Long Lake Polk County

Lake Management Plan Implementation

Large Scale Planning Grant Application
August 1, 2013

Project Scope/Description

a. Project area

The Lake

Long Lake is a 272-acre lake located in Polk County, Wisconsin in the Town of Balsam Lake (S6, S7, and S8, T34N, R17W). Its Water Body Identification Code is 2478200. The maximum depth of the lake is 17 feet and the mean depth is 11 feet. Its direct watershed is about 1,279 acres.[1] The lake is a seepage lake with no streams entering or leaving the lake. A ditch on the north end and another on the south end, flow to the lake during and after storm events.

Long Lake is a eutrophic to hypereutrophic lake with 2011 summer secchi depths averaging 4.6 feet. The 2011 littoral zone (the depth to which plants grow) ranged from 10 to 12 feet. The bottom substrate is composed of muck (75%), rock (13%) or sand (11%).[2] A lake map is found on the following page.

The main landing on the northwest side of the lake includes nine parking spaces for boats and trailers. It also has a public fishing pier with handicapped access. A second public access is located on the northeast side of the lake along Sunnyvale Lane. **(Point F1 and F2)**

Table 1. Long Lake Information

Size (acres)	272
Mean depth (feet)	11
Maximum depth (feet)	17
Littoral zone depth (feet)	11
Average summer secchi depth (feet) 1992-2011	4.9

[1] Barr. 2003.
[2] Berg. 2011.

