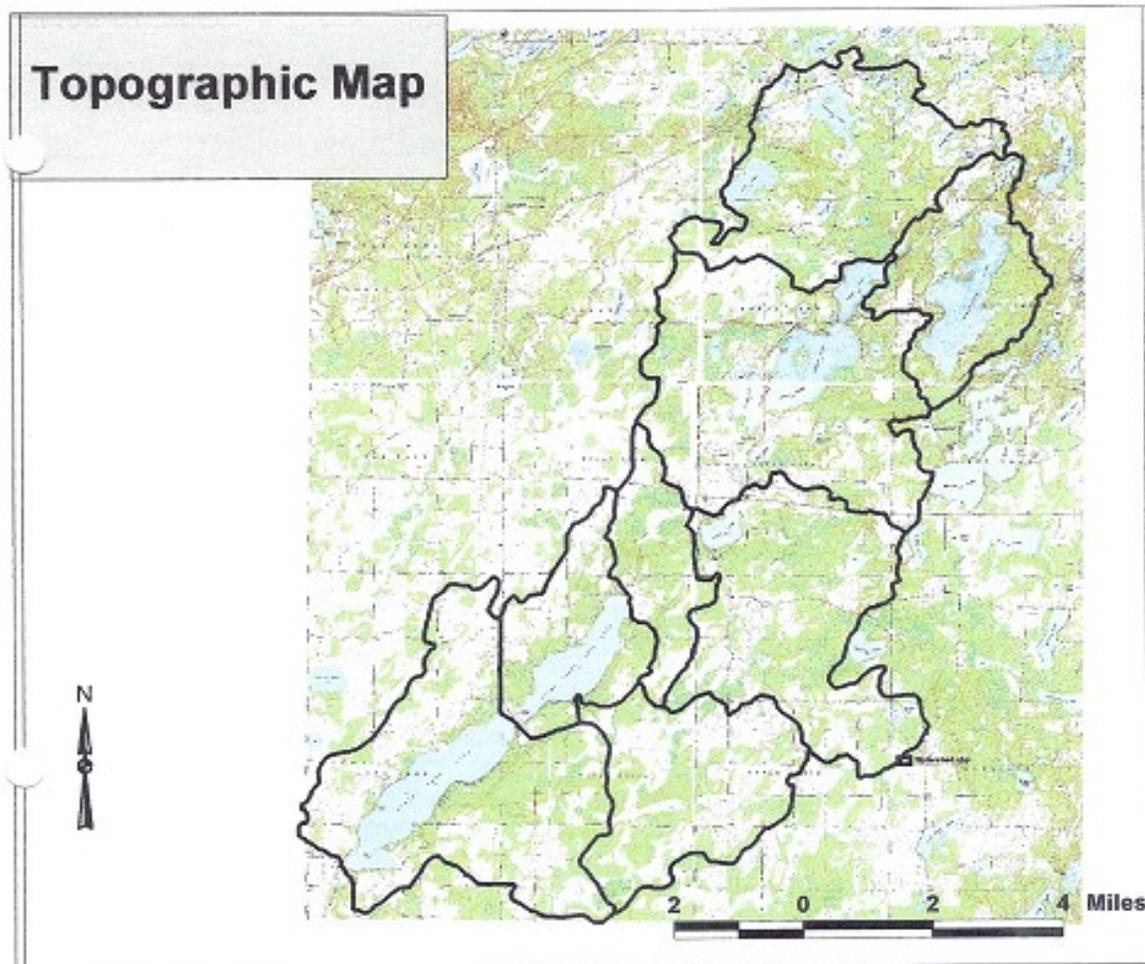
Soils

The soils in the Mississippi River - Brainerd major watershed are primarily Alfisols and Entisols. The area generally around the South Long Lakeshed is located in the Chetek-Onamia general soils association. Generally these soils have relatively rapid drainage rates.

Presently, the County does not have a published soil survey or a digital soil survey for reference and analysis purposes. A soil survey in a digital format would be a very useful resource management tool for landowners, farmers, resource managers, and developers.

For more information on soils in specific areas within the Lakeshed, please contact the Crow Wing County Soil and Water Conservation District at their Brainerd office.

Insert Figure 4 - Topography Map



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Watershed Location in
 Crow Wing County

Topographic Map
 Source:
 USGS Topo Map

UPPER SOUTH LONG LAKE MANAGEMENT PLAN 2002
 CROW WING COUNTY, MINNESOTA

Surface Water Resources

Upper and Lower South Long Lakes

Both Upper and Lower South Long lakes are in the upper ten percent of lakes in the state in terms of size with 802 and 1,306 acres respectively. They are moderately shallow with mean depths of 19 and 20 feet and maximum depths of 40 and 47 feet, respectively. The deepest portion of the northeastern half of Upper South Long Lake is 20 feet while the southwestern half of the lake contains a larger area of deeper water ranging from 30 to 40 feet.

The lakes are long and narrow in shape extending in a northeast to southwest direction. This orientation and narrow shape makes the two lakes less exposed or accessible to the prevailing northwesterly winds.

As flowage lakes, both Upper and Lower South Long Lakes are subject to the impacts of surface water runoff from a relatively large area. **Table 3** summarizes the physical characteristics of both Upper and Lower South Lakes including the ratio between the lake surface area and area of land that drains into them.

Table 3
Lake and Lakeshed Characteristics

Lake:	Upper (ID #18-0096)	Lower (ID #18-0136)	Total
Area	802 acres	1,306 acres	2,108 acres
Mean Depth	19 feet	20 feet	
Maximum Depth	47 feet	40 feet	
Volume	15,006 acre-feet	28,063 acre-feet	43,096 acre-feet
Lakeshed Area	34,417 acres	9,008 acres	43,425 acres
Lakeshed: Lake Surface Ratio	43:1	6:1	37:1
Est. Avg. Water Residence Time	0.6 years	0.9 years	

Source: MPCA LAP Study.

Wetlands

Figure 5 illustrates wetlands in the South Long Lakeshed. The northwestern and southeastern portions of the South Long Lakeshed have the most extensive amounts of wetlands.

The wetland data comes from the National Wetland Inventory (NWI) prepared by the U.S. Fish and Wildlife Service (US FWS). The wetlands are categorized into one of eight types. Based on the NWI data, there are just under 18,000 acres of wetland in the South Long Lakeshed. Wetlands cover approximately 38 percent of the Lakeshed area.

Inland open fresh water is the predominant wetland type with over 5,600 acres. **Table 4** provides an inventory of the wetlands by type for the lakeshed.

Table 4
National Wetland Inventory

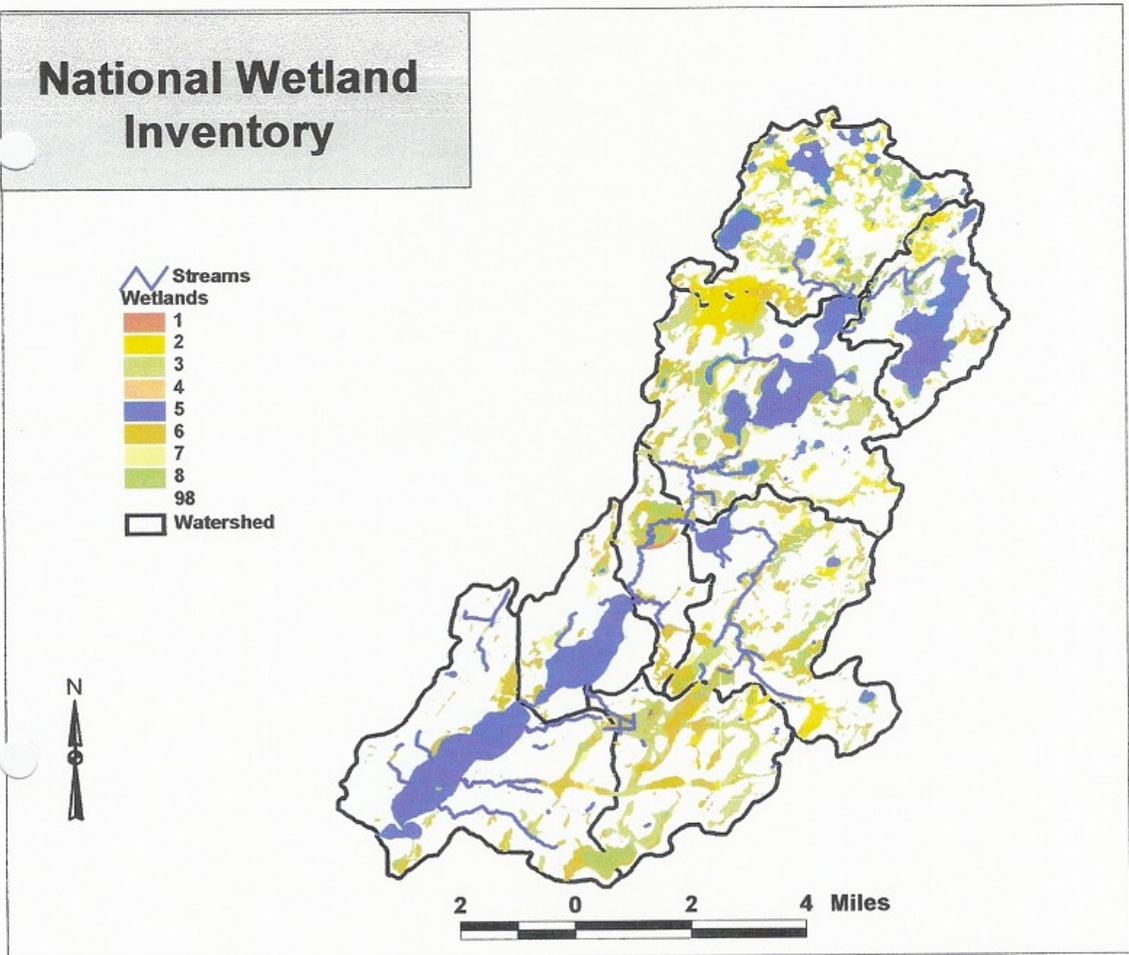
Wetland Type	Description	Acres	Percent
1	Seasonally flooded basins or flats	36	0
2	Inland fresh meadows	2,556	14
3	Inland shallow fresh marshes	3,146	18
4	Inland deep fresh marshes	27	0
5	Inland open fresh water	5,655	32
6	Shrub swamps	3,514	20
7	Wooded swamps	573	3
8	Bogs	2,271	13
80	Industrial or Municipal	0	0
90	Riverene system	0	0
	Total Wetland	17,777	100

Source: LMIC.

Floodplains

As noted in the 2002 Crow Wing County Water Plan, flooding is not a significant impact within the County due to the topography of floodplain areas and corresponding drainage patterns. The biggest impacts from flooding occur in more localized areas and tend to impact township and county roads and culverts. At present, the County does not have detailed floodplain maps nor has it organized inventories of culverts and drainage facilities within each watershed. Local groups and citizens can help townships and counties collect data on stormwater drainage facilities.

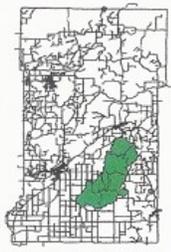
Insert Figure 5 - NWI Inventory



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Watershed Location in
Crow Wing County

National Wetland Inventory
Source:
DNR Lakes, Streams,
LMIC Wetlands

UPPER SOUTH LONG LAKE MANAGEMENT PLAN 2002
CROW WING COUNTY, MINNESOTA

Groundwater Resources

Surficial Aquifers

Surficial aquifers provide the dominant source of potable water supplies for Lakeshed residents and businesses. There are two types of surficial aquifers that occur in the Lakeshed. The surficial aquifers along the outwash plain that follows the Nokasippi River in the center of the lakeshed have substantial groundwater reserves with up to 500 gallons per minute of sustained yield according to the Minnesota Geologic Survey (MGS). To the northwest and southeast of the river corridor are glacial deposits from the Rainy Lobe. Aquifers in the glacial till found in these areas generally produce low sustained yields, often less than 5 gallons per minutes.

Based on information from the Crow Wing County Water Plan, there are no groundwater observation wells in the Lakeshed. The observation well program is administered cooperatively between the MN DNR and the soil and water conservation district to monitor groundwater levels.

Bedrock Aquifers

The bedrock aquifer in the South Long Lakeshed is the Proterozoic aquifer. The aquifer typically produces low yields of groundwater, but it is generally of good quality. There has been limited investigative work to determine the depth to bedrock in the Lakeshed. The Nokasippi Resort had a new well drilled in two years ago. The depth to bedrock was 86 feet for that well. It should be noted that few wells in the Lakeshed use bedrock aquifers for water supply.

Sensitivity to Groundwater Pollution

In 1989, the Minnesota Pollution Control Agency (MPCA) in conjunction with other state agencies, published the Groundwater Contamination Susceptibility Map. The map ranks all areas in the state for the potential for groundwater contamination based on geologic materials that restrict the downward migration of contaminants into groundwater. Five different rankings are used to assign the susceptibility potential from lowest to moderate to highest susceptibility.

Based on this map, the Nokasippi River corridor that follows the outwash plains are ranked in the highest category for potential groundwater contamination. The areas to the northwest or southeast sides of the river corridor were ranked in the second lowest susceptibility category.

Typically rivers, streams, and lakes provide some of the greatest interconnections between surface water and groundwater resources. Since a majority of the residences and businesses in the Lakeshed and Crow Wing County draw drinking water from groundwater sources, what happens across the Lakeshed and that drains into the surface water features can then more quickly migrate into the aquifers.

As a part of the state's groundwater monitoring program (MPCA – GW MAP), a total of 3 wells in the Lakeshed were monitored in the early to mid 1990s for pollutants. None of the samples tested from these wells indicated any volatile organic compounds.

Nitrate Probability Mapping

In July 2002, the Minnesota Department of Health (MDH) completed a study on probability of nitrates levels in ground water drinking supplies in Crow Wing County. An area of highest probability was found in the Lakeshed on the northwest side of Upper South Long Lake (see **Figure 6**). The cause of this high probability is not entirely understood at this time. The other areas in the Lakeshed are in the lowest probability rating. The study was developed to help local and state water quality planning efforts by identifying areas in the County having higher nitrate levels in groundwater drinking supplies.

Nitrate is a common, naturally occurring chemical that is found in the air, soil, water, and plants. The levels of nitrate in Minnesota's groundwater are usually quite low, less than 1 milligram per liter (mg/l). Where sources of nitrate are concentrated near the ground surface, nitrate may seep down and contaminate groundwater.

From a public health standpoint, elevated nitrate levels above 10 mg/l can cause a condition known as "blue baby" syndrome or infantile methemoglobinemia in infants under 6 months in age. Bacteria which are present in an infant's digestive system can convert nitrate into nitrite, a chemical which can interfere with the ability of an infant's blood to carry oxygen. If levels are high enough and medical attention is not received, death can result. Pregnant women and people with certain blood disorders may also be susceptible to nitrite induced illnesses. Beyond nitrate concerns noted above, public health officials have noted that nitrate contamination of a well is often regarded as a first sign of deteriorating groundwater quality.

