2011 End of Year Project Summary

Poskin Lake Interim AIS Education, Prevention, and Planning Project

Barron County, WI

DNR No. AEPP-274-11
SEH No. POSKI 116511

January 28, 2012

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RE: Poskin Lake Interim AIS Education, Prevention, and Planning Project
2011 End of Year Project Summary
Barron County, WI
DNR Project No. AEPP-274-11
SEH No. POSKI 116511

Mr. Larry Kahl, President
Poskin Lake Association
856 15th Avenue
Almena, WI 54805

Dear Larry:

The following is intended to be an end of year summary of tasks completed to accompany a Potato Lake Association request for partial reimbursement related to the current 2011-12 AIS education, prevention, and planning grant funded project. It is not intended to be a final report for the project. The end date associated with this project is June 30, 2012, and several tasks have yet to be completed.

Sincerely,

Lake Scientist

dlb
p:\pt\p\poski\116511\end of year report\end of year 2011 summary.docx

2011 End of Year Project Summary

Poskin Lake Interim AIS Education, Prevention, and Planning Project
Barron County, WI

Prepared for:
Poskin Lake Association
Poskin, WI

Prepared by:
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_____ _____

Lake Scientist Date

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2011 End of Year Project Summary

Poskin Lake Interim AIS Education, Prevention, and Planning Project

Prepared for Poskin Lake Association

1.0 Introduction

This project was intended to be an interim plan of actions until watershed-wide lake protection projects could be identified and funding for them applied for from the Wisconsin Department of Natural Resources (WDNR) by the Poskin Lake Association (PLA). This project has four main goals: 1) support AIS education, prevention, and monitoring programs on Poskin Lake, 2) gather additional information about the extent of curly-leaf pondweed (a non-native, aquatic invasive species) in the lake, 3) continue existing water quality monitoring and collect additional storm water runoff data, and 4) promote, plan, and implement shoreland best management practices on Poskin Lake.

The following task update is intended only as an end of year summary for the purpose of a partial project reimbursement for activities completed through the end of October 2011. The entire project is not scheduled for completion until June 30, 2012. A final Project Report will be completed in the spring or early summer 2012.

2.0 Aquatic Invasive Species Education and Monitoring

As a part of this project, the Poskin Lake Association continued its AIS education program on behalf of residents and users of Poskin Lake. This program has three parts: watercraft inspection, in-lake AIS monitoring, and public education.

2.1 Watercraft Inspection

Use of Poskin Lake by boats outside of the residents on the lake is limited to a couple boats a weekend, and occasional use by visitors to the Poskin Lake Resort. In 2011, more than 50 hours of volunteer watercraft inspection time was put in at the public landing. One resident of the lake took the lead in these inspection activities, providing refresher training for those few volunteers that assisted following UW-Extension Lakes Clean Boats, Clean Waters guidelines. Data from 2011 has been entered into the SWIMS database, but is not complete yet. The project provided funding for paid inspection time as well, though little of this time was tapped into. Watercraft inspection will continue into the 2012 season, where it is expected that more time will be generated.

2.2 In-lake AIS Monitoring

Several volunteers put in more than 70 hours of in-lake AIS monitoring time in 2011. A training session was held early in the summer, attended by several Poskin Lake Association representatives. Volunteers are monitoring for EWM, PL, CLP, and several other AIS as a part of the Citizen Lake Monitoring Network AIS Monitoring Program. No additional AIS

were identified in 2011 and end of year summary results are being entered into the SWIMS database.

2.3 Public Education Efforts

A Lake Fair was held coinciding with the annual Poskin Lake Association Picnic August 13, 2011. In addition, two newsletters were developed and mailed to all residents on the Lake.

3.0 Aquatic Invasive Species Management

Curly-leaf pondweed and Chinese mystery snails are the only AIS know to be in Poskin Lake. The level of CLP in the system warrants annul monitoring, but not necessarily annual treatment. No management is currently under way related to the snails.

3.1 Curly-leaf Pondweed (CLP

The Poskin Lake 2010 Aquatic Plant Management (APM) Plan recognized a little more 2 acres of CLP (Appendix A). These two acres were primarily contained in isolated beds, one at the north end of the lake, and one in the southeast corner of the lake. Isolated plants were present in other areas of the lake, but not in densities great enough to warrant management. The two beds that were defined in the 2010 APM Plan were small enough that their negative impact to the lake was considered to be minimal. Annual monitoring of these beds was recommended to tract their expansion, and to help determine if management should be undertaken in the future.