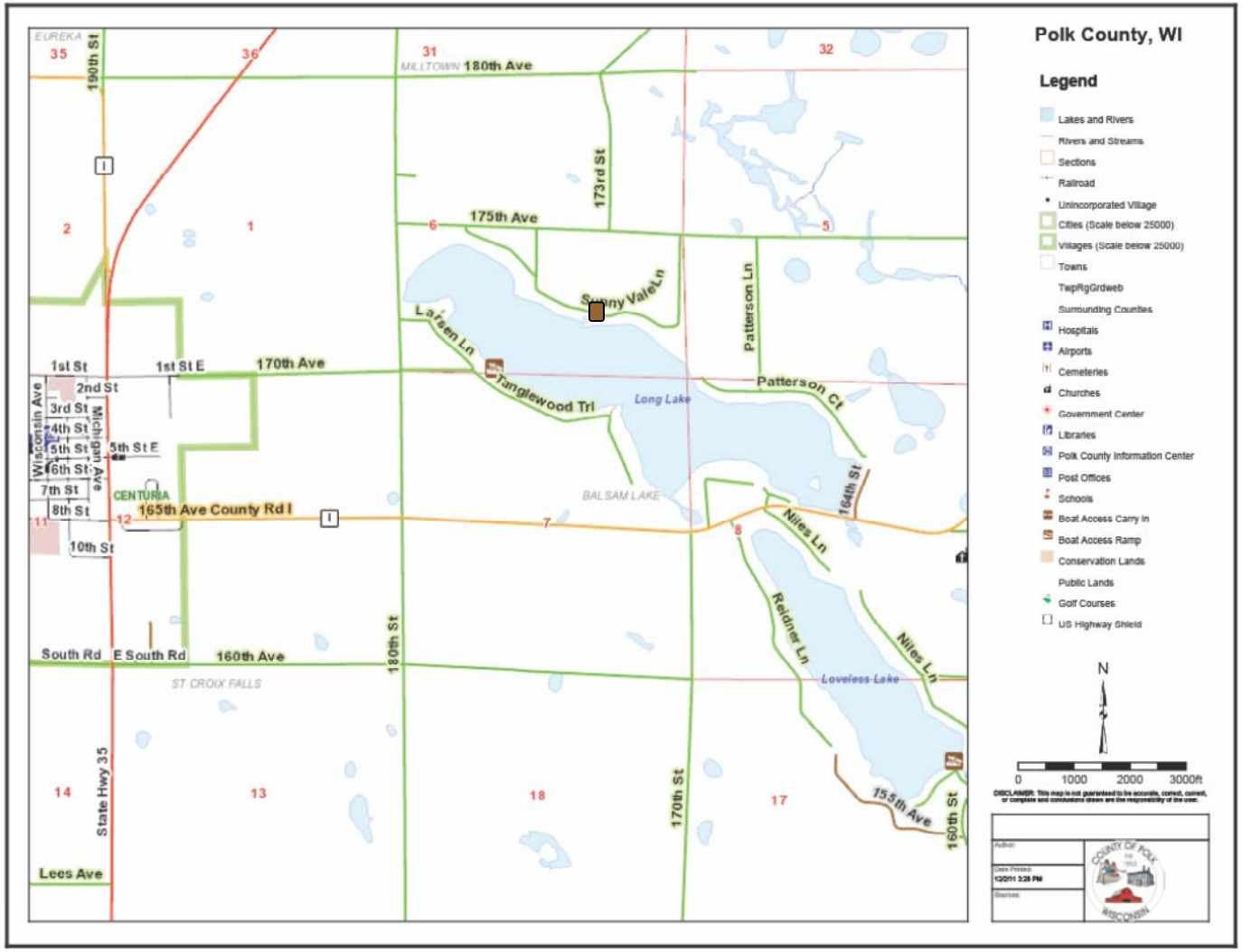

Figure 1. Long Lake Boating Access

Citizen lake monitoring volunteers have collected data from the lake annually at the deep hole of Long Lake since 1992. The lake was sampled 9 times during 2011 with an average reported secchi depth of 4.63. The TSI for this level is 55 – a eutrophic value. Figure 3 illustrates the Secchi depth averages for the lake. Figure 3 graphs the Trophic State Index for Long Lake, based upon Secchi depth, chlorophyll, dissolved oxygen, and total phosphorus results.

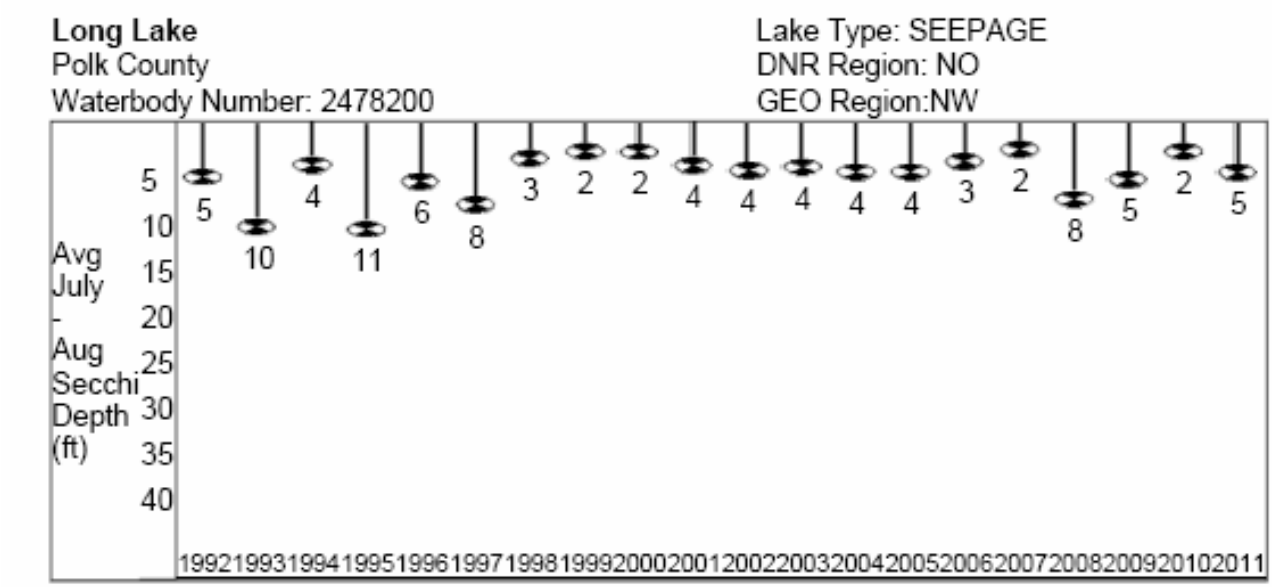

Figure 2. Long Lake Secchi Depths 1992-2011.