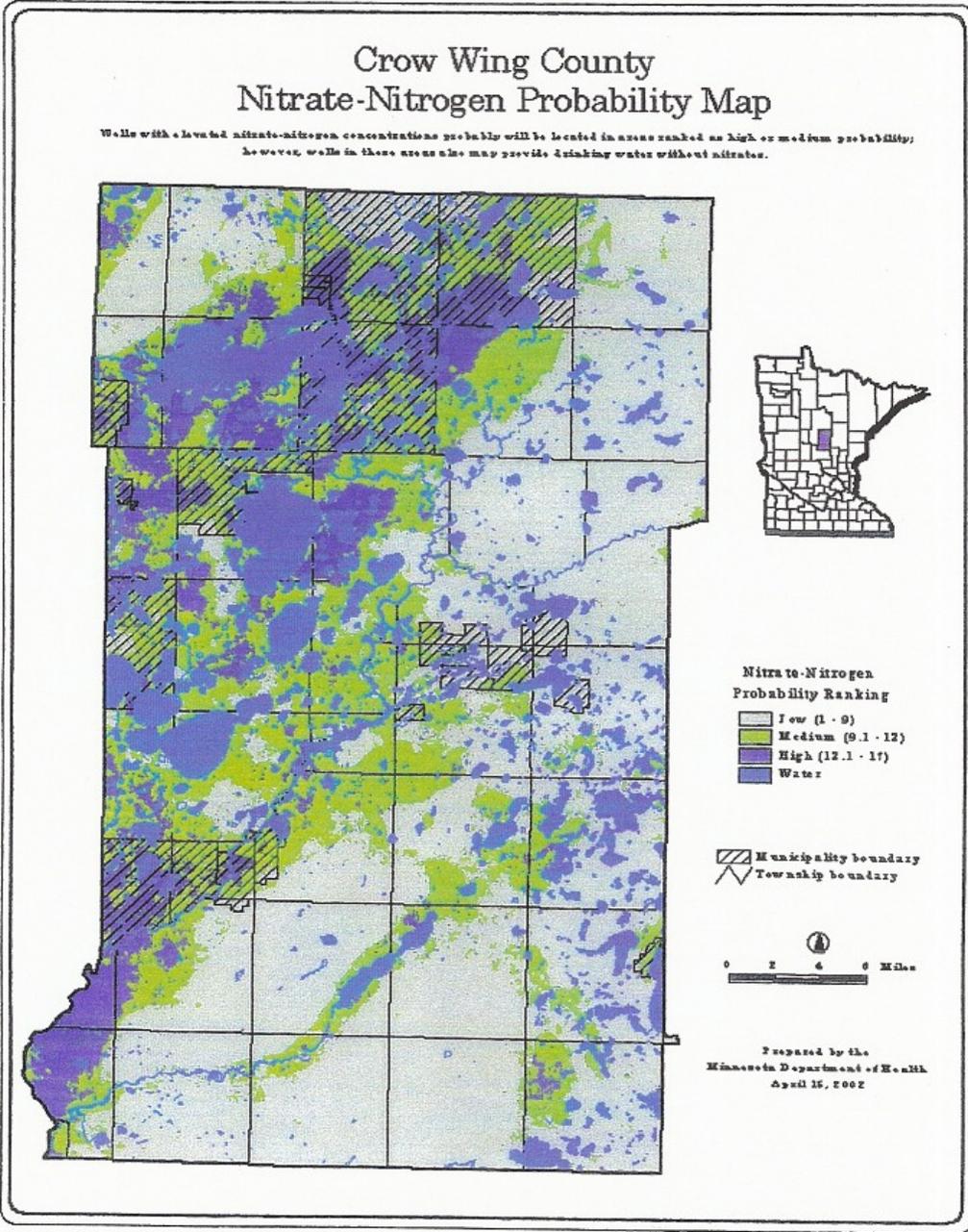
The probability ratings were mapped for the County in a geographic information system (GIS) format using data describing the physical attributes of the geologic setting or geomorphology. Ratings were based on nitrogen inputs, aquifer sensitivity and geochemical analysis.

Probability mapping is a first step towards developing strategies to protect drinking water supplies. The nitrate study includes several recommendations on applications of the probability mapping study. They include 1) setting priority areas for community and nontransient noncommunity systems for wellhead protection, 2) identify areas where potential sources of nitrogen should be more closely managed, 3) identify areas that may be susceptible to other contaminants, 4) target educational programs to landowners and citizens, and 5) select wells for further monitoring groundwater quality. Citizens in conjunction with local, county and state organizations should consider these recommendations as starting points to address groundwater quality concerns.

Insert Figure 6 – Nitrate Probability Map

05/01/03

Volume 1: Section 3 – Resource Inventory



Section 4

Lake Water Quality Assessment

Section 4 provides an assessment of water quality in Upper South Long Lake and the factors and activities that are affecting the lake. The intent of this section is to provide a general scientific foundation for the development of the goals and objectives to be developed in the “Where are we going?” portion of the plan (Volume 2).

4. Phosphorus: Transported from the Lakeshed Into Our Lakes

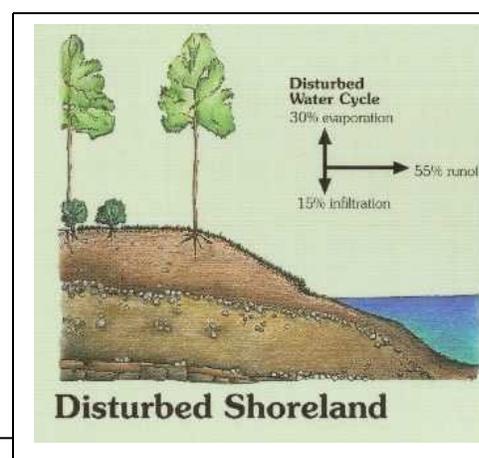
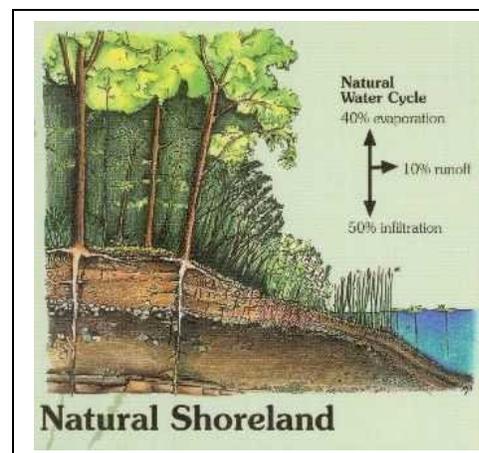
In order to flourish, all living plants require a variety of nutrients including phosphorus. Although phosphorus is naturally scarce, human activities tend to result in increased amounts of phosphorus flowing into our lakes and streams.

Increased levels of phosphorus can result in heavy algae blooms and excess plant growth which can ruin not only weekend recreational activities like swimming and water skiing but can cause long lasting negative effects on fisheries and wildlife. Weed tangled boat propellers and fishing hooks can be signs of potential lake **water quality** problems.

Fertilizers for lawns and crops to enhance their growth are primary sources for increased phosphorus transport. In addition, human and animal wastes both contain substantial amounts of phosphorus, and if not properly treated, can result in significant increases in phosphorus levels in nearby lakes and streams.

Increased phosphorus transport is also a **water quantity** problem. While rain tends to soak into the ground where forests and natural vegetation exist, more than **two to three** times as much rain can run off from cropland, lawns, roads, and developed areas. The more rain that runs off the land, the greater the chance that phosphorus will be transported into a lake or stream. The two diagrams shown to the right illustrate the significant increase in stormwater runoff that has typically occurred with land development.

Human activities over the past 100 years have greatly increased the amount of stormwater runoff



and reduced the quality of runoff flowing into the receiving waters – our lakes and streams.

Other long-term impacts on lakes from increased phosphorus transport can occur as well. The settling of phosphorus-laden particles removes it from the water and stores it in the bottom sediments of the lake. When there is enough oxygen in the water that comes in contact with the bottom sediment, the phosphorus remains in the sediment. But when oxygen levels drop in the water near the sediments, chemical reactions can free phosphorus to become available for more plant growth and can cause nuisance levels of plant growth. Minimizing disturbances to lake bottom sediments becomes yet another management concern for lake associations and resource managers.

In 1998, the lake assessment study prepared by the MPCA in collaboration with the USLLIA found that Upper South Long Lake has quite high levels of phosphorus located beneath the thermocline layer in the lake where oxygen levels were measured to be low. If strong winds were to occur, that could upset the summer thermocline and the lake would experience an algae bloom of memorable proportions for the rest of the summer.

The impacts of phosphorus on water quality are slowly becoming more understood by both the general public and government officials. The removal of phosphates from detergents is one example. Another is the ban of phosphorus from fertilizers in the Twin Cities Metropolitan Area. While these examples reflect positive steps, many more efforts are needed to protect and improve lake water quality. One of the best places to make positive improvements to lake water quality is in our own back yards.

B. Historical Land Cover Analysis

“Land cover” is another way of talking about the kinds of plants growing on the land or that have been removed for roads, buildings, cropland or feedlots. Land cover changes over time as trees grow and are then cut down for lumber, a new farm field, or when new development is constructed. Knowing the land cover changes over time in a given watershed is important to understanding the health of a lake or river because it is the land cover that affects the proportion of rainfall that either sinks into the ground or runs off into receiving waters carrying phosphorus and other nutrients.

Land Cover Inventories and Comparisons

At this time, the best picture that we have to describe historical land use changes comes from two sets of state land cover data. The first is the Marshner presettlement vegetation inventory. This inventory is based on surveyor notes dating back over 100 years. The second is the 1995 land cover inventory developed by the state’s Land Information Management Center (the most current available land cover data).

This analysis technique provides a general comparison of the two land cover inventories and begins to quantify changes in land use that have occurred in the Lakeshed since the times of presettlement. Further, it initiates the process of determining what impacts these

changes have made on water resources in the Lakeshed. **Table 5** below provides a historical land cover comparison for the Lakeshed based on acres and percentages:

Table 5
Historical Comparison of Land Cover Inventories

Land Cover Description	Presettlement		1995	
	Acres	Percent	Acres	Percent
Urban development	0	0.0	0	0.0
Rural development (residential, comm.)	0	0.0	648	1.4
Cultivated land	0	0.0	1,506	3.2
Hay/pasture/grassland/prairie	676	1.4	10,283	21.9
Forestland	24,786	52.9	19,782	42.4
Water	4,433	9.5	5,498	11.7
Bog/marsh/fen	16,956	36.2	9,095	19.4
Mining	0	0.0	43	0.0
Unclassified	4	0.0	0	0.0
Total	46,855	100.0	46,855	100.0

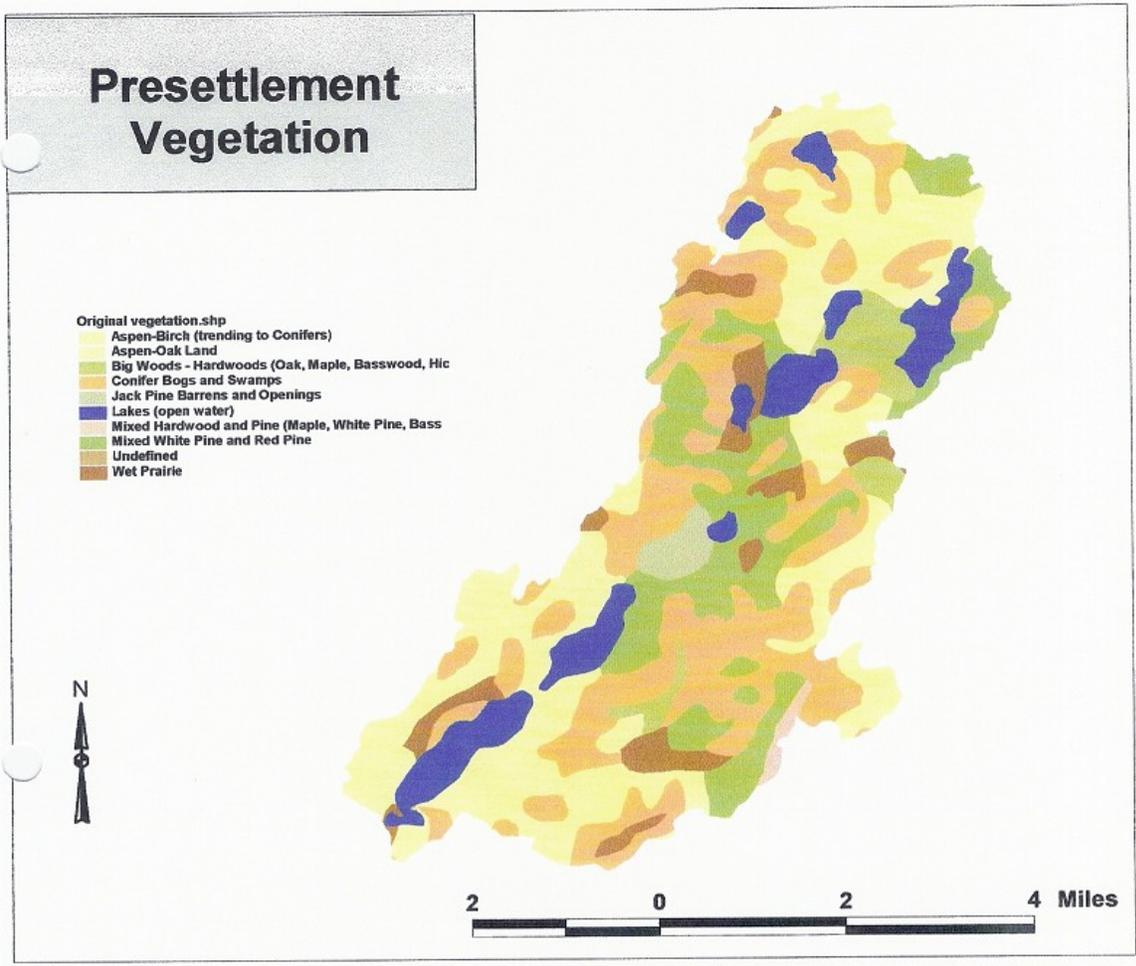
Source: LMIC.

What do these historical changes in land use mean to water quality? In presettlement times, forestland and wetlands provided extensive vegetative cover that held phosphorus and soil particles on the land and out of our lakes and streams. Based on research by water resource agencies, runoff rates from precipitation events would be as low as 10 percent, with most of the stormwater infiltrating into the ground or evaporating.

As shown on **Table 5**, there has been a decrease in the amount of forestland and wetlands in the Lakeshed. Although the landscape is not intensively farmed or under urban development, the changes in land cover have made some definite impacts on water quality in Upper South Long Lake because runoff that carries phosphorus has been slowly increasing with the increases in population and development that have occurred in the Lakeshed. A more detailed discussion of the land use impacts on water quality is provided later in this section.

Figures 7 and **8** illustrate the land cover conditions for Presettlement and 1995 timeframes for the Lakeshed.

Insert Figure 7 - Presettlement Land Cover



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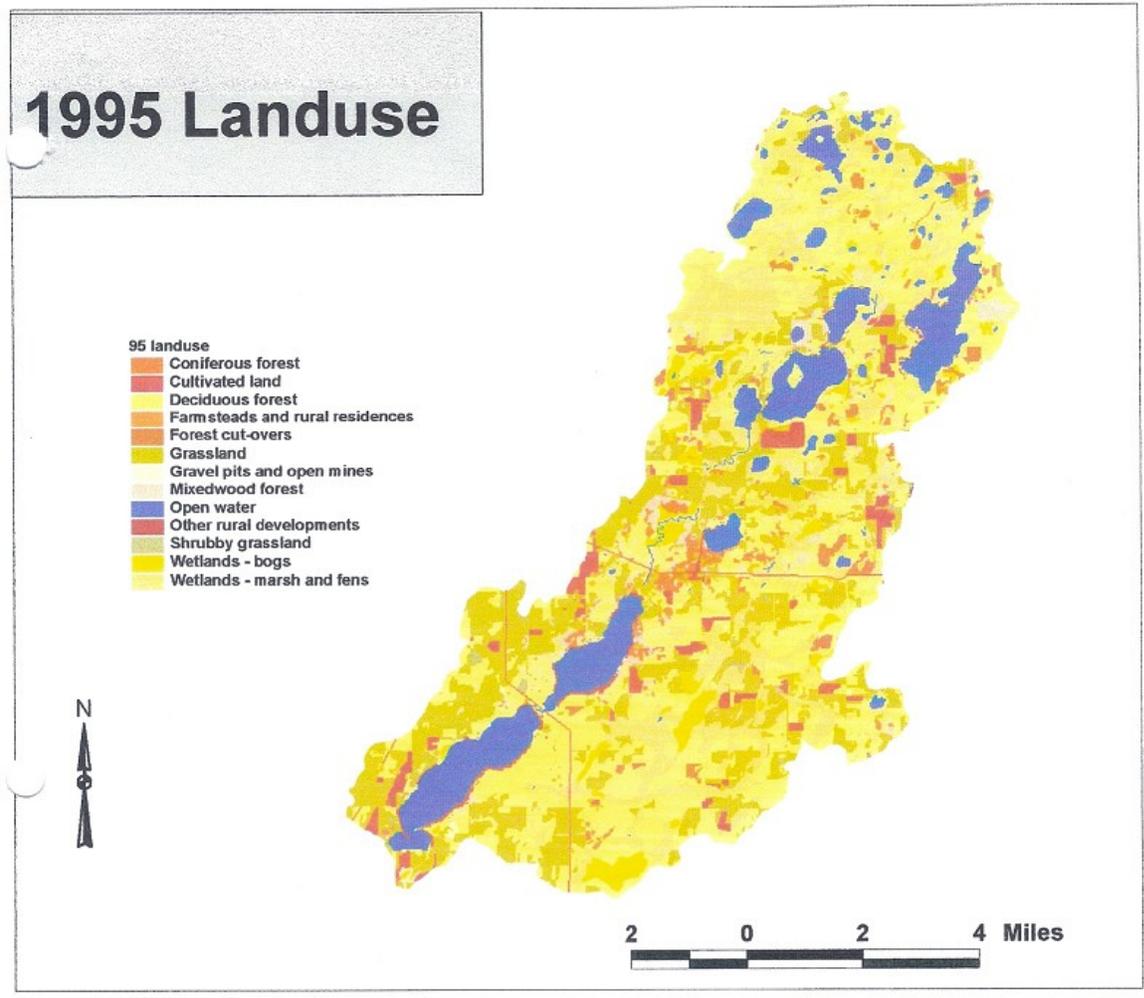
Ekola & Associates, LLC
Melrose, Minnesota
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Watershed Location in
Crow Wing County

Presettlement Vegetation
Source: LMIC

UPPER SOUTH LONG LAKE MANAGEMENT PLAN 2002
CROW WING COUNTY, MINNESOTA

Insert Figure 8 - 1995 Land Cover



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1995 Landuse Map

Source:
LMIC 95 Landuse

Watershed Location in
Crow Wing County

UPPER SOUTH LONG LAKE MANAGEMENT PLAN 2002
CROW WING COUNTY, MINNESOTA

Land Use and Development

Shoreland Development Trends

While phosphorus is relatively uncommon in nature, as people have developed shoreline areas, it has resulted in increased phosphorus going into the lake. According to records from the MN DNR, there were approximately 50 residences around Upper South Long Lake in 1941. By 1984, there were 170 residences and it increased to 194 in 1998. Somewhat more lakeshore development has occurred around Lower South Long Lake over this timeframe in comparison to Upper South Long Lake.

