



Lake Vegetation Management Plan

Lake Sarah, Hennepin County

- Draft LVMP (No Signatures)
- Final LVMP with Signatures (Variance Approved - see Section 8 & 9)

Date Signed: 3/11/2013

Expiration Date: 3/11/2018

Summary: This Lake Vegetation Management Plan (LVMP) authorizes a variance to allow treatment of more than 15% of the littoral area of Lake Sarah, Hennepin County to control curly-leaf pondweed. All other APM permits for submerged plants will be subject to 50 x 50 foot minimum standard. Justification for this variance includes the potential for this project to further research on the control of invasive aquatic plants in conjunction with an alum treatment.

Section 1: Lake Information

Name: **Sarah** Surface Acres: **583 acres**
 County: **Hennepin** Littoral Acres: **373 acres (64%)**
 DOW Number: **27019100** Maximum Depth: **59 feet**
 Fisheries Area: **West Metro** Median Depth: **9.7 feet**
 Classification: **Recreational Development**
 Cooperator(s): Pioneer Sarah Creek Watershed Commission (PSCWMC), Three Rivers Park District (TRPD),
 Lake Sarah Improvement Association (LSIA)

Section 2: Water Quality and Plant Community

A. Water Quality

Table 1. Water quality measures observed in Sarah Lake (27019100)			
Water Quality Measures	Averages (June-Sept)	Observations	Monitored Years
Total Phosphorus [$\mu\text{g per L}$]	87 ppb	10	2003-2012
Chlorophyll-a [$\mu\text{g per L}$]	48 ppb	9	2003-2012
Secchi Depth [meters]	1.0 meters	133	2003-2012

(Narrative - describe water quality concerns, quantify TSI, note if impaired or if TMDL exists):

Lake Sarah was listed in Minnesota's impaired waters list in 2006 due to excessive phosphorus. Water quality in the lake exceeds the lake eutrophication standards for deep lakes in the North Central Hardwood Forest ecoregion. Lake Sarah typically has TSI values for each parameter that ranged



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between 54 and 87, indicating eutrophic to hypereutrophic conditions. A TMDL Implementation Plan (available here: <http://www.pca.state.mn.us/index.php/view-document.html?gid=16315>) was completed for the lake in 2011 and include the management of curly-leaf pondweed (CLP) to achieve 914 lbs. per year internal phosphorus load reduction. In addition to CLP reduction, an alum treatment is proposed to be applied sometime after the initial 5-year herbicide treatment of CLP. **This document does not authorize an alum treatment.** An alum treatment is part of the longer term plan to reduce phosphorus levels, improve water clarity, and restore a more robust and diverse native plant community.

B. Plant Community: (Narrative below & see Table 2):

Table 2. Percent frequency of plants observed in Lake Sarah (DOW 27019101 & 27019102) from 2011-2012

Growth Form	Common Name	Scientific Name	6/9/2011	8/11/2011	6/7/2012	8/15/2012
Submersed	coontail	<i>Ceratophyllum demersum</i>	26	43	42	43
	muskgrass	<i>Chara spp</i>	1	-	1	-
	Canadian waterweed	<i>Elodea canadensis</i>	4	-	5	5
	water stargrass	<i>Heteranthera dubia</i>	-	-	2	-
	curly-leaf pondweed	<i>Potamogeton crispus</i>	65	6	38	5
	northern watermilfoil	<i>Myriophyllum sibiricum</i>	-	-	5	6
	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>	26	16	23	6
	naiad	<i>Najas flexilis</i>	-	1	1	-
	small pondweed	<i>Potamogeton pusillus</i>	-	-	6	1
	water celery	<i>Vallisneria americana</i>	-	3	-	3
	leafy pondweed	<i>Potamogeton foliosus</i>	4	-	-	-
	flat-stem pondweed	<i>Potamogeton zosteriformis</i>	1	-	-	-
Floating-leaf	spatterdock	<i>Nuphar variegata</i>	-	1	-	1
	white water-lily	<i>Nymphaea odorata</i>	-	-	-	15
Free-floating	small duckweed	<i>Lemna minor</i>	-	-	-	1
	forked duckweed	<i>Lemna trisulca</i>	10	19	-	17
	common duckweed	<i>Spirodela polyrhiza</i>	-	2	-	5
	watermeal	<i>Wolffia</i>	1	1	-	2



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Narrative:

The most recent aquatic plant surveys for Lake Sarah were completed in 2012 by Three Rivers Park District (see Table 2 above). The surveys followed the point intercept methodology developed by Madsen (1999). Aquatic plants were surveyed at 197 points within the littoral zone of both basins of the lake. Both surveys of Lake Sarah had average species richness of 12. The most dominant plant species include aquatic invasive plants: curly-leaf pondweed and Eurasian watermilfoil. The frequency of occurrence for curly-leaf pondweed for the spring plant surveys was 65% (2011) and 38% (2012).