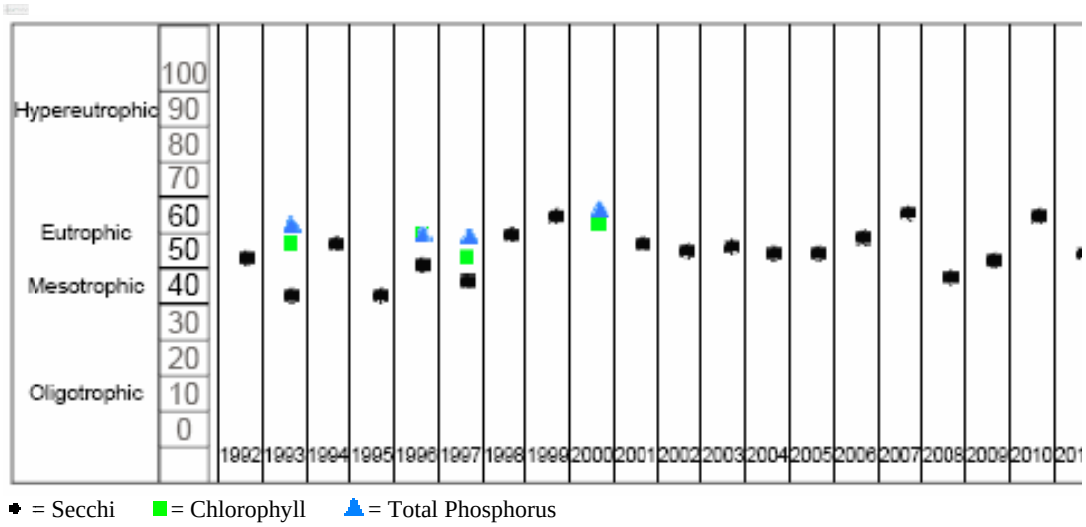

Figure 3. Average Trophic State 1992-2011.

Citizen monitoring results show good early summer water clarity with increasing algae growth and declining water clarity later in the summer. The trend of 2011 summer secchi depth readings shown in Figure 4 below is a typical summer trend.