As a part of the research and data gathering effort for the plan, copies of all subdivision plats surrounding the Upper South Long Lake were obtained from the County Surveyor's Office. A total of 16 subdivision plats have been recorded to divide lakeshore properties with the most recent recording occurring in 2002 for a 3-lot plat. Essentially all of the shoreland has been divided either by subdivision plat or metes and bounds description. The lot widths vary from 50' to 250' with depths from 200' to 750'. The older plats, primarily developed in the late 1930s and 1940s, contain the smaller lots.

Public roads typically separate the lakeshore lots from the larger undeveloped tracts. In most areas around the lake, larger tracts still remain in the second or third tier of properties behind the lake lots in most places. The potential for further development exists in these second and third tier areas.

The Planning Committee believes that it will be necessary to make sure that new development in the second and third tier areas as well as throughout the Lakeshed be done according to the appropriate land use controls and best management practices in order to control or minimize phosphorus transport.

Non-Shoreland Development Trends

Outside the developed shoreland areas within the Lakeshed, the vast majority of the land is under vegetative cover in the form of forestland, brushland, wetlands, or grasslands. Only five percent of the Lakeshed is developed or under cultivation. From a water quality perspective, the current land cover patterns reflect an ecosystem that is more conducive to better water quality with less phosphorus runoff than the more intensively developed watersheds such as those closer to Brainerd/Baxter area or the more intensively farmed areas to the south in Crow Wing and Morrison counties.

Septic Systems

It is important to lake water quality that wastewater treatment systems be designed, constructed, and maintained properly. For example, it is crucial that there be a 3-foot thick bed of unsaturated soil between the bottom of pipes in a septic drain field and the underlying water table. Otherwise phosphorus can enter into the water table and leach into the lake. Human waste contains a substantial amount of phosphorus.

There are approximately 200 residential dwellings on properties located around the Upper South Long Lake. Each dwelling has its own septic system. There are no shared or common systems in the Upper Lake neighborhoods at the present time.

As a part of the lake assessment study developed by the MPCA, a survey was distributed to the lakeshore residents regarding septic systems. The objective was to find out whether there was a widespread problem with phosphorus coming from septic systems into the lake.

From the 194 residences of Upper South Long Lake, a total of 104 completed surveys were returned. Of the 104 residents who completed the survey, 95 had a sealed septic tank and drainfield. Of these, the majority of systems (80) were less than 20 years old and may have followed required standards. For the remaining residents, 13 of the septic systems had been installed prior to 1978 and 11 residents did not know when their system was put in. Very few systems (16) were noted as being less than 100 feet from the lake. Seasonal residents account for 43 of the homes on the lake. While 17 residents did not answer the question, a total of 50 residents claimed they had their septic system pumped at least every 3 years.

Although the septic system survey provided some useful information, it is not clear how effective these systems are at keeping phosphorus out of the lake, the age of the systems, or their compliance with the current county and state regulations. On a positive note it was good to see the relatively high number of residents who have indicated that they have pumped their system at least every 3 years.

Over the life of this lake management plan, there are many actions that the lake association can take to encourage the proper operation of septic systems. Some of the management options include education to landowners on proper maintenance, assist the County in enforcing its regulations, inventory all system, audit the County records on all septic systems for dates of construction and compliance, support a periodic pumping program for all systems, etc.

Crow Wing County requires mandatory compliance inspections of existing systems under the following situations:

1. Upon application for Zoning permit and Certificate of Compliance is more than five years old or the Compliance Inspection is more than three years old.
2. Within 90 days of a Certificate of Real Estate Value or Warranty Deed or Trust being filed with a property dependent on an onsite septic system and the Certificate of Compliance is more than five years old or the Compliance Inspection is more than three years old.
3. Any time the Planning and Zoning Department deems appropriate.
4. For any addition to a residence on the property or variance request to an existing septic system.
5. For necessary disclosures.

Feedlots

Animal waste contains a substantial amount of phosphorus. Feedlots are defined by the County as a lot or building or combination of lots and buildings intended for the confined feeding, breeding, raising, or holding of animals and specifically designed as a confinement area in which manure may accumulate. Poorly designed or operated feedlots can allow large amounts of phosphorus to runoff with rain into lakes and streams. Pastures where vegetative cover can be maintained are not included in this definition but can also contribute significant amounts of phosphorus.

As documented in the County Water Plan there are there are 175 feedlots in Crow Wing County. In addition, there 109 operations that do not meet the criteria of feedlots since they have less than 50 animal units and these operations are not required to register with the County.

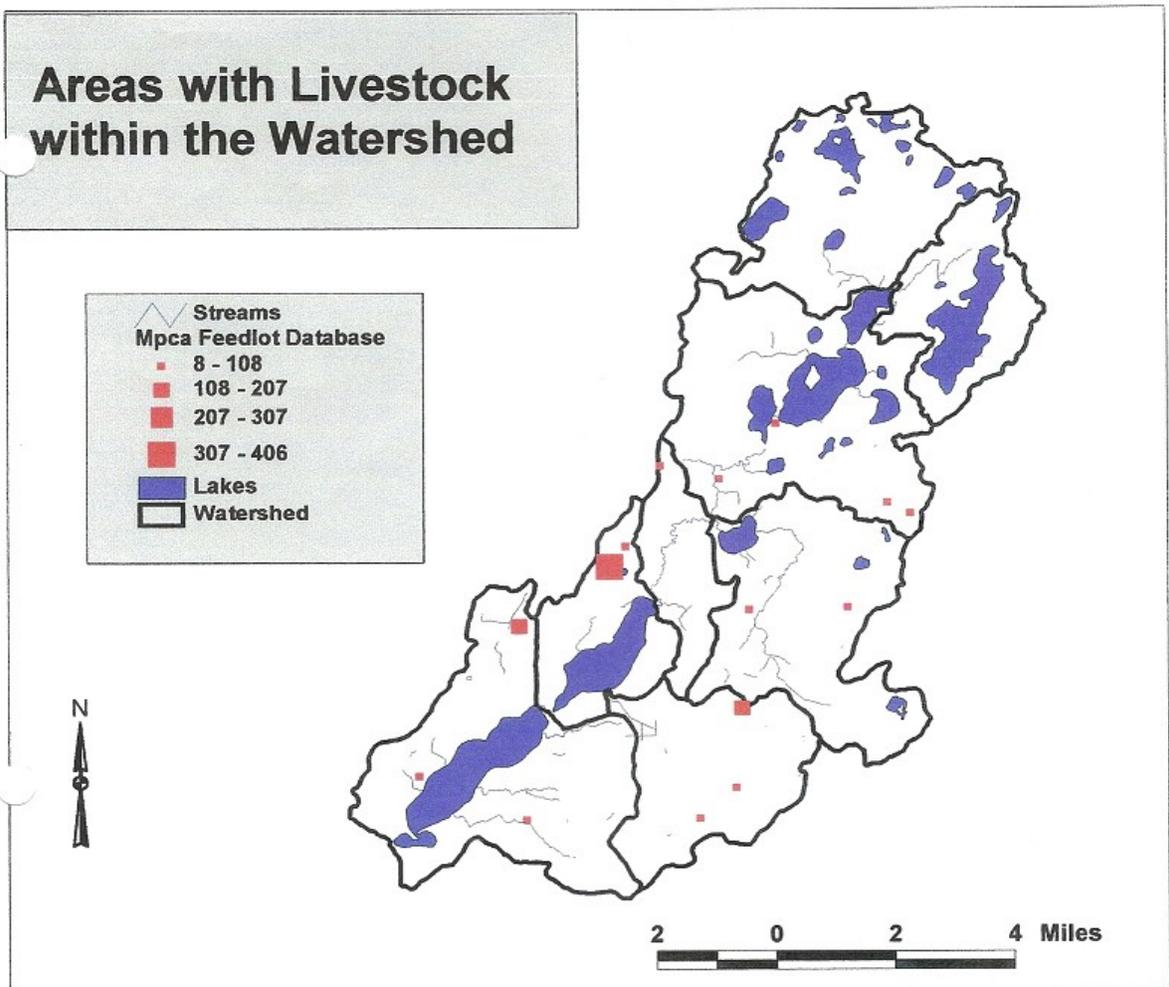
Within the Lakeshed, there are 15 feedlots. The Crow Wing County water plan coordinator provided mapping data for all documented feedlots in the Lakeshed ranging in size from 0 to 406 animal units (see **Figure 9**). The largest feedlot is located northwest of Upper South Long Lake. This feedlot is located at the north end of a wetland complex that eventually drains into Upper South Long Lake via a small stream that flows under Silver Creek Road.

In 2000, the USLLIA measured some elevated phosphorus levels in this stream during spring runoff and following July rainstorms. The wetland complex is likely helping to trap soil particles that may carry phosphorus from the feedlot.

There are several activities that the lake association and its citizens could take in the simultaneous support of agricultural operations and protection of water quality. The association could support and/or organize a tour of the feedlots in the Lakeshed and meet with operators to better understand their concerns. Supporting education and incentive programs may be other approaches. It should be noted that feedlot operations are in a constant state of flux or change due ongoing operation changes with each feedlot. Assisting the County in the inventory efforts could be yet another approach.

In summary, feedlots in the Lakeshed tend to be small in size or scale. Most of the feedlots are located away from the larger lakes and watercourses. The County Water Plan and SWCD staff members are currently working with feedlot operators in the Lakeshed in a prioritized fashion to help minimize impacts from feedlot runoff. The lake association could contact the Crow Wing SWCD staff and invite them to a board meeting or to make a presentation of their work at an annual meeting to help association members and area landowners better understand these issues.

Insert Figure 9 - Feedlot Map



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Watershed Location in
Crow Wing County

Livestock Map
Source:
CFO Database 2002
DNR Lakes & Streams

UPPER SOUTH LONG LAKE MANAGEMENT PLAN 2002
CROW WING COUNTY, MINNESOTA

Land Use Planning and Management

County Comprehensive Plan

The current County comprehensive plan was prepared in 1994. Although it did not include a land use plan or map of the proposed future land uses in the County, the plan did provide some policy framework for guiding land use and development. The plan's overall concept was focused around sustainable development.

With residential development being one of the major building blocks from a land use perspective in the County, the plan set in motion a general strategy to encourage the clustering of residential development in ways so as to protect valuable open space and amenities. Unfortunately, areas for clustering development were not delineated.

The County is beginning to rebuild its comprehensive plan at the time this plan was being prepared. The lake association and the citizens of the Lakeshed have an opportunity to enlist the County's resources and attention to prepare an agreed upon land use plan for the Lakeshed. The lake association could consider taking an active role in the County's comprehensive planning process as a means to further implement the goals and objectives established in this lake management plan. The USLLIA could identify one or more people to serve as liaisons to the County Planning & Zoning Office to encourage the delineation of areas for cluster development, the use of best management practices for new development, and to monitor decisions made by the County in our Lakeshed to ensure they follow the comprehensive plan.

Zoning Requirements

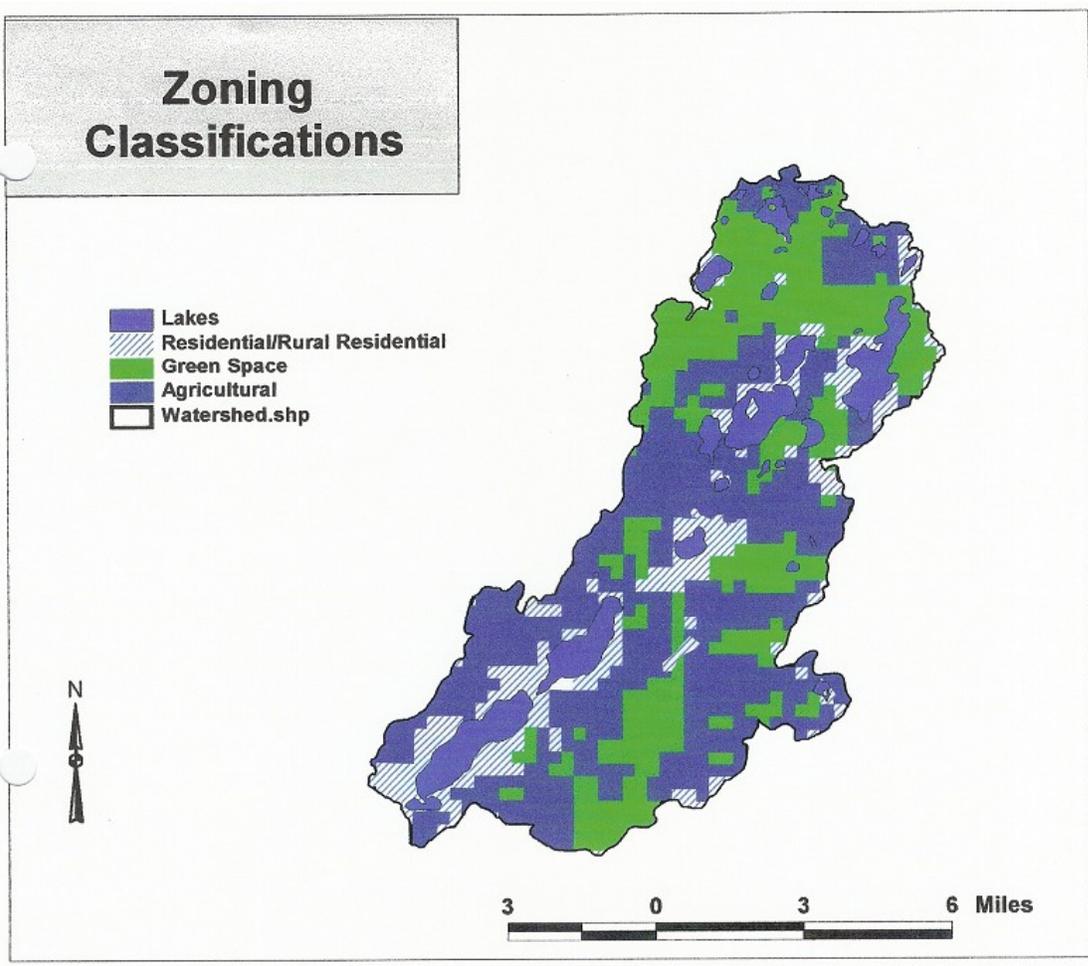
The County Zoning Ordinance includes 15 underlying zoning districts, some of which appear to have been conceptualized with the 1970 Comprehensive Plan. Properties within the Lakeshed are zoned into one of four of these zoning districts including the following: Residential (R), Rural Residential (RR), Agricultural (A), and Green Space (G). **Figure 10** illustrates the zoning patterns in the Lakeshed and surrounding area. **Table 6** summarizes the general zoning district development standards for these four districts.