Aquatic plant surveys were also completed for the years of 2006, 2007, 2008, 2009 and 2011.

Section 3: Public Participation Process (Narrative):

There are approximately 165 shoreline owners surrounding Lake Sarah, of which the largest lakeshore owner is the Three Rivers Park District (Rebecca Park). Due to the recent TMDL process, a public input meeting was held in January 2011. Further, the Lake Sarah Improvement Association (LSIA) has mailed three educational newsletters and held three public meetings (including non-members) in April, July, and November 2011. All of these meetings included public education and awareness from Richard Brasch (Three Rivers Parks) as to the TMDL findings and LSIA proposed actions (lakewide CLP chemical control) consistent with the TMDL Implementation Plan. In addition to the public meeting LSIA maintains an actively managed and monitored website (www.lakesarah.com).

Section 4: Problems to be Addressed in this Plan (Narrative):

1. Low abundance of native plants
2. Curly-leaf pondweed (CLP) surface matting interferes with recreational uses
3. Low water clarity
4. High concentration of phosphorous and subsequent algal blooms
5. Potential increase in Eurasian watermilfoil following control of curly-leaf pondweed
6. Lack of comprehensive understanding of the relationship among CLP, water quality and native submersed plants

Section 5: Goals for Management of Aquatic Plants (Narrative):

A. Plant Management Goals & Measureable Objectives:

1. Maintain or increase native plant distribution and species richness
 - a. Native plant distribution and species richness shall be maintained or increase
 - b. Subsequent treatment of native plants for access shall be limited
2. Control CLP to reduce interference with recreational lake use



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- a. Reduction in annual delineated acres of CLP in spring

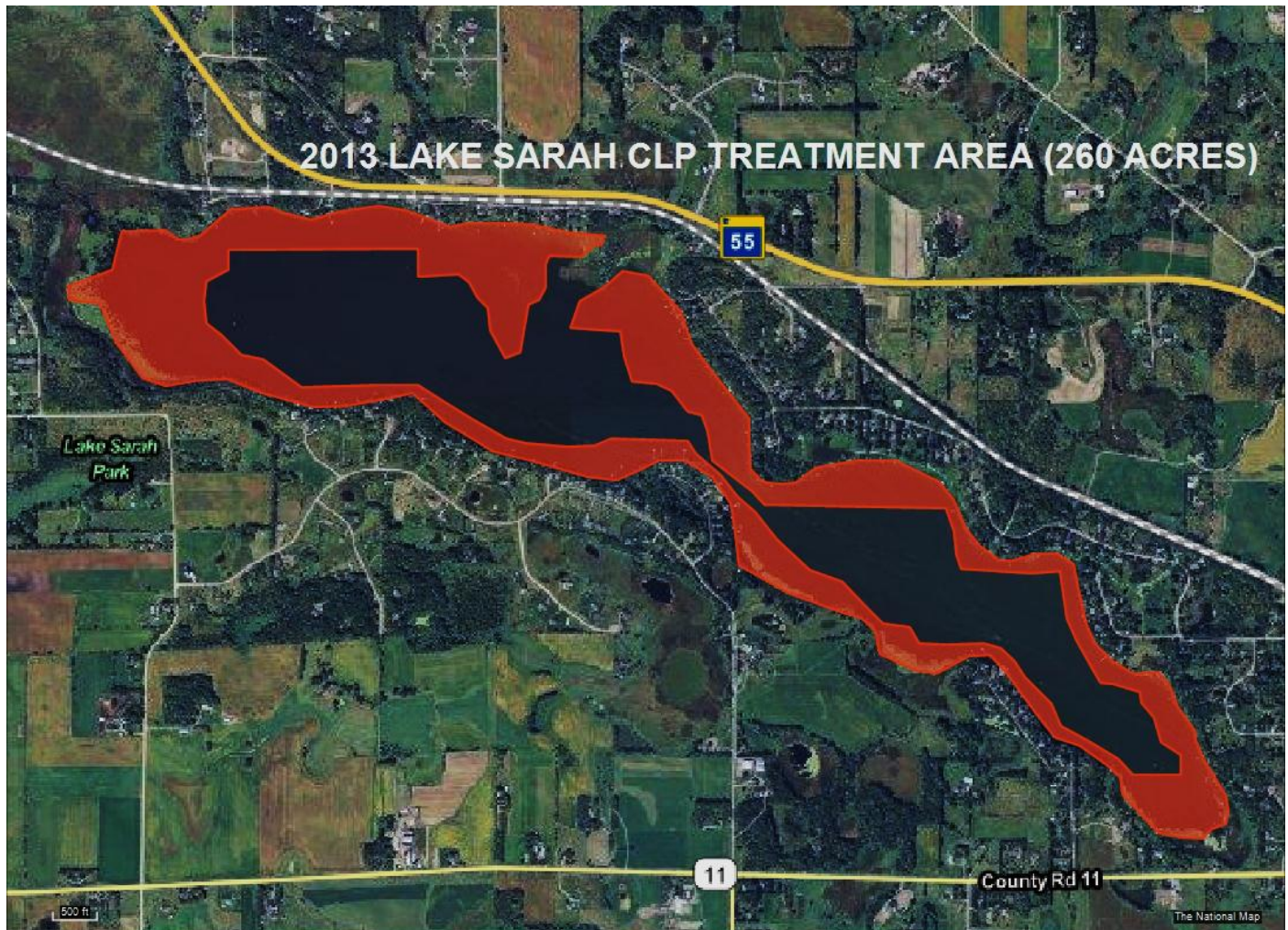
B. Additional Management Goals & Measureable Objectives:

1. Maintain or increase water clarity
 - a. Water clarity as indicated by Secchi depth shall be maintained or increase
2. Reduce concentration of phosphorous (TP)
 - a. TP shall decrease (compared to 2012 data & ecoregion standard)
 - b. Phytoplankton, as indicated by Chlorophyll-*a* shall decrease

Section 6: Proposed Actions to Achieve Plant Management Goals

A. Whole lake treatment: *(See map below where control of plants is anticipated):*

- Herbicide Control: Selective control of curly-leaf pondweed beyond the 15% littoral limit.
(The treatment area will be determined by early spring delineation and MNDNR approval.)





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Narrative:

Curly leaf pondweed will be treated using the early season application of endothol. Applying herbicides in early spring can potentially increase their selectivity by targeting CLP at a time when these invasive species are actively growing and when many native species remain dormant. Chemical application will occur prior to the seasonal active growth phase of native plants to specifically target curly-leaf pondweed before the development of viable turions. Water temperatures will be monitored by LSIA volunteers to ensure applications are made in the recommended temperature range. Treatment applications will be performed by LSIA trained volunteers.

NOTE - The treatment protocol may change as new information becomes available. If the treatment protocol changes the new treatment protocol and why it was changed will be added to the LVMP in the appendix and those conditions will be incorporated into APM permits.

B. Individual Near-Shore Permit Standards *(new APM permits after lake-wide treatment, not including IAPM permits for Eurasian watermilfoil which are subject to 15% littoral limit)*

- Herbicide Control: Treatment of submerged plants up to 50 feet or half the frontage whichever is less, 50 feet lakeward

Narrative:

Permit applications received from riparian landowners for chemical treatment of native submersed plant after the lake-wide treatment will be considered on an individual basis. Removal of native submersed vegetation will be limited to that area necessary to allow reasonable use, with the maximum area being no more than 50 feet wide, or half of the owner's frontage whichever is less, by 50 feet lakeward plus a 15 foot wide channel to open water that may extend from the lakeward side of the 50 x 50 foot area. No removal of sparse native vegetation through the use of chemicals will be permitted. Permit requests are subject to inspection and the aforementioned limits are maximums allowed for native species control.