3.1.1 Bed Mapping

Bed mapping in 2011 by SEH identified 1.68 acres of CLP, in the same beds as previously identified (Map 1, Appendix A). No additional beds were mapped, although a meandering survey of the shoreline was completed. The density of CLP in the beds mapped was low to moderate (1 or 2 on a 0-3 scale) with no points listed as severe or a 3 on the 0-3 scale. Spring growing conditions were less than ideal in 2011suggesting that the growth mapped may be low. Poskin Lake will be monitored for CLP again in the spring of 2012 to determine if treatment would be beneficial to the lake.

3.1.2 Turion Density Survey

CLP growth is highly dependent upon in-lake conditions and weather and the distribution and density of CLP growth in infested lakes can vary substantially from year to year, even if turion abundance and distribution remain relatively constant. Turion abundance provides an assessment of the potential for widespread dense growth under ideal growing conditions, and thus provides a more stable measure of CLP infestation that is not as sensitive to weather (Johnson 2012).

The purpose of this survey was to assess the abundance of CLP turions in the sediments of the Poskin Lake. The information gained from this assessment provides another tool to evaluate the severity of the CLP infestation (compared to other infested lakes) and provides a baseline for evaluating any changes in the abundance and distribution of CLP turions in the lake over the coming years. It had three objectives; 1) determine turion abundance at identified sample locations, 2) map turion abundance throughout the surveyed area, and 3) calculate statistics for turion distribution and abundance in the surveyed area.

Previously conducted plant surveys indicated that most of the CLP growth in Poskin Lake occurred in a few isolated patches. Accordingly, the 2011 CLP turion survey was confined to these areas of the lake basin.

Within these survey areas, 12 sample locations (Map 2, Appendix A) were randomly selected using ArcGIS software and sampling was completed on October 27th. More detail related to the methods employed to complete the turion density sampling are provided in the report entitled "Abundance of Curly-leaf Pondweed Turions in the Poskin Lake" prepared by Freshwater Scientific Services, LLC (FSS) and included in Appendix B (Johnson, 2011).

In 2011, turions were found at 42% of the sampled locations and average turion abundance in the surveyed area was 56±36 turions/m^2 (Map 3, Appendix A). According to the FSS report, this is much lower than what is typically seen in heavily infested lakes at 400 ±90 turions/m^2. Only one of the sampled locations (in the far southwest end of the lake) had a high turion density (444 turions/m^2) that indicated a potential for dense, nuisance-level curlyleaf growth (Map 3, Appendix A). Turion abundance in all of the remaining samples was below100 turions/m^2. Over half of the samples had no turions at all. Previous studies referred to in the FSS report indicate that CLP densities below 150 stems/ m^2 do not generally impair lake recreation, while densities >400 stems/m^2 represent a severe nuisance. This suggests that although turions may be widespread in Poskin Lake, only a few areas supported nuisance-level growth in 2011.

Detailed delineations of CLP beds and additional turion surveys in Poskin Lake in future years would provide valuable information about the relationship between turion abundance and CLP plant density in the lake. Completing a more comprehensive turion survey (more sample locations to cover the entire littoral area) would provide a lake-wide estimate of turion density. This would be helpful in guiding future CLP management decisions in Poskin Lake. CLP management in Poskin Lake should be planned on an annual basis, but not necessarily implemented. Implementation would be based on conditions as they exist in each individual year.

4.0 Water Quality

Volunteers collected temperature, dissolved oxygen, and Secchi depth measurements on three sites in the lake beginning in January 2011 and continuing through early October. Additional water quality parameters including total phosphorus (TP), dissolved reactive phosphorus (DRP), total Kjeldahl nitrogen (TKN), NO3 & NO2 dissolved nitrogen, Ammonia, and chlorophyll a (Chl A) were collected from the Deep Hole site through the Citizen Lake Monitoring Network and the 2011 WDNR AIS education project. All water quality data for the lake and tributaries will be incorporated into the final report for this project due by early summer 2012.