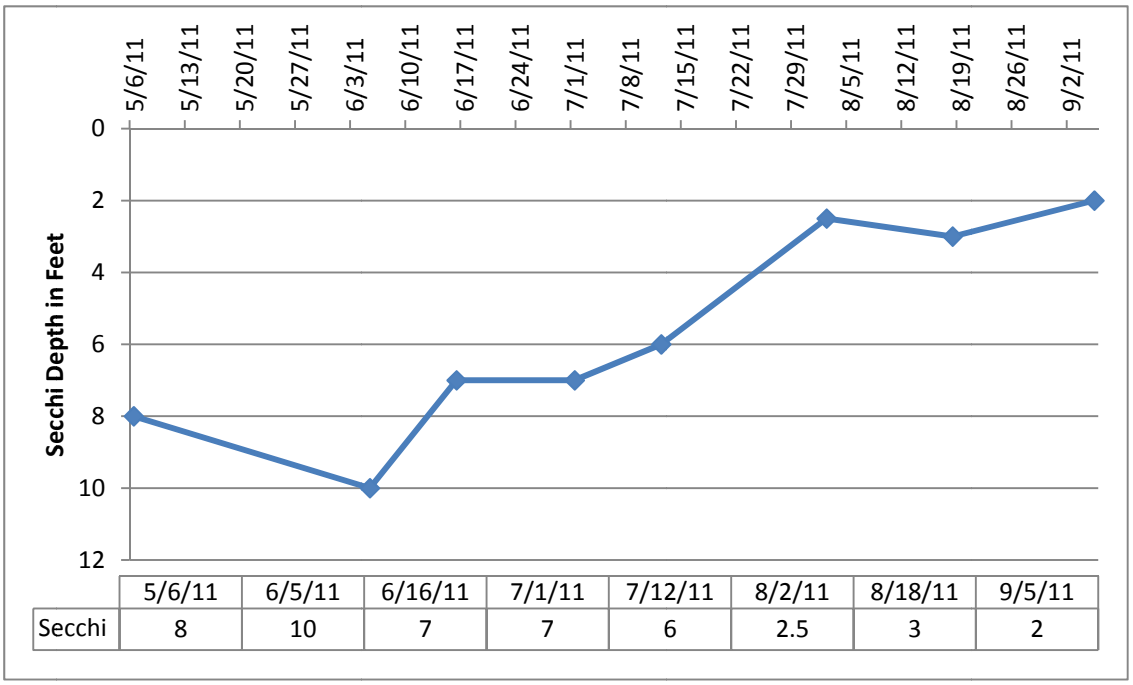

Figure 4. Long Lake Summer 2011 Secchi Depth Trend

Algae Study

The Polk County Land and Water Resources Department measured cyanobacteria (blue-green algae), the toxins they produce, and water quality parameters in 2010 and 2011. This study was prompted by the death of a dog in 2009, and other incidents suspected to be caused by cyanobacteria toxins. Cyanobacterial concentration was highest in late July. This spike in growth included a high concentration of *Aphinzomenon issatschenkoi*. This species produces anatoxin-A which was measured at high levels during this time period. Anatoxin-A affects nerve synapses. As shown in Figure 5, a spike in microcystin liver toxins occurred in late September 2010. This spike corresponded with fall lake mixing.[3] The World Health Organization established a level of 1ug/L mycrocystin-LR for long term consumption of drinking water. The level of mycrocystin-LR in Long Lake in September of 2010 was 79, with other mycrocystin toxins at even higher levels.

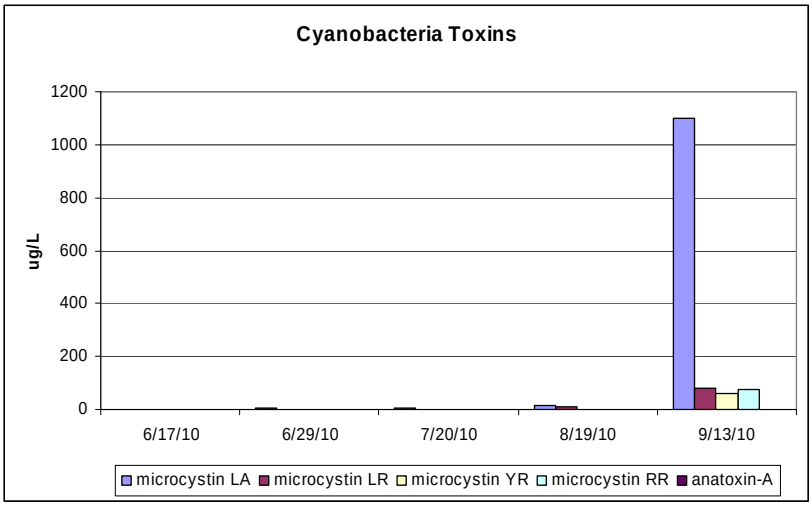

Figure 5. Cyanobacteria Toxins 2010

Lake Management Plan (Points A 1-6)

The LLPRD completed a comprehensive lake management plan with assistance from a DNR Large Scale Lake Management Planning Grant. The Polk County Land and Water Resources Department completed the lake study with assistance from lake volunteers in 2012. Polk County and Harmony Environmental developed the lake management plan with assistance from an advisory committee.

The lake management plan

- identifies and prioritizes lake management needs and sets goals
- provides specific lake water quality management objectives
- provides specific objectives for watershed and land use management
- provides specific management objectives for fish and wildlife habitat
- provides educational objectives.

[3] Williamson. 2010.

Project results will advance the implementation of the lake management plan. **(Point E3).** Implementation phases are identified in the lake management plan **(Point G4).**

Rare, Endangered, or Protected Species Habitat

Long Lake is located in the Town of Balsam Lake (T34N, R17W) in sections 6 and 7.[4]

Species listed in the Town of Balsam Lake (T34N, R17W):

Bald Eagle	*Haliaeetus leucocephalus*	Special Concern

b. Problem to be addressed by project

Long Lake water quality is poor in late summer, and cyanobacteria and the toxins they produce reduce recreational enjoyment and health and safety on the lake.

Additional investigation and education are needed to begin implementation of the management plan.

c. Project goals and objectives

d. Methods and activities

Goals, objectives and activities are taken from the lake management plan. Activities proposed for funding under this lake planning grant application are highlighted.