Table 6
Zoning Development Standards

	Minimum Lot Width	Minimum Lot Depth	Minimum Lot Area	Maximum Building Coverage
Residential (R)	100 feet	None	20,000 sq ft	30%
Rural Residential (RR)	165 feet	None	2-1/2 acres	15%
Agricultural (A)	330 feet	None	15 acres	20%
Green Space (GS)	165 feet	None	2-1/2 acres	15%

Source: Crow Wing County

Insert Figure 10 - Zoning Map



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Watershed Location in
Crow Wing County

Zoning Classifications

Source:
*Note zoning theme is Approximate.
Information taken from 40
acre parcel database
and Crow Wing County
Zoning Map.
DNR Lakes

**UPPER SOUTH LONG LAKE MANAGEMENT PLAN 2002
CROW WING COUNTY, MINNESOTA**

Table 7 provides an inventory of the acres of the property by zoning district in the Lakeshed.

**Table 7
Lakeshed Zoning Inventory**

Zoning Classification	Acres	Percent
Agricultural	22,214	47
Greenspace	14,973	32
Residential or Rural Residential	4,361	9
Lakes (open water)	5,306	11
Total	46,855	100

Source: Crow Wing County

The Crow Wing County Zoning Ordinance also includes shoreland management standards. The County adopted its initial shoreland regulations in 1972. Upper South Long Lake is classified as a General Development lake (the LAP study noted the lake was classified as “recreational” shoreland zoning which lead to some confusion at the visioning session).

Section 5.410 of the Zoning Ordinance prescribes lot size and setback requirements in shoreland areas adjacent to general development lakes such as Upper South Long Lake. **Table 8** shown below summarizes these requirements. The provisions in the top half of this table under the “Unsewered Lakes” category, apply to properties around Upper South Long Lake since the area is not served by public sewer.

**Table 8
Zoning Standards for Shoreland Properties around General
Development Lakes**

	Riparian Area	Lots Width	Nonriparian Area	Lots Width
Unsewered Lakes				
Single	20,000	100	40,000	150
Duplex	40,000	180	80,000	265
Triplex	60,000	260	120,000	375
Quad	80,000	340	160,000	490
Sewered Lakes – (if the Upper South Long Lake are were to have public sewer):				
Single	15,000	75	10,000	75
Duplex	26,000	135	17,500	135
Triplex	38,000	195	25,000	190
Quad	49,000	255	32,500	245

Source: Crow Wing County

Future Build-Out Scenario

If future development were to occur at what the County's Zoning Ordinance currently allows, the amount of "build out" and its concurrent impacts on water quality would be staggering. Applying the minimum lot sizes (20,000 square feet to 2.5 acres) to the 4,300 acres of land in the R or RR zoned areas, would equate to hundreds and perhaps thousands of lots or building sites in these two districts alone.

Obviously, a future build out scenario of this magnitude will not happen in any given likelihood. But a good share of it might happen over a longer timeframe, for example by the year 2050.

The future build-out scenario is a way to measure how effective the County's land use regulations really are. In reality, the existing land use regulatory framework only minimally guides land use and development. Most often, land development results in a very scattered and haphazard pattern or unplanned manner because the land use plan is not specific enough. Furthermore, protection of the water resources receives limited attention as the land development process occurs in this incremental fashion.

Zoning ordinances should guide land use and development in ways that reflect the vision and policies established in a comprehensive plan. Typically, comprehensive plans and zoning ordinances seek to encourage wise use of land. In addition, most land use ordinances or controls promote the protection of water quality but miss the opportunity to do so in their most important function, through the guidance of land use and development.

From a citizen or landowner perspective, the current Crow Wing County Zoning Ordinance and permitting process is cumbersome and confusing to the public. Further, many people commented on their doubts as to the adequacy or consistency of enforcement procedures. This sentiment was reflected in comments made by citizens participating in the Visioning Session.

Rebuilding the comprehensive plan and overhauling the Zoning Ordinance from a watershed perspective may provide the County with both environmentally friendly and publicly acceptable results. In an area where lakes and rivers are a key part of creating jobs and income, the land use plan should certainly protect our highly valuable waters. The lake association and its members may want to consider getting more active in promoting these perspectives with the County.

C. In-Lake Conditions

Five major efforts have been developed to analyze the conditions of water quality in Upper South Long Lake including the following:

- Citizen Lake Monitoring Program (MPCA).
- Lake Assessment Program (MPCA).
- Stream monitoring (USLLIA).
- Lake level monitoring (MN DNR).
- Lake water sampling program (Crow Wing County Outdoor Corps).

Typically, these efforts are the result of a partnership by lakeshore property owners and state agencies including the MPCA and MN DNR and the Outdoor Corps program. The following provides a summary of these water quality/quantity monitoring efforts.

Citizen Lake Monitoring Program (CLMP)

The Citizen Lake Monitoring Program (CLMP) is a cooperative program combining volunteer efforts of citizens and technical resources from the Minnesota Pollution Control Agency (MPCA) to collect water-quality data on their lakes. The program greatly multiplies water-quality sampling capabilities, while volunteers learn about the water quality of lakes in their region as well as the causes and effects of lake pollution.

CLMP volunteers collect water transparency data using an 8-inch, circular, all-white metal plate attached to a calibrated rope. This tool is called a Secchi disk. About once a week during the summer, volunteers boat to a designated spot on their lakes to collect transparency readings. The volunteer lowers the disk into the water until it is no longer visible and notes that depth from the markings on the rope. The disk is then lowered a little further and then raised back up until it is just visible. This second depth reading is averaged with the first, and the final number is recorded on a data sheet. At least eight to ten readings per season are taken to define each summer's water quality. At the end of summer, volunteers send their data sheets to the MPCA to be compiled with other water-quality data. In 2001, two volunteers from Upper South Long Lake (Herb Nelson and John Rolfs) collected water quality data for the lake at three sites. **Table 9** provides the results from the monitoring data.

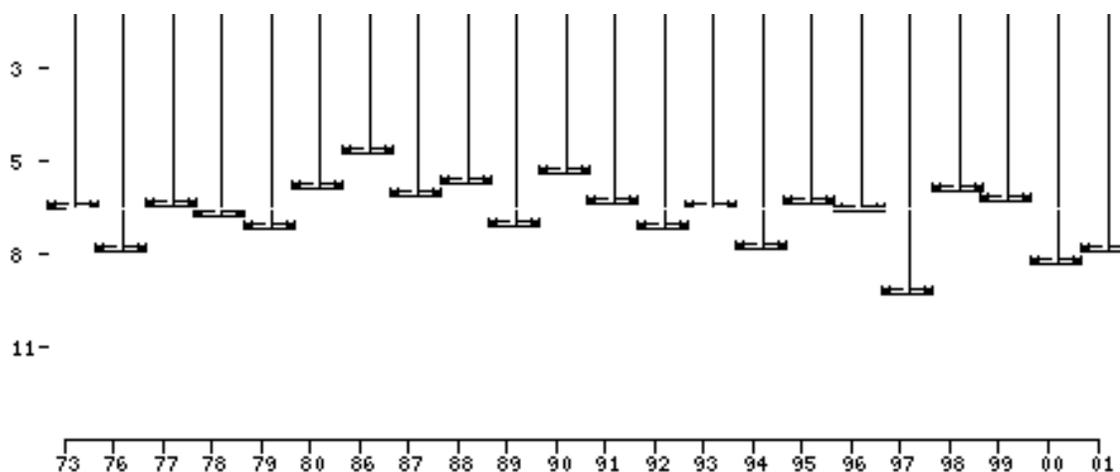
Table 9
Secchi Disk Monitoring in Upper South Long Lake

Site	# of Readings	Mean (in feet)	Minimum (in feet)	Maximum (in feet)	Volunteer
202	9	6.2	4.5	10.5	Herb Nelson
204	9	8.2	6.5	11.0	Herb Nelson
205	10	9.3	7.0	14.0	John Rolfs

Source: MPCA.

Historical data on Secchi disk data have been compiled for both lakes. Based on an analysis of 25 years of this data, the MPCA reported that a long-term trend of stable to slightly improving water quality is evident. As noted by the MPCA, summer mean Secchi transparency measures ranged from 4 to 9.9 feet from the 1970s to 1998. **Figure 11** graphs the Secchi disk readings as shown on the MPCA web site.

Figure 11
Secchi Disk Readings



Source: MPCA

Lake Assessment Program - MPCA

The Lake Assessment Program (LAP) was developed by the MPCA to assist lake associations and local governments in the collection and analysis of baseline water quality data in order to assess the trophic status of their lakes. The general approach taken in a LAP study includes lake association participation in the CLMP, a cooperative examination of land use and drainage patterns in the watershed, and an assessment of water quality data by MPCA staff.

One way of assessing and categorizing lake water quality is based on fertility of a lake. Trophic State Index, or TSI, is a standard measure or means for calculating the fertility or productivity of a lake. The index uses a scale from 1 to 100, where 100 represents the most nutrient rich (eutrophic) lakes and 1 represents the most nutrient poor (oligotrophic) lakes. The middle range of the scale, about 30 to 60, coincides with mesotrophic lakes. The majority of lakes in Crow Wing County are classified as mesotrophic.

TSI uses three measurements combined together to get an average value. The three measurements are: Transparency or Secchi Disk reading (water clarity), the amount of Total Phosphorus (a major contributing nutrient), and Chlorophyll A (a measure of the amount of algae in the water). An important relationship exists between these three parameters:

“Increased phosphorus = increased chlorophyll = decreased secchi disk.”

TSI is based on the interrelationships of these measurements or parameters. If the index values agree fairly well for a lake, it may be safe to assume that given data for one of the parameters, e.g., Secchi transparency, one should be able to estimate the others and ultimately, be able to track changes in trophic status over time. Using the numeric results from TSI, it is possible to categorize lakes within a watershed or region (oligotrophic, mesotrophic, eutrophic, and hypereutrophic). **Table 10** illustrates the TSI range, lake type by trophic status, general characteristics and representative lakes for each type.

Table 10
TSI Lake Types

TSI Range	Trophic Status	Characteristics	Representative Lakes
0-40	Oligotrophic	Clean lake.	Clearwater
41-50	Mesotrophic	Temporary algae & aquatic plant problems.	Gull
50-70	Eutrophic	Persistent algae & aquatic plant problems.	Upper South Long
Above70	Hypereutrophic	Extreme algae & aquatic plant problems.	Little Rock (Benton)

Source: MPCA LAP Study for Upper and Lower South Long Lakes

Water samples from Upper and Lower South Long Lakes were collected and analyzed by citizens and MPCA staff on five occasions during the spring and summer of 1998. Water quality data collected on Upper South Long Lake during the study revealed summer mean total phosphorus (TP) concentration of 29 ug/l, chlorophyll a of 12.4 ug/l, and Secchi disk transparency of 7.2 feet.

Water monitoring data for Upper South Long Lake and hundreds of other lakes in the state has been organized by the MPCA on the Lake Water Quality Database (www.pca.state.mn.us/water/lakequality.html#reports). The following graph and table are provided on the database for Upper South Long Lake:

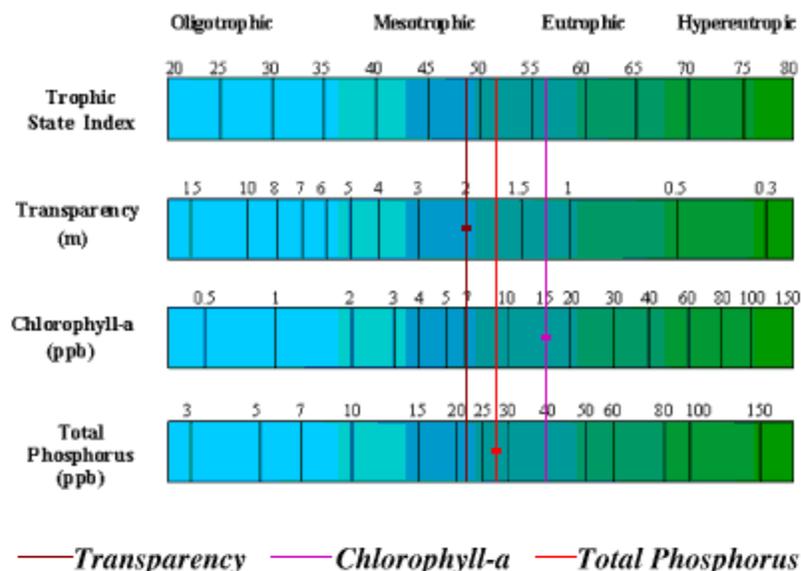


Table 11
TSI for Upper South Long Lake

Water Quality Values	TSI
Carlson's Trophic State Index – Total Phosphorus based on TP=14.42 IN (TP)+4.15:	52
Carlson's Trophic State Index – Chlorophyll A based on CHLA = 9.81 In (CHLA)+ 30.6:	57
Carlson's Trophic State Index – Secchi Disk based on SDM = 60 - 14.41 In (SDM):	49
Average of all available index values:	53
Trophic Status Alpha:	Eutrophic

Source: MPCA

The measures for Upper South Long Lake are outside the range of values for reference lakes from the region. Upper South Long Lake is in a “**Eutrophic**” condition (the Lower lake is also in a similar condition). As reported in the LAP study, the 1998 water quality in both lakes was poor compared to other lakes in the Northern Lakes and Forests (NLF) ecoregion and was in the 13 – 19th percentile. This means that over 80 percent of the lakes in the area have better water quality than Upper South Long Lake.

The elevated levels of nutrients in both Upper and Lower South Long Lake indicate that they have sources of non-point nutrients coming from the Lakeshed. The MPCA has estimated the contributions of phosphorus to the lakes as follows:

Upper South Long Lake

- Nokasippi watershed 90 percent
- Septic systems 6 percent
- Precipitation 4 percent

Lower South Long Lake

- Immediate Lakeshed 50 percent
- Upper South Long Lake outflow 40 percent
- Septic systems 6 percent
- Precipitation 4 percent

The LAP study recommended that the USLLIA prepare a lake management plan to help develop better information about the water quality situation and develop strategies to address the water resources problems.

2000 and 2001 USLLIA Monitoring Programs

During the spring and summer of 2000, the lake association conducted water sampling on the streams and tributaries that flow into Upper and Lower South Long Lakes. Ten different sampling sites were selected and sampled on 14 different dates. A total of four measurements were also sampled with two sites in each lake. The results of the 2000 monitoring program are provided in **Appendix 4**. The data has been forwarded to the MPCA for their review and consideration.

Some of the preliminary findings from the 2000 monitoring program include the following:

1. The phosphorus levels coming into the Upper Lake from the Nokasippi River and the creeks at Silver Bay, Rognaldson and Paradise Shores Roads is generally good. However, phosphorus levels can exceed desirable levels during spring runoff and in response to rainfall events over 1 inch of rain.
2. 2000 was a relatively low flow year and we are not sure how representative the collected numbers are compared to what happened in 2001, for example. The USLLIA did a reduced sampling effort in 2001 to help make a comparison. Flow measurements were taken at all four inflows and the outflow plus total phosphorus at the river inlet.
3. At the higher flows, the Nokasippi River and the creeks under Silver Bay and Rognaldson Roads move large amounts of silt into the lake. This is of concern because silt particles can carry extra phosphorus.
4. In the Upper Lake, the total phosphorus levels were very good in the main lake, but marginally poor north of the submerged island, nearest the inlet. This may indicate that the Upper Lake is actually behaving a little like two different lakes on either side of the island.