4.1 Lake Monitoring

Volunteers collected lake water quality samples from the Deep Hole four times during the 2011 open water season. A fifth sampling period was scheduled for October, however volunteer monitors did not receive the Wisconsin State Lab of Hygiene (SLOH) monitoring lab slip and bottles necessary to complete that testing period. In addition, DRP sampling bottles were missing from the water samples received at the SLOH in the months of May and July. Expanded CLMN sampling (TP and Chl A) at the Deep Hole was completed during the regularly scheduled CLMN times (Spring, June-August) but TP results for the spring, July, and August sampling periods is missing. Appendix B shows the existing lab results for 2011. Poskin Lake volunteers completed temperature and dissolved oxygen profiles and Secchi disk readings of water clarity eleven times at the Southwest Basin, eight times in the North Basin, and 14 times at the Deep Hole in 2011.

4.2 Runoff Event Sampling

Runoff event sampling was scheduled for three sites at three different times in 2011. Two out of the three runoff events were sampled by SEH technicians in 2011. One event was sampled on April 26, and the other samples on August 2. The third event was not collected in 2011 due at a complete lack of runoff after the runoff event collected in August. The third runoff event will be collected in the spring of 2012. Water quality parameters collected included total phosphorus, dissolved reactive phosphorus; total Kjeldahl nitrogen, NO3 & NO2 dissolved nitrogen, Ammonia, and suspended solids. Appendix C shows the lab results of the two runoff sampling events completed in 2011.

4.3 Precipitation Monitoring

Precipitation monitoring was completed by lake volunteers in 2011. The first reading was recorded on April 26, and the last on September 29. A total of 23.2 inches of precipitation fell on the lake with more than 57% (13.25 inches falling between July 10 and August 6th. Volunteers also recorded lake level following precipitation events. Throughout the month of July and early August the lake level was up by several inches, the max being on August 2 at 13.2 inches above what was considered to be normal lake level. Precipitation results are included as Appendix D.

5.0 Shoreland Restoration Planning

This project allowed for up to two shoreland improvement projects to be completed as demonstration sites for other to view. A shoreland restoration specialist was brought into the project to provide restoration planning services to the PLA. Only one site, the Poskin Lake Public Boat Access on the west side of the lake, was chosen to complete a shoreland improvement project. The public access is owned by the Town of Clinton, and they have already agreed in concept to the improvement plan put together by Laura Nackerud of White Pine Landscaping and Design. The Shoreland improvement plan includes establishing a wider buffer strip with three layers of vegetation (grasses, shrubs, and trees) along the southern edge of the Township owned property, limited erosion control, and the establishment of a rain garden. The entire plan is attached as Appendix E.

Given that the property is owned by the Town of Clinton, representatives from White Pine Landscaping, SEH, and the PLA have appeared before the Town Board to discuss the plan. A limited amount of money is available via the 2011 AIS education grant monies awarded, but is only accessible if the property owner is willing to fulfill certain requirements, including a perpetuity agreement on the property that is filed with the deed to the property. The Clinton Town Board has tentatively agreed to the requirements and the plan, and details are being worked out to install the shoreland improvement project in the spring of 2012.

6.0 References

Johnson JA, Jones AR, Newman RM. *Submitted for Publication 2012*. Evaluation of lake-wide, early-season herbicide treatments for controlling invasive curlyleaf pondweed (*Potamogeton crispus*) in Minnesota lakes. Lake Reserv Manage.