Water quality goal. Achieve and maintain a growing season mean total phosphorus concentration of .065 mg/L (65 ug/L.)

> *Phosphorus leads to algae blooms in Long Lake. Total phosphorus concentration at this level will mean that the lake will stay clear longer and there will be less risk from algae toxins. This goal is achievable only if both the internal load from lake sediments and the external load from the watershed are controlled. In 2012 the total phosphorus was .146 mg/L*

Water clarity goal. Extend the number of weeks that secchi depths exceed 4 feet and 2 ½ feet by 2 weeks.

> *Secchi depth is a measure of water clarity. It records the depth at which a black and white disk is no longer visible as it is lowered into the lake. A secchi depth of 4 feet is the threshold where algae growth increases greatly. The Chla level (a measure of algae growth) increases above .03 mg/L at this point. This transition occurred early in July in 2012. A secchi depth of 2 ½ feet corresponds to a Chla level*

[4] Natural Heritage data for Wisconsin is found at http://dnr.wi.gov/org/land/er/nhi. (data current as of 11/04/11)

of about .05 – the threshold from moderate to high risk for algae toxin production. This transition occurred in early August in 2012.

Evaluation:

1. Participate in DNR Expanded Self-Help Monitoring measuring total phosphorus, chlorophyll a, temperature and oxygen profiles in addition to secchi depth. *This is a newly added task for the lake district. Polk County LWRD no longer has support from the DNR or CDC to complete this task*. **(Point D1)**

2. Continue algal toxin measurements and algae assessment.

3. Consider conducting a sediment core study to establish a baseline of lake conditions, magnitude of changes, and progress with plan implementation.

Goal 1. Minimize nutrients, sediment, and other pollutants that flow to the lake from its watershed.

Objective A. Engage and support agricultural producers in reducing runoff to Long Lake.

Actions

1. Invite agricultural producers to special lake meetings and develop other means to reach out to farmers in a positive manner.

2. Inventory crop fields and other agricultural land uses to identify positive practices and where priority improvements could be made. Polk County LWRD will complete this task. *This will include delineation of surface runoff patterns and environmentally sensitive areas that are currently row-cropped.* **(Point C2)** *It will also develop a management strategy for addressing the identified sensitive areas including best management practices.* **(Point C4)**

3. Share information about positive agricultural and residential practices with lake owners and agricultural producers.

4. Pay for soil tests to measure phosphorus levels in crop fields. Polk County LWRD will complete this task. **(Point D2)**

5. Consider financially supporting the installation of priority best management practices including sediment basins.

Develop sediment basin designs for locations identified in the lake management plan Polk County LWRD will complete this task. **(Point E2)**

6. Consider purchasing land or easements to allow installation of priority best management practices including sediment basins.

7. Evaluate to track improvements made and determine next steps.

Objective B. At least 50 percent of Long Lake owners carry out best management practices to reduce runoff to the lake.

Actions

1. Provide information about residential best management practices in meetings, personal visits, newsletters, and emails.

2. Teach residents about residential best management practices at workshops, demonstrations, and tours.

3. Provide free design assistance for water quality landscaping and habitat improvements to lake residents if funds are available from the LLPRD, grants, and other sources.

4. Assemble and train volunteers and provide volunteer support for project installation.

5. Share in the cost of project installation if funds are available from the LLPRD, grants, and other sources.

6. Provide recognition in the form of a sign or dock marker to raise interest, and/or consider a special listing in the homeowner's directory with permission from the landowner.

7. Evaluate to track best management practices implemented and determine next steps. *Next steps will include a shoreland restoration and protection program for the lake.* **(Point B2)**

Goal 2. Encourage lake processes which minimize the release of nutrients from within the lake.

Objective A. Investigate/pursue in-lake management techniques including alum treatment and aeration.

Actions

1. Conduct an alum dosage study to determine appropriate alum application rates and cost. (small scale lake planning grant or lake protection grant)

2. Measure soluble and total iron in the hypolimnion (near lake bottom) to assess potential efficacy of an aeration system.

Objective B. Reduce internal loading from lake sediments by 90 percent.