Lake Levels (MN DNR)

The ordinary high water level (OHWL) in Upper South Long Lake has been set at 1195.5 feet. The highest recorded level was 1196.23 feet on April 20, 1965. The lowest recorded level was 1192.68 on September 14, 1998. The overall range of lake levels is 3.55 feet.

2002 Crow Wing County Outdoor Corps Water Sampling

The USLLIA contracted with the Crow Wing County Outdoor Corps to sample water quality parameters in Upper South Long Lake during 2002. Water quality indicators were monitored monthly in these lakes from May through October 2002. These indicators included chlorophyll-a concentrations, total phosphorus levels, light transparency, dissolved oxygen, and temperature profiles for the lake.

Water samples and lake profiles were collected from Upper South Long Lake on five days over the summer with the final sample date delayed until early October in order to assure that the water in the lake had mixed during the “fall turnover”. Water samples were collected in the lake at its deepest point.

All water samples collected from Upper South Long Lake throughout the summer of 2002 yielded an average trophic status index (TSI) value of 52.1. This compares with an overall average TSI value of 48.5 determined from samples collected from Upper South Long Lake during summer 2001. It should be noted, however, that the 2001 data did not include samples taken during the month of August. When August samples are eliminated from the 2002 data (and the 2002 samples now comparable with the 2001 samples) the resulting average TSI value becomes 51.5.

Water quality values did not show great fluctuations during the summer, but did vary seasonally around the average TSI value. Most May and June measures of water quality fell below the trophic status of 50, while July, August, and October samples all were greater than 50, some at or above a TSI value of 60. No samples taken at any point during the summer fell below a TSI value of 40.

On average, 2002 water quality parameters measured in Upper South Long Lake showed slight decreases in water quality parameters from 2001 water quality measurements, even when August data was excluded from the 2002 data set. It should be noted, however, that these decreases were not significant and may be explained by a variety of factors our sampling did not address (e.g., precipitation).

The average total phosphorus concentrations for Upper South Long Lake (0.053 mg/l) fell just below the 75th percentile for dimictic lakes within the north central hardwood forest region of Minnesota, which includes Crow Wing, Cass, Aitkin, portions of Morrison, and a number of other counties (Heiskary and Wilson, 1988). This means that Upper South Long Lake ranks among the bottom 25 percent of lakes within this region of the state in terms of water quality. Put another way, three out of four lakes in our region have better water quality (as determined by total phosphorus levels) than Upper South Long Lake.

Dissolved oxygen levels were maintained at adequate levels throughout the summer in the lake (see Attachments). During mid-summer, water below 7 meters (23 ft.) in depth was depleted of oxygen. Surface waters in the lake reached a maximum temperature of nearly 26°C (79°F) and maintained dissolved oxygen levels of approximately 9 mg/l. Mixing of the entire water column (fall turnover) was just completing on October 8.

The Outdoor Corps is student-operated small business that delivers environmental stewardship services in Crow Wing County. Students in the 9th through 12th grades are trained in managing natural resources and operating a small business. Once trained, the students deliver environmental stewardship services to contracting individuals, groups, or agencies. Students travel to contracting lakes to collect samples monthly, intern at a local laboratory (that processed the samples), maintain a website, and present the sampling results and their interpretations to contracting individuals and groups. A copy of the water sampling report prepared by the Outdoor Corps is provided in **Appendix 5**.

The report prepared by the Outdoor Corps includes a number of recommendations and conclusions. One conclusion from the report noted the following:

It should be remembered that although light transparency and TSI values are great indicators of water quality and lake health, they can vary substantially in relation to factors such as precipitation and temperature. It has been stated in the literature that “any two lakes within 10 TSI values probably have the same level of biological productivity”. Furthermore, the Minnesota Pollution Control Agency will only recognize a trend in water quality that is based on 15 years of consecutive data.

The report also provided several recommendations including

1. Maintain Secchi disk monitoring in all lakes and increase the frequency of the monitoring when possible.
2. Occasionally verify what the light transparency is really measuring.
3. Monitor inflows and outflows of Upper South Long Lake.
4. Collaborate with the Lower South Long Lake Improvement Association on shared issues.
5. Establish your own “Lakeshore Liaisons”.
6. Establish demonstrations highlighting best practices around your lake.
7. Do not hesitate to retell old messages.
8. Keep your lake association healthy.

The USLLIA has contracted with the Outdoor Corps to sample lake water quality in 2003. It may want to consider maintaining a long-term relationship with the student run organization to monitor water and other natural resources matters.

Water Quality/Quantity Conclusions

The MPCA has set standards or criteria for lakes in the Northern Lakes and Forests (NLF) ecoregion. The phosphorus criteria value for lakes in the NLF ecoregion is less than 30 ug/l in order to support swimmable use. At or below this level, nuisance algae blooms should occur less than 5 percent of the summer and transparency should remain over 1 meter over 90 percent of the summer.

Upper South Long Lake with a phosphorus concentration of 29 ug/l is very near the criteria level. The MPCA has given Upper South Long Lake a “marginal” grade for this swimmable criteria.

The MPCA further stated in the LAP study that the ecoregion target of 20 – 25 ug/l would be reasonable in-lake phosphorus target based on the three water monitoring models they use. Significant reductions in the frequency of algae blooms and increases in transparency would be expected if the phosphorus levels were reduced to these levels.

Another target may be lake water transparency. The MPCA stated in the LAP study that one indication of a serious decline in water quality for both the Upper and Lower South

Long lakes would be if the summer mean transparency remained consistently below the current long term mean of 6.6 feet or 2 meters.

To attain these water quality targets, **controlling the sources of phosphorus** is critical. Potential sources of phosphorus in the Lakeshed include septic systems, livestock operations, erosion, land development, and other miscellaneous sources such as lawn fertilizers (SLEDM). Unmanaged land use practices in the Lakeshed, poor management of shoreland areas, increased development and stormwater runoff, and draining of wetlands all can create the greater likelihood of increases in phosphorus loading. With increases of phosphorus, the resulting degraded water quality could shift the balance in this productive lake to less desirable species of fish and more nuisance vegetation.

A water quality target that USLLIA may wish to consider would be to maintain swimmable levels of total phosphorus from Memorial Day to Labor Day. Furthermore, it should be noted that weather or climatic conditions will vary each year and attainment of quantitative targets such as these may be better viewed from a multi year perspective.

e. Recommendations from the MPCA LAP Study

Based on this monitoring and analysis effort in the LAP study for Upper and Lower South Lakes, a number of specific recommendations were developed. The following is a list of the recommendations:

1. Lake management plan. The two lake associations should develop a lake management plan for protecting the water quality of the lake. The plan should incorporate a series of strategies and activities in a prioritized fashion that will aid in the long-term protection and improvement of the lakes.
2. CLMP. The lake association should continue to participate in the Citizen Lake Monitoring Program. At a minimum, the MPCA recommended that measurements be taken weekly during the summer.
3. Nutrient Sources. A more detailed examination of land use practices in the watershed to identify nutrient sources should be completed. Potential sources include urban runoff, lawn fertilizer, septic systems, draining of wetlands, and increased ditching.
4. Aquatic Plants Management. Continue to work with the MN DNR on aquatic plant management.
5. Septic Systems. The lake association should encourage all shoreland property owners to bring septic systems up to code and be properly maintained.
6. Buffers. Property owners should be encouraged to maintain buffer areas between lawns and lakeshores and if fertilizers are needed, to use phosphorus free fertilizers.
 7. Land Use/Water Connection. Controlling sources of phosphorus is critical to water quality in Upper South Long Lake.
 8. Involvement. The lake association should seek representation on boards or commissions that address land use management activities.

E. County Water Plan Priorities

The main priorities that the Crow Wing County Water Plan Advisory Committee established for the Mississippi River – Brainerd Watershed in the County Water Plan include the following:

1. Develop sound planning and development in the northern portion of the watershed.
2. Manage stormwater and TMDLs in the central portion of the watershed.
3. Increase riparian buffers around the lakes and streams.
4. Inventory and on-site inspection of agricultural areas for potential pollution problems.
5. Upgrade non-conforming septic systems.
6. Address future drinking water and wastewater needs.
7. Continue to work with the Mississippi Headwaters Board.

How should the USLLIA lake management plan mesh with the County's water resource planning and management efforts? What can the USLLIA do to enhance and expand the coordination of water resource management efforts in the Lakeshed?

The above list of implementation efforts outlined in the Crow Wing County Water Plan reflect a number areas of overlapping interest and concern with the USLLIA. The USLLIA may want to consider developing stronger communication linkages with the County through the water planning program as well as other County initiatives such as the comprehensive plan, incentive programs, and regulatory efforts.

F. Conclusion to Volume 1

A primary concern facing the USLLIA and area residents is that increased development and land use activities in the surrounding watershed are going to impact the water quality in Upper South Long Lake. This will impact the use and enjoyment of the lake and area residents, visitors, and area businesses for years to come. The challenge for the South Long Lake community is to find ways to best protect the water quality.

The public input discussed in Section 2 combined with the resource inventory in Section 3 and lake water quality assessment described in this section, provide a foundation for the lake association to establish a comprehensive framework of goals and objectives to guide their efforts over the next five to ten years. Volume 2 provides this strategic framework.

Section 1

Mission Statement and Guiding Principles

A. *Overview – “The Big Picture”*

The Planning Committee developed an overall vision for the year 2008, a mission statement, and a set of guiding principles to provide guidance for the development and implementation of this Plan.

The concepts expressed in this section are also intended to provide specific language for members of the lake association to quickly and easily communicate the overall mission and purpose of the Upper South Long Lake Management Plan with landowners, visitors, residents, local and County officials, and state agency personnel.

B. *Vision for 2008*

Based on input from participants attending the visioning session and the analysis of the resources in the Lakeshed, the Planning Committee established an overall vision for what they would like to see Upper South Long Lake be like in the future. By 2008, the Planning Committee envisions:

- **Less Algae.** In July and August of each year, the amount of algae in the water would be reduced and show up on fewer days.
- **Clear Water.** The clarity of lake water would increase to a depth of 9 to 12 feet. Contamination of the lake from our own residences would be at a minimum. Septic systems would be in compliance, vegetation buffers identified and 40 percent installed. Direct run off from our properties, roadways, and culverts would be eliminated or minimized. Contamination from upstream in our watershed would be identified, quantified, and a plan in place to either control or remove the sources.
- **Less Nuisance Weeds.** You could tour the lake in your boat and not have your boat motor entangled in weeds. Non-natural aquatic plants would be reduced by 25 percent, replaced by natural species that support water quality, fish and wildlife habitat. Existing patches of nuisance aquatic plants would be removed in accordance with the DNR regulations.
- **Better Fishing.** Fishing would be such that you, your family, and friends could regularly catch northern, bass, crappies, and sunfish. You could troll the outer edges of the weed beds and not have to stop every few feet to untangle your line with nuisance weeds. Vegetation in areas by the dam and public landing would be selectively cleared out to permit better access.
- **Cooperative Lake Use.** Wildlife such as loons, ducks, and muskrats would be common during quiet mornings and evenings. Lake users would agree on guidelines for the use of personal water craft and would be off the lake in the evenings to allow enough time for fisherman and pleasure crafts to enjoy the solitude of our lake.

C. *Mission Statement*

A mission statement should be general or overarching statement that describes the purpose of an organization and what it intends to do. Mission statements should be short, concise, and encompassing. In developing the mission statement, the Planning Committee considered many factors that influence lake and its watershed. Some of these factors include demographic, environmental, economic, geographic, and political areas (a detailed assessment of these factors has been addressed in Volume 1).

With increasing pressures on the natural resources and limited funding and volunteer time, the lake association needs to focus on the highest of priorities and coordinate its efforts with property owners and governmental agencies. To meet the complexity of challenges, the lakes association has combined its members' skills and talents to pursue the wise management of the lake and the watershed resources. Therefore, the Upper South Long Lake Association has adopted the following mission statement:

Mission Statement

“It is the mission of the Upper South Long Lake Association to work together with others to use, enjoy, and maintain our lake wisely while protecting it for our children, grandchildren, and generations to come.”

D. *Guiding Principles*

Early in the process, the Planning Committee considered a series of principles to be used to guide the development and implementation of the lake management plan. The following is a list of the principles that the Committee adopted:

- Encourage broad involvement and support in the development of the plan and its implementation.
- Promote the management of water and land resources on a watershed perspective.
- Support a diverse economy within the watershed – including agriculture, commerce, development, tourism, and recreation.
- Use the knowledge gained the inventory and assessment of resources to prioritize efforts to improve water quality.
- Leverage volunteerism as much as possible.
- Encourage intergovernmental cooperation and coordination.
- Recognize that land use is a unique local responsibility and encourage the County and the townships to more proactively plan land use and development.

- Support the adoption and administration of regulatory controls and enforcement mechanisms when appropriate and necessary, to address water management issues.

Section 2

Goals, Objectives and Action Items

A. *Introduction: Planning Terminology*

After reviewing and analyzing public input from the Visioning Session at the annual lake association meeting in August of 2001 and data from the resource inventory and assessment, the Planning Committee developed a comprehensive strategy for addressing water and land related resource issues. The overall strategy consists of a series of statements in the form of goals, objectives, and action items. Collectively, these statements form the policy framework for the lake association in its efforts to manage resources in the watershed.

Too often, resource management plans in the past have not provided enough depth or comprehensiveness from a policy standpoint. As a result, plans have had limited usefulness and have often ended up sitting on a shelf. This problem is further compounded by inconsistent use of planning terms.

The concepts and principles developed for the Upper South Long Lake Management Plan are intended to provide a comprehensive and meaningful guide for citizens and the lake association in their ongoing decision making processes over the next five years. Without the framework of these statements, the intended objectives and actions become lost or confused as new people become involved with the lake association in the coming years. This approach requires more consistent use of terms.

In order to develop a useful plan that can be more successfully implemented, the Planning Committee adopted a series of terms to clearly define the concepts established in this strategic policy framework. The terms used in this section are defined as follows:

- **Goals:** Statements that outline the general directions that the lake association wishes to pursue over the next five or more years to protect and improve the water quality in the lake. Goal statements are intended to provide a long-term view or direction for a given resource initiative (water, land, recreation, etc.).
- **Objectives:** Statements that provide more specific direction on the programs or projects that are needed to implement each goal. Goals may have one or more objectives.
- **Action Items:** Statements that provide further direction for the objectives. Action items tend to have language that is specific, attainable and measurable. The list of action items serve as an initial outline of the tasks or efforts that the lake association, with assistance from state agencies and private landowners and citizens should take to implement the programs or projects listed under the various objectives. Collectively, the objectives and action statements define the methods needed to achieve the goals.

The goals, objectives, and actions have been organized into the following four categories:

- Water Resources.
- Land Resources
- Recreational Resources
- Administrative/Fiscal Strategies

B. Water Resources

Goal 1 – Water Quality. *Protect and enhance* surface water quality in lake and the watershed through sound scientific research and best management practices.

Objective A – Education and Communications. Develop an education program with a specific lake/watershed focus that helps citizens to understand how their individual actions impact water quality.

Actions:

1. Inventory of Misperceptions. Gather a list of misperceptions on water and land resource management topics and provide to the Management Subcommittee to be used to help dispel the misperceptions.
2. Inventory of Existing Programs. Gather materials from existing water quality education programs from resource management agencies and organizations such as MLA, MN DNR, MPCA and others.
3. Detailed Education/Communications Program. Prepare a detailed program specific to the Upper South Long Lake watershed for water quality education and public involvement.

Objective B – Monitoring. Continue and expand efforts to *support and assist* in the collection of water monitoring data of the in-lake and watershed conditions.

Actions:

1. Monitoring Protocols. Work with the Crow Wing County Water Plan program and resource agencies to review and coordinate water monitoring protocols.
2. Watershed Monitoring. Support and coordinate water quality monitoring by the MPCA and Crow Wing County water plan program to monitor and report water quality data within the watershed.
3. In-Lake Monitoring. Continue to work with the MPCA through the Citizen Lake Monitoring program (CLMP) to monitor water clarity with Secchi disk measurements and document the water quality data.

4. Inlet Monitoring. Continue to work with the MPCA through the Citizen Stream Monitoring program (CSMP) to monitor and document water quality data for streams and inlets into the lake.
5. Lake Level Monitoring. Work with the MN DNR Division of Waters to monitor and record lake levels.
6. Precipitation Monitoring. Work with the Crow Wing County SWCD to monitor precipitation in the watershed.