C. Additional Management Actions: *(Narrative of other planned actions relevant to this LVMP)*

In addition to proposed lake-wide CLP control, cooperators of this plan have outlined the existing Lake Sarah TMDL implementation plan (available here: <http://www.pca.state.mn.us/index.php/view-document.html?gid=16315>). Partners involved with the development of this LVMP have a comprehensive approach to enhance the native plant community and improve water quality which includes: annual monitoring, external watershed treatments and a proposed alum treatment for the future.



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D. Alternative Methods Considered: *(Description of pest management alternatives considered including impacts to water quality, impact to non-target organisms, feasibility and cost effectiveness)*

This section is required to meet the requirements of MNG87D000 Vegetative Pests and Algae Control Pesticide General Permit, which was issued by the Minnesota Pollution Control Agency to meet requirements of the National Pollution Discharge Elimination System.

Target Pest:

Curly-leaf pondweed

No Action:

The result of no action could result in the expansion of curly-leaf pondweed in this water body and could also result in transport of invasive plants to other water bodies. Curly-leaf pondweed has the ability to compete with and displace the native plants and alter the native plant community. In addition, no action could result in continued internal loading of phosphorous, due to CLP growth and senescence, further contributing to poor water quality.

Prevention:

The MN DNR has an AIS Prevention program to stop the spread of invasive species. This includes designating and posting signage on infested waters, enforcement of AIS laws, inspect and educate boaters at water accesses, and decontaminate water equipment as needed.

Mechanical/Physical Methods:

Hand pulling of submersed vegetation is a control option. Hand pulling is labor intensive and typically is done in shallow water, less than five feet in depth in small areas around docks and beaches. Mechanical harvesting is another control option. The cost is considerable, from \$200 to \$750 per acre. In this case, these methods are considered to be infeasible due to high cost and large amount of time required to employ these methods.

Cultural Methods:

These are manipulations of the habitat to increase pest mortality by making the habitat less suitable to the pest. Examples include dredging a lake to increase depth or water level manipulations such as whole-lake drawdowns to make the habitat unsuitable for the target pest. Generally, such approaches are infeasible due to high cost and potential to reduce the abundance of desirable native plants.

Biological Control Agents:

At present, there are no proven and acceptable biocontrol agents for curly-leaf pondweed.



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Section 7: Variance Conditions & Approval *(check all that apply)*

The commissioner may issue APM permits (and IAPM permits) with a variance from one or more of the provisions of parts 6280.0250, subpart 4, and 6280.0350, except that no variance may be issued for part 6280.0250, subpart 4, items B and C. Variances may be issued to control invasive aquatic plants, protect or improve aquatic resources, provide riparian access, or enhance recreational use on public waters (6280.1000, subpart 1).

Variance(s) and Justification(s)

- Application of pesticides to control submerged vegetation in more than 15 percent of the littoral area (M.R. 6280.0350, Subp. 4, A).**

Justifications (identify which variance and provide the rational for all items checked above):

A variance to control CLP in more than 15% littoral area will provide recreational and ecological benefits by (1) minimizing recreational impairment and (2) increasing the likelihood of effective CLP control by allowing for larger contiguous areas to be treated (*variance to M.R. 6280.0350, Subp. 4, A*).

The Lake Sarah TMDL Implementation Plan as well as the positive results Three Rivers Park District is seeing in long-term CLP reduction (Lake Rebecca & Hyland Lake) constitutes the need for further research and evaluation of whole-lake CLP management. This LVMP facilitates this research, is expected to increase native plant abundance and diversity, as well as provide for improved recreational access for all users of Lake Sarah.

- Variance approved with monitoring conditions** *(See Section 8 below)*

Section 8: Required Monitoring & Evaluation *(See Table 3 below for clarification)*

- Pre-treatment delineation collection** *(provided annually to the MNDNR)*
- Post treatment herbicide report** *(provided annually to the MNDNR)*
- Lake-wide plant survey** *(provided annually to the MNDNR)*
- Evaluation** *(Conducted annually by MNDNR with cooperators)*

The DNR, in conjunction with other interested parties, will review the plant survey(s) and water quality results annually. If plant surveys or water quality data reveal that the treatments appear to be producing results that do not meet the goals of this plan, then the approach to control may be revised at the discretion of the DNR. If treatments need to be modified, the DNR will work with the LSIA and partners to develop an alternative management strategy. LSIA is responsible for ensuring that all required monitoring is collected in accordance with DNR guidelines and are submitted to the DNR.