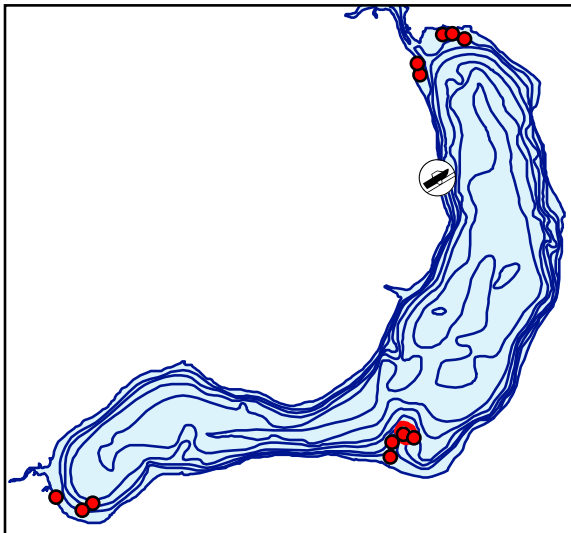
dlb

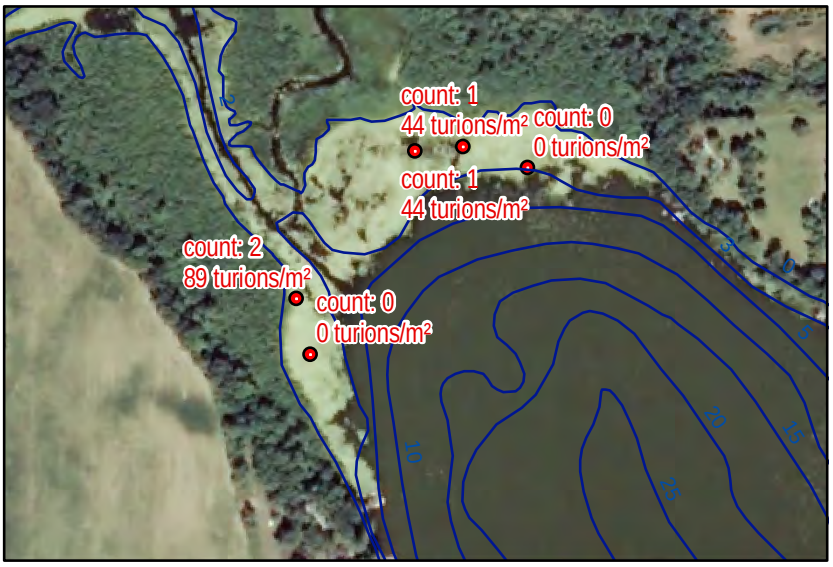
Appendix A

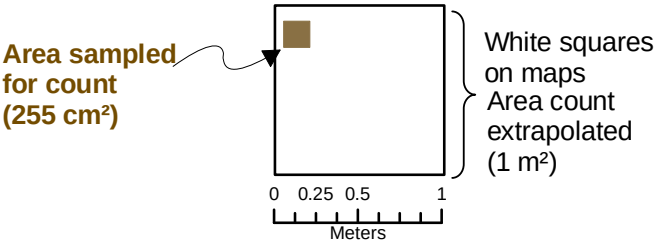
Curly-leaf Pondweed Maps

Poskin Lake Turion Sample Points (n = 12)

2011-10-26







Map Document: P:\PT\P\Poski\Common\0-GIS\mxd\2012 Proposed Poskin Lake CLP Treatment_2012-01-25.mxd
1/25/2012 -- 10:20 AM

SEH

1701 WEST KNAPP ST., SUITE B
RICE LAKE, WI 54868
PHONE: 715.236.4000
FAX: 715.234.4069
WATTS: 800.903.6970
www.sehinc.com

Project: POSKI
Print Date: 1/25/2012

Map by: JA Macholl
Projection: NAD 83 HARN WISCRS Barron County Feet
Source: FSS (J. Johnson)

Turion Survey 2011-10-27

Poskin Lake
Barron County, Wisconsin

Appendix B

Freshwater Scientific Services, LLC 2011 CLP Turion Density Report

FRESHWATER
Scientific Services, LLC

www.fixmylake.com
18029 83rd Avenue North
Maple Grove, MN 55311
mail@freshwatersci.com
(651) 336-8696

Abundance of Curlyleaf Pondweed Turions in Poskin Lake – *Barron County, WI* *(WBIC 20-980-00)*

October 2011

Prepared for Short, Elliott, and Hendrickson (SEH) Inc. (Spooner, WI) – December 2011

Sample Collection and Processing by:

James A. Johnson – *Aquatic Ecologist, Freshwater Scientific Services, LLC*

Data Analysis and Reporting by:

James A. Johnson – *Aquatic Ecologist, Freshwater Scientific Services, LLC*

Report available for download at http://www.freshwatersci.com/fw_projects.html

Cite this report as:

Johnson JA. 2011. Abundance of Curlyleaf Pondweed Turions in Poskin Lake – Barron County, WI. *Report to* Short, Elliott, and Hendrickson (SEH) Inc. (Spooner, WI). Freshwater Scientific Services, LLC (Maple Grove, MN). 11 pp.