Objective C – Water Quality Data Analysis. *Develop* practical and sustainable methodologies that analyze and interpret water resource trends and communicate the results to the public.

Actions:

1. Data Compilation and Organization. Support efforts by the MPCA to compile and organize water resource data on an ongoing basis.
2. Data Analysis. Work with the MPCA, and MN DNR to analyze and interpret water resource data at the in lake and the watershed.
3. Water Quality Report. Prepare an Annual Water Quality Report that summarizes the water resource trends from that year’s water quality monitoring efforts. Insert the report into the lake association newsletter. Present a summary of the report at each year’s annual meeting.

Objective D – BMPs. *Advocate and support* the use of Best Management Practices (BMPs) relating to surface water for all land uses and activities in the watershed.

Actions:

1. Agricultural BMPs. Support efforts by the Crow Wing SWCD, state and federal agencies, and landowners to implement Best Management Practices on agricultural lands including applications such as conservation tillage, erosion control practices, runoff management, riparian buffers, agricultural waste management, integrated pest management, and others.
2. Shoreland BMPs. Support efforts by the Crow Wing SWCD, state and federal agencies, and landowners to implement Best Management Practices in shoreland areas including lakes, rivers, and streams through planning and zoning permits and other governmental approvals.
3. Urban and Rural Development BMPs. Support efforts by Crow Wing County and the townships in the watershed to apply Best Management Practices for stormwater management on road construction and land development projects.
4. BMP Educational Materials. The Land Resource Subcommittee should gather and organize educational materials describing BMPs for the Management Subcommittee to distribute to appropriate landowners within the watershed.

Objective E – Water Quality Projects. *Support* the implementation of water quality projects (financial, technical, administrative and political) in the watershed.

Actions:

1. Inlet Wetlands. Support efforts to relocate or reconfigure Leisure Lane as it crosses the wetland along the Nokasippi River so that it minimizes impacts on water quality and maximizes opportunities to enhance native vegetation.
2. Minor Inlet Wetlands. Support efforts to protect and enhance the wetlands located near the confluence of the three minor inlets (Silver Bay, Rognaldson, and Paradise 12) with the lake. These wetlands serve as critical last stop buffers for surface water before it enters the lake.

Goal 2 – Aquatic Vegetation. *Protect and increase* desirable aquatic vegetation in Upper South Long Lake including species that benefit fish and wildlife. *Prevent* the spread and presence of exotic aquatic vegetation species, particularly curlyleaf pondweed, eurasion milfoil and purple loosestrife

Note: Please refer to the approved Vegetation Management Plan for more details on the lake association vegetation management program.

Objective A – Public Awareness/Education. *Develop* educational or outreach programs on aquatic vegetation that target information resources to specific groups in the watershed.

Actions:

1. Misperceptions. Gather and list misperceptions by the public on aquatic vegetation management issues. The Management Subcommittee should distribute literature that clarifies and dispels the misperceptions.
2. Property Owner Program. Obtain and distribute literature from resource agencies that describe the relationship between aquatic vegetation and water quality including topics such as weed management practices, and the impacts of mowing and fertilizing, the benefits and importance of native plant species, how the natural lake systems functions, the impacts of exotic species on the lakes, and ways to better manage man’s activities on the lakes.
3. Boating Public. Help the MN DNR install and maintain signage at the public access that describe and inform boaters on the proper practices to prevent the spread of exotic species.

Objective B – Inventory. *Develop* inventories of aquatic vegetation in the lake for existing and past conditions.

Actions:

1. Existing Vegetation Inventory. As called for in the Vegetation Management Plan, assist the MN DNR Division of Fisheries in inventorying and mapping of aquatic vegetation in the lake. Identify areas of both desirable vegetation (hard stem bulrush, water lilies, etc.) and nuisance vegetation (curly leaf pondweed, etc.).
2. Past Vegetation Inventories. Work with the MN DNR and the Crow Wing SWCD to inventory and map historic vegetation patterns in the lake. Utilize historic aerial photographs, landowner input and other available sources as data sources.
3. Critical Habitat Areas. Work with the MN DNR to identify, inventory, protect and enhance critical aquatic habitats in the lake such as the inlet wetlands and within the lake itself.

Objective C – Monitoring. *Monitor* aquatic vegetation patterns in the lake on an ongoing basis as called for in the Vegetation Management Plan.

Actions:

1. Exotic Species. Develop a volunteer program that monitors the presence exotic and nuisance vegetative species including Eurasian Milfoil, purple loosestrife, etc.
2. Reporting System. Document and report the invasion of exotic species to the MN DNR and the lake association on a periodic basis.

Objective D – Permitting/Enforcement. *Support* efforts by permitting/enforcing resource agencies to protect aquatic vegetation in the lake as specified in the Aquatic Vegetation Plan.

Actions:

1. Photography and Mapping. Support the periodic aerial or other kinds of photography of the lake to inventory aquatic vegetation patterns and any changes or disruptions to the existing vegetative patterns. Support the mapping of aquatic vegetation.
2. Permit Review and Comments. Work with the MN DNR and the county planning and zoning offices to administer the water permitting processes. The lake association should maintain a listing of sites permitted for aquatic vegetation removal as well as persons at the MN DNR to contact for permit applications. Review and comment on permit applications that impact critical aquatic vegetation or habitat areas.
3. Neighborhood Weed Watch. Develop and coordinate a neighborhood weed watch program with the MN DNR that helps to protect critical aquatic vegetation or habitat areas from illegal boating activities, vegetation removal and destruction, etc.

Objective E – Vegetation Management. *Plant, restore and maintain* native aquatic vegetation in critical areas in the lake.

Actions:

1. Critical Habitat Areas. Support the maintaining and replanting of native species where appropriate in the critical habitat areas in the lake. Provide volunteer labor to assist the MN DNR in installing and maintaining vegetation in the critical areas.
2. Hard Stem Bulrush/Lilies. Support efforts to provide maximum protection to stands of hard stem bulrush and water lilies.
3. Weed Harvesting Program. Continue to operate the weed harvester in compliance with the Vegetation Management Plan.
4. Lakeshore Properties. Support efforts by private lakeshore owners to plant, restore and maintain native species along the shoreland areas adjacent to their properties.
5. Use of Chemicals. Support efforts that discourage private property owners from using chemicals. Work with the MN DNR to consider the selective use of herbicides to reduce curlyleaf pondweed levels early in the growing season to support their replacement by native plants (please refer to the Upper South Long Lake Aquatic Vegetation Plan).

Goal 3 – Groundwater. *Protect and enhance* groundwater quality and quantity in the watershed.

Objective A – Monitoring. *Support* the monitoring of groundwater resources in the watershed.

Actions:

1. Observation Wells. Work with the SWCD to monitor groundwater elevations in the watershed to help monitor directions of groundwater movement.
2. Nitrate Levels. Support efforts by the County, MDH, and MPCA to monitor nitrates levels in areas where there is a high probability of high nitrate-nitrogen levels (See the Crow Wing County Nitrate-Nitrogen Study by MDH)
3. Nitrate Clinics. Distribute notices and information on nitrate clinics for the testing of well water. These events are held by the SWCD and county water plan program.

Objective B – Abandoned Wells. *Support* efforts by the county water planning programs to identify and properly seal abandoned wells.

Actions:

1. Lakeshore Property Assessments. Survey shoreland landowners about abandoned wells as a part of any property surveys or assessments.

2. **Public Relations.** Periodically distribute brochures and/or place in newsletters information regarding the potential impacts of abandoned wells and the proper sealing of them. Direct all landowners with abandoned wells to the County water planning program.

C. *Land Resources*

Goal 1 – Septic Systems. *Promote and encourage* the safe and economical treatment of sanitary sewage in the watershed in order to protect public health and to minimize the availability of nutrients from human waste that affect water quality.

Objective A – Education and Communications. Obtain and distribute information on the proper septic system design and maintenance through programs administered by the County, local units of government, and state agencies. Establish a quarterly

Actions:

1. **Newsletter Articles.** Establish a schedule of articles on wastewater topics. Publish the articles on a quarterly basis in the lake association newsletter.
2. **Current Regulations.** Distribute information on the current requirements for septic systems to all properties owners in the watershed.
3. **Proper Maintenance.** Distribute information on the proper maintenance of septic systems using the association newsletter as one method of distributing general information. Consider distributing to each septic system owner a copy of the “Septic System Owner’s Guide”, prepared by the Minnesota Extension Service.
4. **Workshops.** Support the attendance by interested citizens to workshops on septic system topics including new design technologies, inspection and enforcement maintenance, benefits of common systems, etc.

Objective B – Inventory. Support the development and maintenance of an inventory of septic systems throughout the watershed starting with lots adjacent to the lake.

Actions:

1. **Parcel Mapping.** Work with the Crow Wing County to develop a parcel map of the townships in the watershed.
2. **Inventory.** Work with the Crow Wing County Planning & Zoning Department to inventory and map the existing septic systems in the watershed.
3. **Property Owner List.** Work with the County to develop and periodically update a property owners list for all parcels in the watershed.

Objective C – Compliance. Increase compliance to 100 percent for all septic systems on 1st and 2nd tier properties by December 1, 2007. Support the point of sale and permit issuance compliance programs administered by the County.

Actions:

1. Septic System Audit. Support efforts to develop a program to inspect all septic systems on 1st and 2nd tier parcels.
2. Point of Sales. Support the continued practice of requiring an inspection of septic systems when individual properties prior to its sale.
3. Point of Permit Issuance. Support efforts to enforce the compliance of the septic system regulations through the permitting process.
4. Common Systems. Where systems are in close proximity to other failing systems, explore and support landowners and County officials in considering the installation of common on-site wastewater treatment systems.

Objective D – Regulation. Support efforts by the appropriate local governing unit to administer and enforce septic system regulations.

Actions:

1. Update Regulations. As viable new technologies become available to properly treat sewage, work with the County to update and revise the regulations to allow for the new methods or designs.

Goal 2 – Livestock. *Promote and encourage* the raising of livestock while balancing the need to protect water and land resources to help reduce movement of nutrients from animal waste to lakes and waterways.

Objective A – Education and Communications. *Support* efforts to improve the awareness by the general public of the importance of feedlots to the local economy, how they can be properly operated, ways to minimize impacts on water resources, and ways in which degradation to the environment can occur.

Actions:

1. Watershed Tours. Help the County and SWCD coordinate attendance of watershed tours that bring farmers and shoreland owners together to see feedlots in operation.
2. FLEval. Support efforts by the SWCD and NRCS to apply the Feedlot Evaluation model (FLEval) to help feedlot operators assess the impacts that their facilities on water resources and ways that they can reduce the impacts.

Objective B – Incentives. *Support* efforts by the resource agencies to assist feedlot operators and livestock producers to the use of Best Management Practices (BMPs) to reduce the movement of animal waste nutrients from entering waterways and lakes.

Actions:

1. Corrective Efforts. Support efforts by landowners and the SWCD to make corrective actions and improvements to feedlots in the watershed.
2. Fencing Riparian Areas. Support the installation of fencing through programs sponsored by resource agencies that keep livestock out of critical riparian areas in the watershed.

Goal 3 – Erosion. *Promote and encourage* land use activities that prevent or minimize soil erosion (soil particles facilitate the movement of nutrients into watercourses)

Objective A – Inventory and Assessment. *Identify and prioritize* soil erosion sites and sources.

Actions:

1. Buffer Inventory. Work with the Crow Wing County SWCD to develop an inventory of the riparian buffers in the watershed. Riparian buffers are areas of trees, shrubs, and other vegetation located along waterways and around water bodies. Develop a list of the top ten areas where more buffers are needed in the watershed.
2. Lake Inlet Inventory. Work with the Crow Wing County SWCD to develop an inventory of all inlets to both lakes and prioritize them for impacts on lake water quality.

Objective B – Incentives and Improvements. *Work with* resource agencies to implement incentive programs and projects on private and public lands that improve water quality in the lakes.

Actions:

1. Buffer Projects. Support projects being developed by landowners and the resource agencies in the watershed that increase the amount of riparian buffers.
2. Land Development/Road Construction Practices. Support practices by landowners and townships in the watershed that decrease the amount of stormwater runoff and soil erosion.

Goal 4 – Development. *Promote* the wise and sustainable use of land in the watershed to help support the sustainability of lake water quality.

Objective A – Comprehensive Planning First. *Support and monitor* the development and implementation of local comprehensive plans and policies that are based on sound water and land related resource principles.

Actions:

1. Watershed Involvement and Coordination. Consider forming a watershed association to include the lake associations, townships, landowners, farmers, resort owners, to support and monitor comprehensive planning and implementation that seeks to protect water quality through appropriate methods (from incentives to regulations).
2. Lake Association Representation. Support the appointment of USLLIA members to serve on County and local boards and committees that oversee the planning and management of water and land related resources (County planning commission, water plan task force, etc.)
3. Land Use Analysis. Encourage the County and the townships to work cooperatively to review the potential development or build-out scenario that their current policies and ordinances allow.
4. County Land Use Controls. Encourage the County to review and update the land use controls (zoning ordinance, subdivision regulations, ISTS, feedlots, etc.) that better protect our valuable water resources.
5. Land Use Recommendations. Provide recommendations on land use policies that encourage more economical and sustainable land development patterns.
6. Water Quality Recommendations. Provide recommendations on the need to protect water and land related resources in the Lakeshed. Recommend that the County and townships, where appropriate, adopt and enforce best management practices as means to guide land development proposals while minimizing impacts on water quality.

Goal 5 – Miscellaneous Issues. *Encourage* better stormwater management practices and the restoration of critical wetlands to maintain and improve water quality in the lakes.

Objective A – Stormwater Management. *Support* the development better stormwater management practices at the local level especially with new construction projects and development (NPDES permit process will apply to sites disturbing more than 1 acre) to improve lake water quality. (Soil particles carry phosphorus so preventing erosion is critical to water quality.)

Actions:

1. Grading and Erosion Control Plans. Advocate the requirement of grading and erosion control plans for all major land development proposals and public construction projects in the watershed. Effective March 10, 2003, development activities that disturb one acre or more of land require a NPDES permit from the MPCA.
2. Stormwater Design Standards. Encourage the County to develop, administer and enforce stormwater design standards.
3. Culvert Inventory. Support efforts to inventory all culverts and box channels in the watershed. Inventory items such as culvert size, elevation, flow direction, maximum capacity, flow conditions, etc.
4. Leisure Lane. Reduce erosion from Leisure Lane at the north end of the lake and at the inlet in the southeast corner of the lake.
5. Culvert Maintenance. Help the townships monitor debris in culverts including the culvert crossing the inlet at the southeast corner of the lake so that the road does not wash into the lake.

Objective B – Wetland Protection and Restoration. *Identify, restore and enhance wetland areas that improve surface water quality and promote groundwater recharge.*

Actions:

1. Prioritize Wetland Protection Efforts. Support efforts by the County SWCD to identify and prioritize wetland areas in the watershed where there are sites with the potential for improving water quality and water storage.
2. Wetland Restoration Projects. Support efforts by property owners and the resource agencies to restore wetlands in high priority areas.
3. Leisure Lane. Support the relocation of Leisure Lane and the installation and restoration of the wetland in the road alignment.

D. Recreational Resources

Goal 1 – Fisheries Resources. *Protect and enhance* the fish resources in the lake.

Objective A – Planning Fish Resource Management. *Support* efforts by the MN DNR to plan fisheries management efforts in the lake including the development of Fisheries (Lake) Management Plans for both lakes.

Actions:

1. Volunteers. Provide volunteers to help the MN DNR conduct fish population surveys, fishing activity levels, and creel surveys.
2. Public Input and Communications. Coordinate input from the public on fish management topics such as desired fish populations, stocking rates, management practices including size limits and other fishing regulations, etc. and provide the input to the MN DNR Division of Fisheries.

Objective B – Fisheries Management. *Support* efforts by the MN DNR to manage the fisheries in the lake.

Actions:

1. Volunteers. Provide volunteers to help the MN DNR complete specific projects and fisheries management activities (rough fish control, stocking, etc.)

Goal 2 – Wildlife Resources. *Protect and enhance* the wildlife resources in the watershed.