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Table 3. Lake Sarah (27019100) aquatic plant management monitoring requirements

	Annual monitoring requirements	When?	Completed by whom?
A	Pre-treatment delineation of curly-leaf pondweed (1)	Early spring with report/map provided to the MnDNR	LSIA, TRPD or approved contractor other than the commercial applicator for this project
B	Whole-lake plant survey using point intercept methodology (1)	Mid-summer (July-September) with report provided to the MnDNR by 31 December annually	TRPD or approved contractor other than the commercial applicator for this project
C	Observations of Secchi depth, Total Phosphorous and Chlorophyll-a (multiple)	Twice per month from May 1 st - September 30 th with final report provided to the MnDNR by 31 December annually	TRPD or approved contractor other than the commercial applicator for this project
E	Post herbicide treatment report (1)	Provided to the MnDNR by 31 December annually	LSIA or approved contractor/commercial applicator



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Section 9: Signatures

This Lake Vegetation Management Plan is in effect for 5 years from date of Regional Fisheries approval. If the plan is not renewed, then permits will be issued according to the standards listed in MR6280.

DNR Approval:

Submitted By: _____

Title: _____

Date: _____

Regional Fisheries Manager

Date

Regional Ecological & Water Resources Manager

Date

I affirm that I am an authorized representative of **Lake Sarah Improvement Association** or **Three Rivers Park District** and acknowledge participation in the development and implementation of this lake vegetation management plan.

Cooperator's Signature and Title

Date

Cooperator's Signature and Title

Date

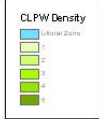
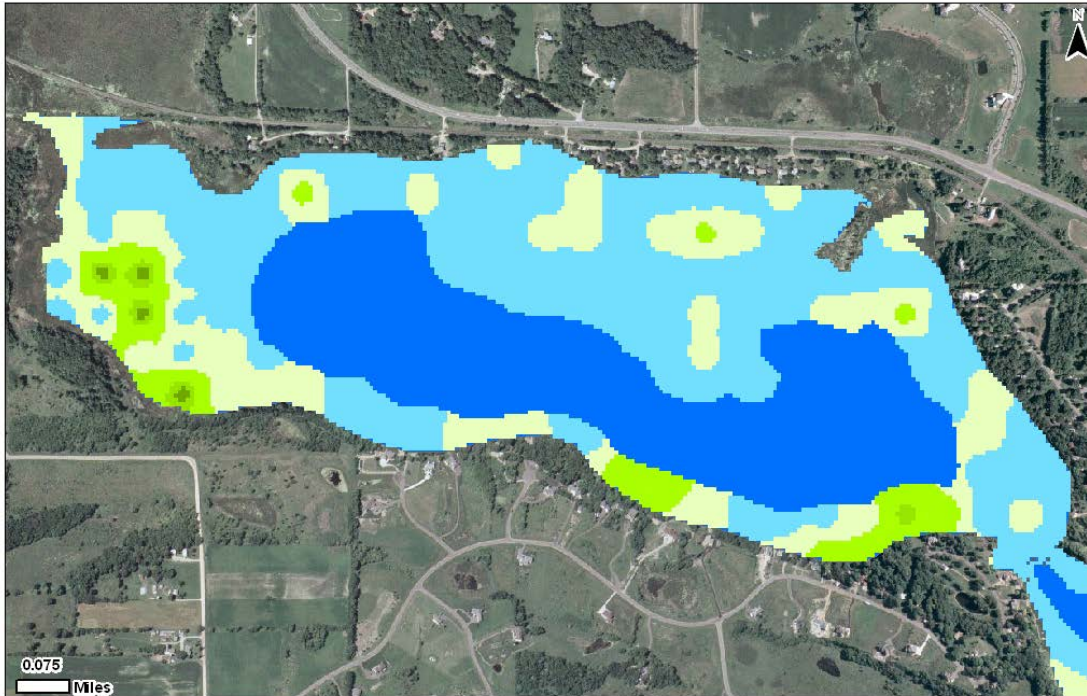
Either party may terminate participation in this plan at any time, with or without cause, upon 30 days' written notice to the other party. If participation is terminated, permits will be issued according to standards listed MR6280.