Introduction

Value of Aquatic Plants

Aquatic plants play an important role in freshwater lakes. They anchor sediments, buffer wave action, oxygenate water, and provide valuable habitat for aquatic animals. Consequently, the amount and type of plants in a lake can greatly affect nutrient cycling, water clarity, and food-web interactions (Jeppeson et al. 1998). Furthermore, plants are very important for fish reproduction, survival, and growth, and can greatly impact the type and size of fish in a lake. Unfortunately, healthy aquatic plant communities are often degraded by poor water clarity, excessive plant control activities, and the invasion on non-native nuisance plants. These disruptive forces alter the diversity and abundance of aquatic plants in lakes and can lead to undesirable changes in many other aspects of a lake's ecology. Consequently, it is very important that lake managers find a balance between controlling nuisance plant growth and maintaining a healthy, diverse plant community.

Curlyleaf Pondweed: An Unwanted Invader

Curlyleaf (*Potamogeton crispus*) is an invasive aquatic plant that typically forms dense surface growth and displaces native aquatic plants (Madsen and Crowell 2002). Consequently, it has dramatically reduced the recreational and ecological quality of many lakes in the upper Midwest (Catling and Dobson 1985, Bolduan et al. 1994). Curlyleaf's ability to dominate the plant community in lakes is enhanced by its novel life-cycle (Tobiessen and Snow 1984). Although it is considered a perennial species, it behaves as a winter annual in northern lakes (Netherland et al. 2000, Madsen and Crowell 2002), sprouting from turions (reproductive buds) in the fall, persisting as small shoots under the ice during the winter, growing rapidly in the early spring (Kunii 1982, Tobiessen and Snow 1984), and forming dense surface growth and new turions in May and June (Wehrmeister and Stuckey 1992, Bolduan et al. 1994). Curlyleaf plants typically die off by mid-summer, depositing any newly-produced turions to bottom of the lake. Although this means that the dense matted growth is generally short lived and out of the way by the 4th of July, deposited turions in lake sediments lead to new curlyleaf growth in subsequent years. Although curlyleaf also produces seeds, under most conditions its annual life-cycle is almost entirely dependent upon sprouting from turions in lake sediments (Rogers and Breen 1980, Sastroutomo 1981, Bolduan et al. 1994). Consequently, there is great interest in adopting management strategies that can prevent turion production, deplete accumulated turions, and thus decrease nuisance growth.

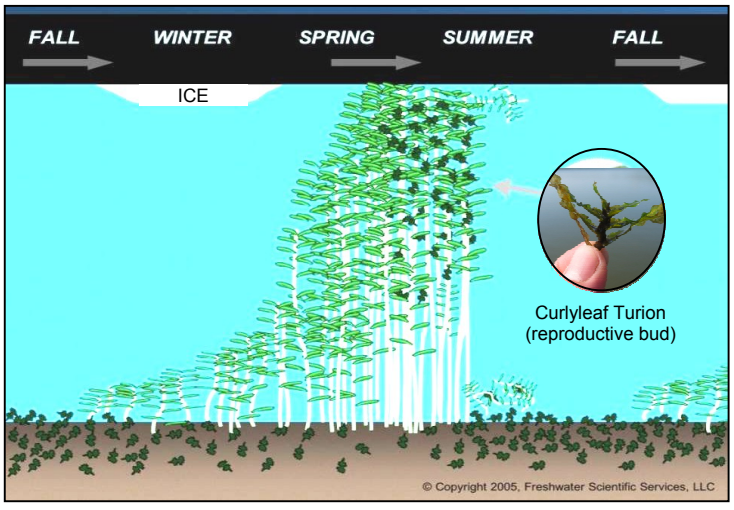


Figure 1. Curlyleaf life-cycle in northern lakes (left); curlyleaf plant (below).

Purpose of Turion Survey

This survey was designed to assess the abundance of curlyleaf pondweed turions in portions of Poskin Lake that have supported curlyleaf pondweed growth in recent years. This information will allow us to evaluate the severity of the curlyleaf infestation (compared to other infested lakes) and provide a baseline for evaluating any changes in the abundance and distribution of curlyleaf turions in the surveyed portions of the lake over the coming years.