Objective A – Assessments/Planning. *Work with* the MN DNR to assess the conditions of wildlife and habitat conditions in the watershed and *develop* management plans.

Actions:

1. Volunteers. Provide volunteers to help the MN DNR conduct wildlife surveys and counts and habitat condition surveys.
2. Loon Survey. Continue to provide and support the volunteer persons for the loon surveys including ____, ____, ____ (insert names).
3. Public Input and Communications. Coordinate input from the public on wildlife management topics such as desired populations, habitat projects, nuisance species management (cormorants, beaver, beetles, tent caterpillars, etc.).

Objective B – Management. *Work with* the MN DNR to manage wildlife resources and improve habitat conditions in the watershed.

Actions:

1. Volunteers. Provide volunteers to help the MN DNR complete specific projects and wildlife management activities (habitat improvement, tagging, disease prevention, etc.)
2. Property Owners. Support and participate in programs sponsored by state and federal agencies to improve habitat on private property within the watershed.
3. Public Lands. Support and participate in projects that enhance wildlife habitat and water resources on public lands (Waterfowl Production Areas, Wildlife Management Areas) within the watershed.
4. Loons. Continue to support the placing and maintaining of nesting platforms for loons. Consider ways to reduce stress from lake use on loons and their nests.

Goal 3 – Surface Water Use Management. *Promote* the safe and wise use of the surface waters of the lake for multiple recreational uses.

Objective A – Education and Communications. *Support and coordinate* education efforts on the safe and wise use of surface waters of the lake.

Actions:

1. Youth Education. Support and coordinate existing programs that train youth on the proper use and operation of boats, personal watercraft, snowmobiles, and ATVs.
2. Adult Education. Coordinate adult education on safe boating practices with annual events held by the lake association.
3. Winter Activities. Distribute literature and publish reminders in the newsletter on the safe use of the lakes for winter activities (ice thickness, fish houses, trash, etc.)
4. Existing Regulations. Provide information to property owners through newsletters, signage and other methods of the current regulations regarding boating and recreation use of surface waters.
5. Boater Awareness. Support and coordinate efforts to make the boating public aware on the need for loon protection.

Objective B – Regulation. *Explore* the development and adoption of surface water use regulations specifically developed for the lake.

Actions:

1. State Laws. Review the various regulatory options that the state laws provide local governments to adopt in regulating the use of surface water use and recreational activities.

2. Prioritize Surface Water Use Conflicts. List and prioritize conflicts.
3. Proposed Regulations. Draft regulations that address the major conflicts and that are consistent with the state laws. Work with the appropriate local units of government to adopt and enforce.

E. Administrative/Fiscal

Goal 1 – Public Involvement and Communications. *Encourage and promote* active, broad and ongoing involvement by citizens and landowners from throughout the watershed to participate in the implementation of the Upper South Lake Management Plan.

Objective A –Volunteerism. *Establish* sustainable approaches to organizing volunteers for implementing specific projects and programs as outlined in this Plan and as determined by the lake association.

Actions:

1. Volunteer Opportunities. Maintain a list of “volunteer opportunities” for persons to get active in the implementation of this plan. Each subcommittee should prepare and maintain a list of tasks and jobs (with a brief description) that need to be done to implement the Plan
2. Resource Directory. Maintain and update on an annual basis, the Resource Directory. The directory should include the membership lists for the implementation committees, lake association board and members, agency representatives, etc. (name, phone, address, etc.)

Objective B – Public Relations and Communications. *Develop* consistent and ongoing methods for informing the public about efforts being taken to improve the lake and the water resources in the watershed as well as those efforts that have been successfully completed.

Actions:

1. Plan Summary. Distribute a copy of the summary to the Upper South Long Lake Management Plan to all property owners in the watershed.
2. Newsletters. Continue to prepare and distribute the newsletters for members of the lake association.
3. Annual Watershed Report. Prepare an annual Watershed Report that summarizes the completed and upcoming projects, education programs, volunteer efforts, and water quality trends. Distribute to all property owners in the watershed.
4. Members List. Maintain the membership mailing list and periodically publish a new membership directory to encourage communications and participation.
5. Web Site. Develop and maintain a basic web page for the USLLIA to help promote communications for members of the association as well as the general public.

Objective C – Annual Meetings. *Continue* annual meetings for the lake association.

Actions:

1. Annual Association Meetings. Hold annual meetings to provide the necessary means to support the functions of the lake association (discussion on issues, voting, setting dues, etc.). Ask attendees to identify what they think are priority concerns and actions needed at each annual meeting.
2. Lake Management Plan Review. Review and discuss the status of projects as recommended in this Plan at the annual association meetings. Request input from meeting attendees on efforts that should be taken in the upcoming year.

Objective D – Implementation Subcommittees. *Establish and support* working or implementation subcommittees to undertake the specific tasks and assignments necessary to complete the projects and programs developed in this Plan. The subcommittees are the main working force to implement the specific actions noted in this Plan.

Actions:

1. Create and Maintain Subcommittees. The lake association board shall appoint members to the working subcommittees. The board will actively seek volunteers to serve on the subcommittees on an ongoing basis and maintain a list of interested persons (see sign up form).
2. Meetings. The subcommittees will meet as needed to complete their projects. Each subcommittee should select a lead person or chair. (The by laws shall be reviewed and revised to incorporate these and other appropriate working relationships).
3. Subcommittee Reports. Each subcommittee will be asked to give a report at the board meetings to summarize the status of actions taken and efforts upcoming.

Goal 2 – Governmental Coordination. *Encourage* early and active involvement with public sector agencies, from local to federal, that have jurisdiction within the watershed to more successfully implement the Upper South Long Lake Management Plan.

Objective A – Water and Land Resource Agencies. *Support and coordinate* efforts with governmental agencies that manage land and water resources in the watershed.

Actions:

1. Annual Intergovernmental Meeting. The board and implementation committees should hold an annual meeting with resource agency representatives and land use officials to review projects and programs to be undertaken in the upcoming year. Ways to improve the review of new land development proposals (subdivision plats, conditional use permits, variances, etc.) with local land use officials should also be addressed at these meetings.

2. County Board/Township Recommendations. Provide recommendations on land use planning efforts by the County and townships that are consistent with protecting water quality.
3. County Water Plan. Meet with the Crow Wing County Water Plan Advisory Committee to review the directions proposed in this Plan and identify areas where more coordination is needed.
4. State Legislative Recommendations. Provide input to legislators as on state laws that affect water quality, lakes and shoreland property owner interests. Work with the Minnesota Lakes Association (MLA) and the Crow Wing County Lakes and Rivers Association (LARA) on legislative issues.

Goal 3 – Fiscal Management. *Promote* the implementation of the Upper South Long Lake Management Plan in a fair and fiscally responsible manner.

Objective A – Funding Opportunities. *Maintain and update* an inventory of funding resources for implementing the Lake Management Plan including local, state, federal, non profit, foundation and private sources.

Actions:

1. Initiative Foundation. Continue to work with the Initiative Foundation to fund the implementation of projects and programs as recommended in this Plan.
2. Crow Wing County Water Plan Program. Explore the use of financing tools provided through the County water plan and provisions in the state statutes including stormwater utility fees, special tax districts, etc.
3. Conservation Programs. Explore and support the use of existing funding programs offered through the four soil and water conservation districts (SWCDs), state agencies and federal agencies including the U.S. Natural Resource Conservation Service (NRCS). Some of the water protection programs include CRP, RIM, EQIP, WRP, etc.
4. Research. Maintain a list of potential funding sources for programs and projects proposed in this Plan. The board should discuss potential funding options with the Finance Subcommittee on at least an annual basis.
5. Property Owner Education. Inform property owners of the programs available to help them improve their properties that help to reduce impacts on water quality (septic system loan interest loans, shoreland vegetation landscaping grants and loans, etc.)

Objective B – Budgetary Process. *Develop* an annual budget for implementation committees and the lake association.

Actions:

1. Public Input. Solicit public input on the proposed budgets at the annual meetings.
2. Annual Budget. Prepare an annual budget for the implementation of the Upper South Long Lake Management Plan.

Section 1

Administration and Coordination

Perhaps the most critical component of any plan is the part that describes implementation. Yet, because of the number of public and private interests involved in managing water and land related resources, as well as the complexity of the management issues, it is the most difficult to accomplish. The purpose of this section is to provide the reader with an outline of the administrative and coordination steps necessary for the successful implementation of the Upper South Long Lake Management Plan.

A. Administration

The Upper South Long Lake Improvement Association (USLLIA) is the primary organization responsible for the implementation of this Plan. Further, board members of the USLLIA and citizens from the Lakeshed recognize that to accomplish the goals outlined in this Plan, they must:

- **Prioritize.** Determine the top priority action items on a periodic or regular basis (Annual Work Program).
- **Refine.** Further develop and refine the prioritized action items or projects and programs listed in the Plan (see Section 2 – Implementation Program).
- **Finance.** Identify and pursue the appropriate funding resources, both within and outside the community, needed for plan implementation.
- **Volunteer.** Take responsibility for the securing appropriate volunteers and/or employing paid staffing needed for completing the tasks or actions.
- **Communicate.** Inform the public about accomplishments made through the planning process on a regular basis (Annual Report).

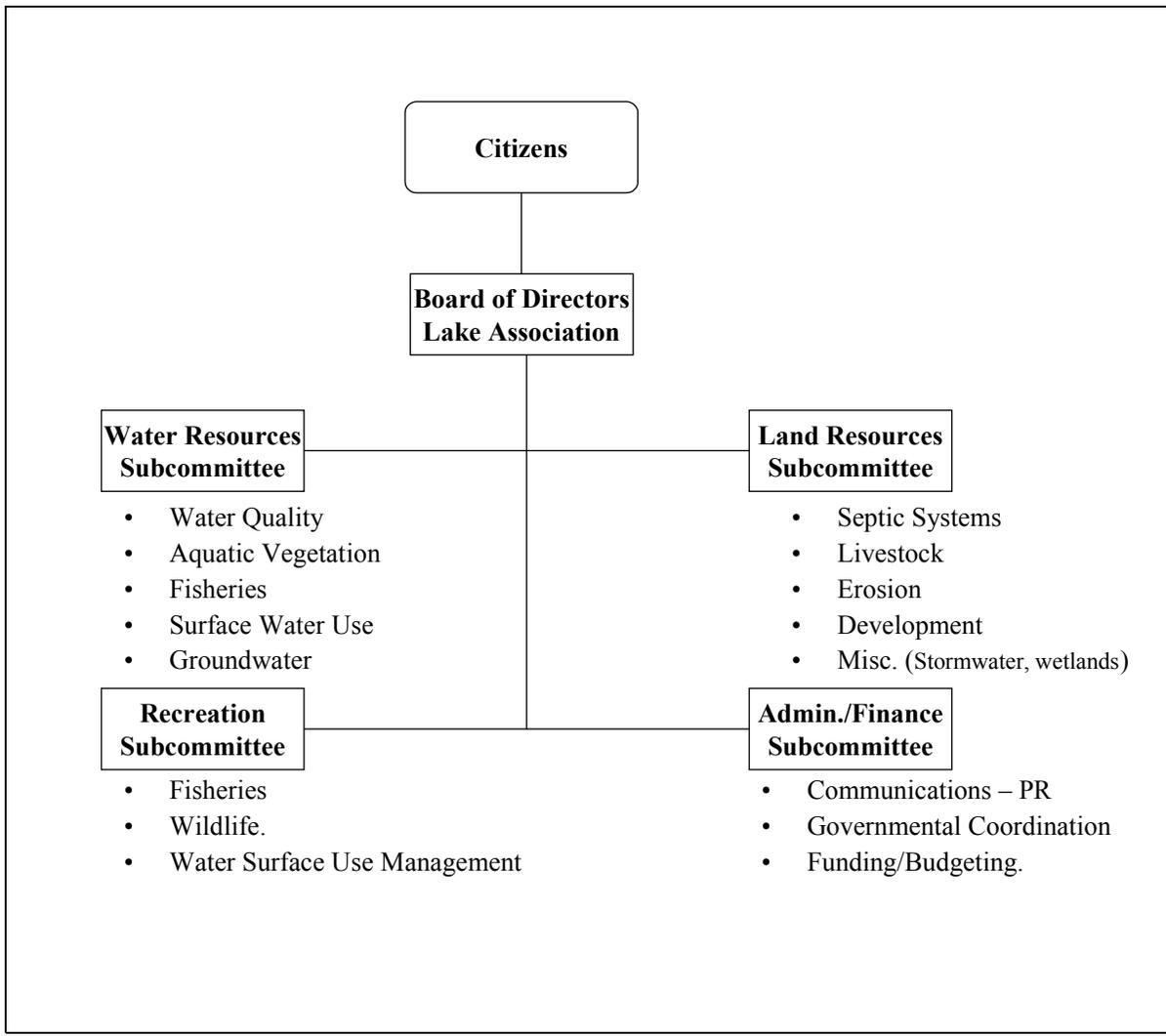
Working Subcommittees – Organization Chart

The lake association recognizes that the list of goals and objectives in Volume 2 is lengthy, but it also recognizes that within the people of the Lakeshed community, there are diverse talents and skills that can make many of these desired actions happen. The lake association intends to promote a comprehensive array of opportunities for volunteerism and citizen participation in the implementation of this Plan.

To help organize and mobilize the volunteer force, the Board proposes to establish four working subcommittees. The subcommittees will actively perform and oversee the

implementation of the Plan. The four subcommittees and their topic areas are shown on an organization chart represented on **Figure 12**.

**Figure 12
Organizational Chart
Upper South Long Lake Improvement Association**



Recommendations

1. **Appointment.** Recruit and appoint members to each of the four working subcommittees. The subcommittees will actively participate and oversee the implementation of the actions and tasks as established in the goals and objectives in this Plan and as established in the Annual Programs.
2. **Maintenance.** Maintain full membership of each of the four subcommittees. Actively seek new members to serve on one or more of the committees. Encourage as many people to participate as possible.
3. **Chair.** Each subcommittee shall appoint its own chair person(s) and shall report periodically to the Board.
4. **Education.** Support and encourage volunteers to attend educational workshops, conservation tours or other similar events or serve on a local governmental board or commission to represent the South Long Lake community and interests.

B. Coordination

There are many agencies in Minnesota at the local, regional, state and federal levels involved with water and land related resource management. Some concerns were raised in the planning process over the complexity and confusion regarding which agencies or organizations are responsible for various actions on water resource management. To make matters more confusing, over time, the roles and responsibilities as well as the programs and projects sponsored and/or administered by the public agencies change.

The Board intends to encourage collaborative partnerships between the lake association and local, county, state and federal agencies and organizations to support the implementation of the Plan.

Furthermore, there is no one entity that represents the eight minor watersheds that are tributary to Upper and Lower South Long lakes. Since there is no one organization, the lake association will encourage the formation of a watershed organization to improve water quality throughout the watershed. Some of the groups that should be a part of this watershed organization include the lake associations, townships, landowners, farmers, resort owners, and other concerned citizens.

By working cooperatively with other players in the watershed as well as the natural resource agencies and with the County's boards and commissions, the USLLIA and its citizens will benefit greatly. The following are specific recommendations for expanding coordination and collaboration:

Recommendations

1. **Watershed Alliance.** Support the formation of the Nokasippi watershed organization.
2. **Plan Distribution.** Distribute a copy of the adopted Lake Management Plan and all subsequent amendments to the Crow Wing County Board of Commissioners, the

- Water Plan Advisory Committee, the township boards, the Soil and Water Conservation District Board, and other appropriate agencies.
- Annual Watershed Meeting. The USLLIA Board and the subcommittees should meet annually with the Crow Wing County Water Plan Advisory Committee, the Board of Commissioners, and township officials to review and discuss status of water and land related management priorities and actions.

C. Clarifying Roles

Overlapping roles are not bad, in fact they are essential to successful implementation. It is the ‘missing’ and ‘duplicative’ roles that cause confusion, distort communications, and cause the unnecessary expenditure of public and private funds.

Identifying which groups should play a supporting role is important to avoid “dropping the ball” and/or the reducing of duplicative efforts. In short, clarifying roles and responsibilities increases efficiency. The purpose of this section is to initiate the development of the roles and responsibilities to be taken by the various agencies and organizations to manage water resource in the watershed.