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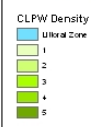
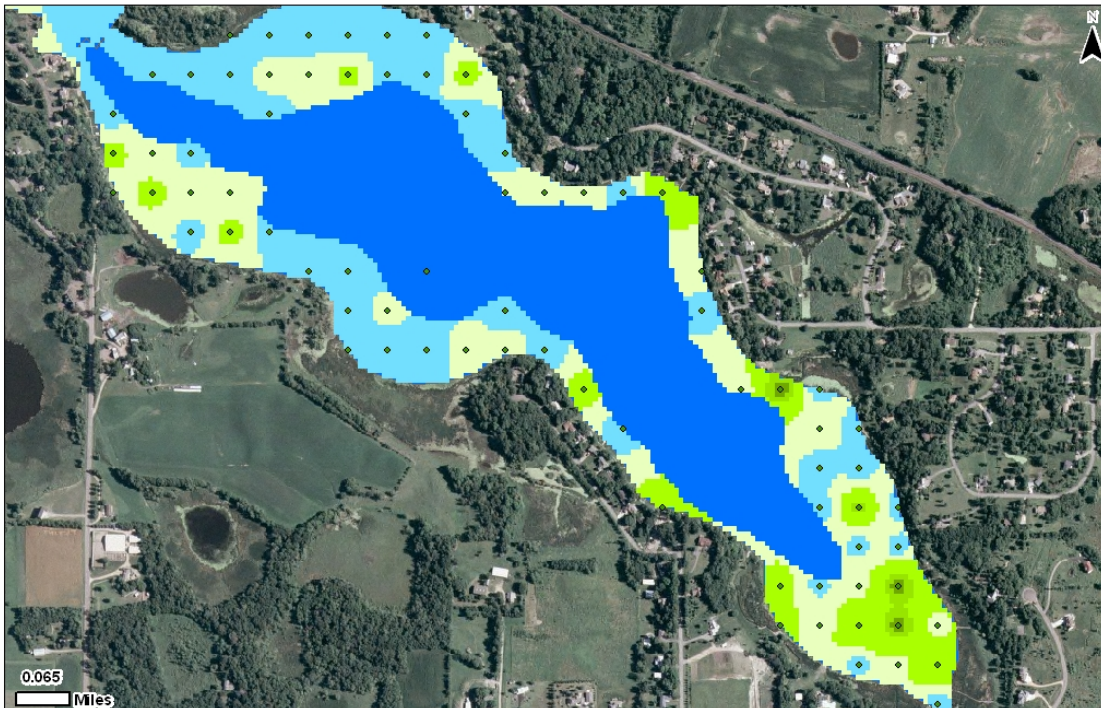
Section 10: Appendix



Lake Sarah-West
Curly-leaf Pondweed
6-8-2012

Curly-leaf pondweed senesced prior to our vegetation survey. This data may not reflect actual Curly-leaf Pondweed densities.

This map is a compilation of data from various sources and is provided "as is" without warranty of any representation of accuracy, timeliness, or completeness. The user acknowledges and accepts the limitations of the Data, including the fact that the Data is dynamic and in a constant state of maintenance, correction, and update.



Lake Sarah-East
Curly-leaf Pondweed
6-7-2012

Curly-leaf Pondweed senesced prior to our vegetation survey. This data may not reflect actual Curly-leaf Pondweed densities.

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Section 9: Signatures

This Lake Vegetation Management Plan is in effect for 5 years from date of Regional Fisheries approval. If the plan is not renewed, then permits will be issued according to the standards listed in MR6280.

DNR Approval:

Submitted By: Keegan Lund

Title: Invasive Species Specialist

Date: 3.7.2013

Bradford Parsons
 Regional Fisheries Manager

3-7-2013
 Date

Jim Farnsworth
 Regional Ecological & Water Resources Manager

03-07-2013
 Date

I affirm that I am an authorized representative of **Lake Sarah Improvement Association** or **Three Rivers Park District** and acknowledge participation in the development and implementation of this lake vegetation management plan.

Joe Baker, LSIA Director
 Cooperator's Signature and Title

March 11, 2013
 Date

Rick Bauer, TRPD Sr. Mgr. Water Resources
 Cooperator's Signature and Title

3-13-2013
 Date

Either party may terminate participation in this plan at any time, with or without cause, upon 30 days' written notice to the other party. If participation is terminated, permits will be issued according to standards listed MR6280.