Actions

1. Develop financing and install the recommended in- management technique(s).
2. Repeat selected treatment as needed.

Objective C. Reduce phosphorus loading from curly leaf pondweed by reducing beds to less than 20 acres and preventing CLP spread (from Aquatic Plant Management Plan).

Objective D. Increase native aquatic plant rooting depth (from Aquatic Plant Management Plan).

Actions for Objectives C and D are described in the Long Lake Aquatic Plant Management Plan.

Goal 3. Preserve and enhance lake and shoreline fish and wildlife habitat.

Objective A. Encourage installation of residential best management practices, such as native plantings and woody habitat, which improve habitat.

Actions are described under Goal 1, Objective B.

Survey potential locations on the lake appropriate for woody habitat installation (Point B1) and develop a strategy for woody habitat installation. (Point E1)

Goal 4. Lake residents and visitors understand the components of and the means to support a healthy lake.

Objective A. Lake residents understand the rationale behind the plan actions and have enough information to make sound decisions.

Objective B. Lake residents take action to improve lake water quality and habitat.

Messages to convey:

- Messages should be simple, and they should be repeated. Recipients can be directed to more in-depth information if interested.
- Celebrate the progress made with aquatic plant and lake management so far.
- Explain plan goals and actions.
- There is an urgency to lake water quality improvements. Algae toxins are a threat to the safety and well-being our families, visitors, and pets and wildlife.
- Describe conditions when algae toxins are a likely concern.

Educational methods:

- LLPRD and Long Lake Association newsletters
- Handouts/brochures (alum handout is one example)
- Presentations (annual meeting, seminars) – encourage new owners to attend, bring in credible experts such as Bill James, use testimonials from owners, include food
- Website: http://longlakepolk.ning.com/
- Email list
- Lake Association welcome packets for new lake residents – add water quality and plan information
- Articles for the Lake News edition of the Ledger Newspaper
- Letter from the LLPRD president, include on web site
- Additional educational methods are described under Plan Goal 1.

e. Project products or deliverables

Crop field soil test results
Crop field phosphorus delivery
Crop field bmp priorities
Sediment basin design
Workshops and demonstrations
Trained volunteers
Residential recognition program
Waterfront designs (3+properties)

f. Data to be collected

Lake secchi, TP and Chla
Crop field soil phosphorus

g. Existing and proposed partnerships

Staff from the Polk County Land and Water Resources Department will conduct agricultural best management practice investigation and design. Polk County LWRD staff completed the lake quality study and have assessed algae and toxins for multiple years.

The Long Lake Association will assist with delivering educational messages to lake residents.

h. Role of project in planning and/or management of lake

The Long Lake Aquatic Plant Management Plan has been approved by the DNR. The Lake Management Plan will be submitted for review.

The project is consistent with the ***Polk County Land and Water Management Plan.*** 2009. Some overlapping goals and objectives are outlined below. **(Point H2)**
Goal 1. Protect the water quality of our groundwater, lakes, streams, rivers, creeks, and associated ecosystems.

Objective 1B. Limit the amount of non-point phosphorus reaching our water bodies to prevent degradation from agricultural land uses.
Objective 1D. Monitor water quality to ascertain condition and alleviate problems before they impact the resource or human health.
Goal 2. Protect shorelines, undeveloped riparian land, wetlands and aquatic plant communities, grasslands, forests, upland plant communities, farmland, and agricultural resources to perpetuate the benefits they provide: habitat and associated native wildlife communities, clean water, clean air, carbon sequestration, aesthetic beauty, and recreational opportunities.

The Department of Natural Resources updated the ***St. Croix Basin Plan*** in 2002 for the Wisconsin portion of the watershed. Goals include maintaining and **improving water and air quality; maintaining diverse, rich shoreland habitat;** preserving large contiguous blocks of forestland, grassland, prairie, and wetlands; **working with the agricultural community to minimize nonpoint runoff;** working with cities, villages, towns and counties to help stem urban sprawl; and **providing education and technical assistance to enhance voluntary conservation.**

i. Timetable for implementation

See implementation charts.

j. Plan for sharing project results

Draft and final documents will be made available to the public and other resource agencies.
Educational materials will be posted on the Long Lake web site, included in newsletter articles, and presented at the LLPRD annual meeting.

k. Other information not described above