Even with the administrative and coordination outlines provided above, the USLLIA will from time to time find that the roles and responsibilities of stakeholders in the implementation process will have changed or need to be clarified. To help clarify the unique and proper role and functions of entities managing water and land related resources in the Lakeshed, the matrix shown below has been provided.

Essentially, the matrix defines four basic roles or functions that any project or program needs to be implemented. Each player or entity has a unique role that it can play to help in the successful resolution of an issue or implementation of a program. The lake association, to help clarify and refine roles and responsibilities in addressing resource management issues should, frequently use the matrix shown below.

Table 12
Issues Matrix

“Players”	Political	Administrative	Technical	Financial
Landowners				
Lake Assns				
Lakeshed Committee				
P & Z/ESD Depts				
SWCDs				
NFCRWD				
State Agencies				
Federal Agencies				

Notes for Matrix Use:

Issue: _____

Roles:

“X” = Lead Role

“S” = Supporting Role

Section 2

Implementation Program

The purpose of this section is to provide the proposed priorities for implementation as established by the Planning Committee. This section also provides a detailed summary of the efforts that the lake association working in collaboration with landowners, local officials, and water resource managers propose to take to implement this Plan over the next five years.

D. Priorities

A two-step process was used to set priorities for implementing this Plan. First, the Planning Committee members individually ranked all of the goals and objectives set forth in Volume 2. Next, the results were compiled and placed into a prioritized list. The following list provides the ranked order of goals and objectives as established by the Planning Committee (please refer to Volume 2 for the full text description for each goal and objective statement):

Water Resources

Priority Goal 1 – Protect and enhance surface water quality.

Prioritized Objectives:

1. Objective A – Education and Communications.
2. Objective D – BMPs.
3. Objective C – Water Quality Data Analysis.
4. Objective E – Water Quality Projects.
5. Objective C – Monitoring.

Priority Goal 2 – Aquatic Vegetation.

Prioritized Objectives:

1. Objective E – Vegetation Management.
2. Objective A – Public Awareness/Education.
3. Objective B – Inventory.
4. Objective C – Monitoring.
5. Objective D – Permitting/Enforcement.

Priority Goal 3 – Groundwater.

Prioritized Objectives:

1. Objective A – Monitoring.
2. Objective A – Objective B – Abandoned Wells.

Land Resources

Priority Goal 1 – Septic Systems.

Prioritized Objectives:

1. Objective A – Education and Communications.
2. Objective C – Compliance.
3. Objective B – Inventory.
4. Objective D – Regulation.

Priority Goal 2 – Promote wise and sustainable land use (Development category per SLEMD).

Prioritized Objectives:

1. Objective A – Comprehensive planning first.

Priority Goal 3 – Stormwater and Wetlands (Miscellaneous category per “SLEDM”).

Prioritized Objectives:

1. Objective B – Wetland protection and restoration.
2. Objective A – Stormwater management.

Priority Goal 4 – Erosion.

Prioritized Objectives:

1. Objective A – Inventory and assessment.
2. Objective B – Incentives and improvements.

Priority Goal 5 – Feedlots.

Prioritized Objectives:

1. Objective A – Education and Communications.
2. Objective B – Incentives.

Recreational Resources

Priority Goal 1 – Fisheries Resources.

Prioritized Objectives:

1. Objective B – Fisheries Management.
2. Objective A – Planning Fish Resource Management.

Priority Goal 2 – Surface Water Use Management.

Prioritized Objectives:

1. Objective A – Education and Communications.
2. Objective B – Regulation.

Priority Goal 3 – Wildlife Resources.

Prioritized Objectives:

1. Objective A – Management.
2. Objective B – Assessments/Planning.

Administrative/Fiscal

Priority Goal 1 – Public Involvement.

Prioritized Objectives:

1. Objective A – Volunteerism.
2. Objective D – Implementation Subcommittees.
3. Objective C – Annual Meetings.
4. Objective B – Public Relations and Communications.

Priority Goal 2 – Fiscal Management.

Prioritized Objectives:

1. Objective A – Funding Opportunities.
2. Objective B – Budgetary Process.

Priority Goal 3 – Governmental Coordination.

Prioritized Objectives:

1. Objective A – Water and Land Resource Agencies.

E. Five – Year Implementation Program

The following series of tables reflects the implementation program proposed by the lake association. For each goal developed in Volume 2, this section outlines the implementation strategies, objectives, priorities, and estimated costs. It should be noted that work on some of the objectives is already in progress while others will need more coordination with outside agencies and organizations.

Each year, the lake association board and the working subcommittees should refer to this implementation program as guide for developing their annual work programs. Other agencies and organizations are encouraged to use the USLLIA Implementation Program when scheduling their projects and programs within the watershed.

Water Resources Implementation Program

Goal 1 – Water Quality. *Protect and enhance* surface water quality in lake and the watershed through sound scientific research and best management practices.

Rank	Objectives	Lead/ Supporting Agencies	Time Line	Estimated Cost
1	A – Education and Communications. Develop an education program with a specific lake/watershed focus that helps citizens to understand how their individual actions impact water quality.	Water Sub Co Water Plan Extension MPCA	Program in 2003, Ongoing	\$1,000
5	B – Monitoring. Continue and expand efforts to <i>support and assist</i> in the collection of water monitoring data of the in-lake and watershed conditions.	Water Sub MPCA DNR Outdoor Corps	Annual	\$500
3	C – Water Quality Data Analysis. <i>Develop</i> practical and sustainable methodologies that analyze and interpret water resource trends and communicate the results to the public.	Water Sub MPCA DNR	2003	Volunteers, Agency
2	D – BMPs. <i>Advocate and support</i> the use of Best Management Practices (BMPs) relating to surface water for all land uses and activities in the watershed.	Water Sub MPCA Co P & Z	Ongoing	Volunteers, Agency
4	E – Water Quality Projects. <i>Support</i> the implementation of water quality projects (financial, technical, administrative and political) in the watershed.	Water Sub SWCD NRCS	Ongoing	Volunteers, Agency

Goal 2 – Aquatic Vegetation. *Protect and increase* desirable aquatic vegetation in Upper South Long Lake including species that benefit fish and wildlife. *Prevent* the spread and presence of exotic aquatic vegetation species, particularly curlyleaf pondweed, Eurasian milfoil, and purple loosestrife..

Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
2	A – Public Awareness/Education. <i>Develop</i> educational or outreach programs on aquatic vegetation that target information resources to specific groups in the watershed.	Water Sub DNR Extension	Program in 2003, Ongoing	\$1,000
3	B – Inventory. <i>Develop</i> inventories of aquatic vegetation in the lake for existing and past conditions.	Water Sub DNR	2004	Volunteers, Agency
4	C – Monitoring. <i>Monitor</i> aquatic vegetation patterns in the lake on an ongoing basis as called for in the Vegetation Management Plan.	Water Sub DNR	Annual	Volunteers, Agency

5	D – Permitting/Enforcement. <i>Support</i> efforts by permitting/enforcing resource agencies to protect aquatic vegetation in the lake as specified in the Aquatic Vegetation Plan.	Water Sub	Ongoing	Volunteers, Agency
1	E – Vegetation Management. <i>Plant, restore and maintain</i> native aquatic vegetation in critical areas in the lake.	Water Sub DNR	Annual	\$500 per year

Goal 3 – Groundwater. *Protect and enhance* groundwater quality and quantity in the watershed.

Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
1	A – Monitoring. <i>Support</i> the monitoring of groundwater resources in the watershed.	Water Sub MPCA	Ongoing	Volunteers, Agency
2	B – Abandoned Wells. <i>Support</i> efforts by the county water planning programs to identify and properly seal abandoned wells.	Water Sub Co Water Plan MPCA	Annual	\$250 per year

Land Resources Implementation Program

Goal 1 – Septic Systems. *Promote and encourage* the safe and economical treatment of sanitary sewage in the watershed in order to protect public health and to minimize the availability of nutrients from human waste that affect water quality.

Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
1	A – Education and Communications. Obtain and distribute information on the proper septic system design and maintenance through programs administered by the County, local units of government, and state agencies.	Land Sub Co P&Z MPCA	Organize in 2003, Ongoing	\$250 per year
2	B – Inventory. Support the development and maintenance of an inventory of septic systems throughout the watershed starting with lots adjacent to the lake.	Land Sub Co P&Z SWCD MPCA	2004, 2005	\$1,000
3	C – Compliance. Increase compliance to 100 percent for all septic systems on 1 st and 2 nd tier properties by December 1, 2007. Support the point of sale and permit issuance compliance programs administered by the County.	Land Sub CO P&Z	2005, 2006	\$5,000
4	D – Regulation. Support efforts by the appropriate local governing unit to administer and enforce septic system regulations.	Land Sub CO P&Z MPCA	Ongoing	Volunteers, Agency

Goal 2 – Livestock. *Promote and encourage* the raising of livestock while balancing the need to protect water and land resources to help reduce movement of nutrients from animal waste to lakes and waterways.

Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
2	A – Education and Communications. <i>Support</i> efforts to improve the awareness by the general public of the importance of feedlots to the local economy, how they can be properly operated, ways to minimize impacts on water resources, and ways in which degradation to the environment can occur.	Land Sub Co P&Z MPCA	2004, ongoing	\$100, \$100 per year
1	B – Incentives. <i>Support</i> efforts by the resource agencies to assist feedlot operators and livestock producers to the use of Best Management Practices (BMPs) to reduce the movement of animal waste nutrients from entering waterways and lakes.	Land Sub Co P&Z MPCA	2004	\$1,000

Goal 3 – Erosion. *Promote and encourage* land use activities that prevent or minimize soil erosion (soil particles facilitate the movement of nutrients into watercourses).

Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
1	A – Inventory and Assessment. <i>Identify and prioritize</i> soil erosion sites and sources.	Land Sub SWCD NRCS	2004	Volunteers, Agency
2	B – Incentives and Improvements. <i>Work with</i> resource agencies to implement incentive programs and projects on private and public lands that improve water quality in the lakes.	Land Sub SWCD NRCS	2005 - 2008	\$2,500 per year

Goal 4 – Development. *Promote* the wise and sustainable use of land in the watershed to help support the sustainability of lake water quality.

Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
1	A – Comprehensive Planning First. <i>Support</i> the development and implementation of local comprehensive plans and policies that are based on sound water and land related resource principles.	Land Sub Co P&Z Townships	Ongoing	Volunteers, Agency

Goal 5 – Miscellaneous Issues. *Encourage* better stormwater management practices and the restoration of critical wetlands to maintain and improve water quality in the lakes.

Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
2	A – Stormwater Management. <i>Support</i> the development better stormwater management practices at the local level especially with new construction projects and development (NPDES permit process will apply to sites disturbing more than 1 acre) to improve lake water quality.	Land Sub Co P&Z MPCA	Ongoing	Volunteers, Agency
1	B – Wetland Protection and Restoration. <i>Identify, restore and enhance</i> wetland areas that improve surface water quality and promote groundwater recharge.	Land Sub	Ongoing	\$500 per year

Recreation Resources Implementation Program

Goal 1 – Fisheries Resources. <i>Protect and enhance</i> the fish resources in the lake.				
Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
2	A – Planning Fish Resource Management. <i>Support</i> efforts by the MN DNR to plan fisheries management efforts in the lake including the development of Fisheries (Lake) Management Plans for both lakes.	Rec Sub DNR	2003	Volunteers, Agency
1	B – Fisheries Management. <i>Support</i> efforts by the MN DNR to manage the fisheries in the lake.	Rec Sub DNR	Annual	Volunteers, Agency
Goal 2 – Wildlife Resources. <i>Protect and enhance</i> the wildlife resources in the watershed.				
Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
2	A – Assessments/Planning. <i>Work with</i> the MN DNR to assess the conditions of wildlife and habitat conditions in the watershed and <i>develop</i> management plans.	Rec Sub DNR	2005	Volunteers, Agency
1	B – Management. <i>Work with</i> the MN DNR to manage wildlife resources and improve habitat conditions in the watershed.	Rec Sub DNR	Annual	Volunteers, Agency
Goal 3 – Surface Water Use Management. <i>Promote</i> the safe and wise use of the surface waters of the lake for multiple recreational uses.				
Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
1	A – Education and Communications. <i>Support and coordinate</i> education efforts on the safe and wise use of surface waters of the lake.	Rec Sub DNR	2004	Volunteers, Agency
2	B – Regulation. <i>Explore</i> the development and adoption of surface water use regulations specifically developed for the lake.	Rec Sub DNR	Ongoing	Volunteers, Agency

Administrative/Fiscal Resources Implementation Program

Goal 1 – Public Involvement and Communications. *Encourage and promote* active, broad and ongoing involvement by citizens and landowners from throughout the watershed to participate in the implementation of the Upper South Lake Management Plan.

Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
1	A – Volunteerism. <i>Establish</i> sustainable approaches to organizing volunteers for implementing specific projects and programs as outlined in this Plan and as determined by the lake association.	Admin Sub Other Subs USLLIA Board	Ongoing	\$100 per year
4	B – Public Relations and Communications. <i>Develop</i> consistent and ongoing methods for informing the public about efforts being taken to improve the lake and the water resources in the watershed as well as those efforts that have been successfully completed.	Admin Sub Other Subs USLLIA Board	Ongoing	\$1,500 per year
3	C – Annual Meetings. <i>Continue</i> annual meetings for the lake association.	USLLIA Board Admin Sub	Annual	\$500 per year
2	D – Implementation Subcommittees. <i>Establish and support</i> working or implementation subcommittees to undertake the specific tasks and assignments necessary to complete the projects and programs developed in this Plan. The subcommittees are the main working force to implement the specific actions noted in this Plan.	USLLIA Board Admin Sub	2003	Volunteers

Goal 2 – Governmental Coordination. *Encourage* early and active involvement with public sector agencies, from local to federal, that have jurisdiction within the watershed to more successfully implement the Upper South Long Lake Management Plan.

Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
1	A – Water and Land Resource Agencies. <i>Support and coordinate</i> efforts with governmental agencies that manage land and water resources in the watershed.	Admin Sub Other Subs USLLIA Board	Ongoing	Volunteers

Goal 3 – Fiscal Management. *Promote* the implementation of the Upper South Long Lake Management Plan in a fair and fiscally responsible manner.

Rank	Objectives	Lead Supporting Agencies	Time Line	Estimated Cost
1	A – Funding Opportunities. <i>Maintain and update</i> an inventory of funding resources for implementing the Lake Management Plan including local, state, federal, non profit, foundation and private sources.	Admin Sub USLLIA Board	Ongoing	Volunteers
2	B – Budgetary Process. <i>Develop</i> an annual budget for implementation committees and the lake association.	Admin Sub Other Subs USLLIA Board	Annual Due in February	\$100 per year

Section 3

Evaluation and Maintenance of the Plan

F. Evaluation of Progress Made on the Lake Management Plan

It is important that the USLLIA monitor results from the implementation efforts to gauge their effectiveness and to develop a sense of accountability. The purpose of the following table is to provide the USLLIA with a tool to help inventory and evaluate success made towards implementing the goals and objectives set forth in this Plan.

Table
Quantifiable Targets

Category/Topic	Targets	2003	2004	2005	2006	2007
Water Resources						
Secchi Disk	feet					
Phosphorus	ppb summer mean					
TSI	average					
Land Resources						
Acres of Wetlands	acres					
Percent Complying Septics	total number					
Percent Complying Feedlots	total number					
Recreation Resources						
Boating Accidents	total number					
Boating Citations	total number					
Administrative Resources						
Number of Volunteers	total number					
Volunteer Hours	hours					
Committee Hours	hours					
Local Dollars Raised	\$					
Outside Dollars Raised	\$					

G. Plan Review and Update

Over the next five years, the Planning Committee anticipates that there will be many changes to the environmental, economic, and social conditions in the Lakeshed. These changes may require amendments or significant revisions to this Plan. Therefore, the lake association will need to maintain the plan over time.

Every five years, the Upper South Long Lake Management Plan should be reviewed and updated. The subcommittees and the USLLIA Board should initiate the process by reviewing the status of the goals, objectives and actions. Additional public input should be sought to provide the Committee with a new context with which to establish and revise the strategic policy framework.