Objectives

1) Determine turion abundance at identified sample locations
2) Map turion abundance in the surveyed areas
3) Calculate statistics for turion distribution and abundance in the surveyed areas

Description of Lake

Poskin Lake (WBIC 20-980-00) is a small (150 acres), but moderately deep lake (mean depth 16 ft) located in west-central Barron County, WI (45°25'55"N/91°58'14"W; Fig. 2 and 3).

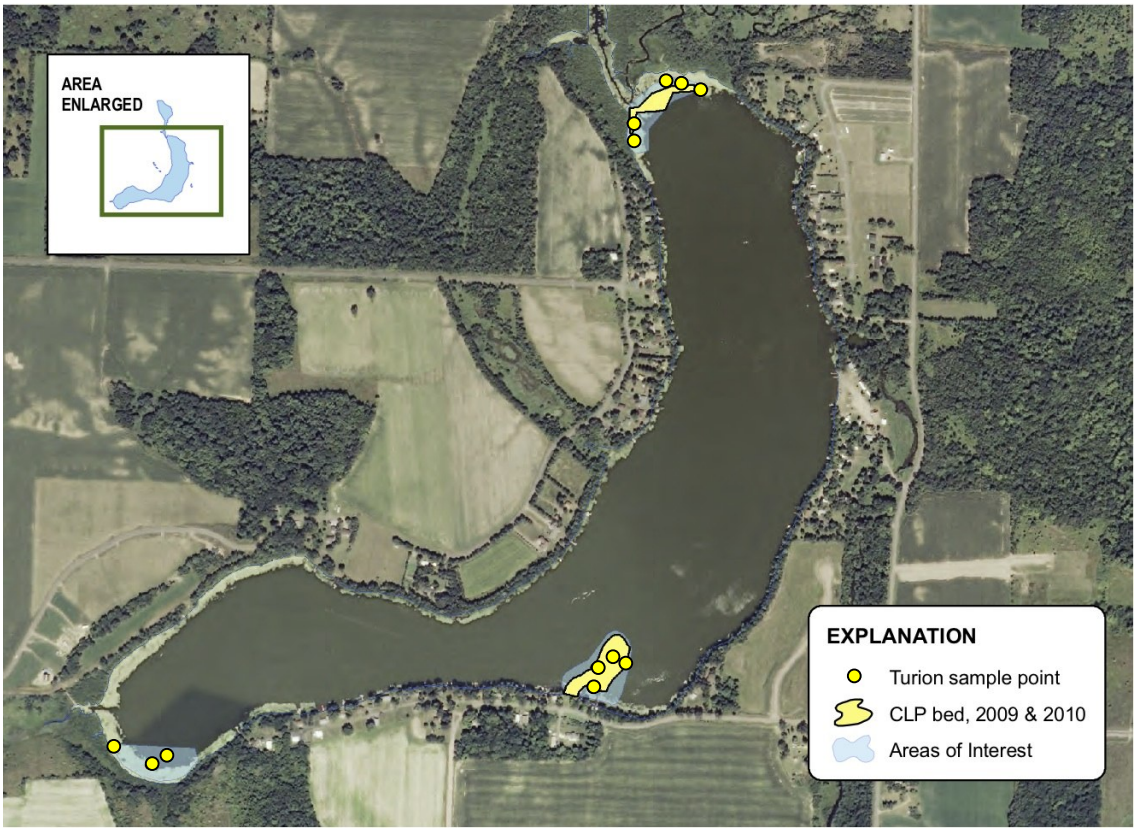
The lake is fertile (eutrophic) and typically experiences low summer water clarity (3 to 5-ft Secchi). Its sediments are primarily sand (70%) and gravel (20%), with some areas of muck (10%) in nearshore areas. The lake is known to be infested with curlyleaf pondweed (*Potamogeton crispus*), an invasive, non-native, aquatic plant. In recent years, curlyleaf growth has generally been confined to small patches on the far northern and far southern shores of the lake.

Figure 2. Location of Poskin Lake

Table 1. Identifiers and characteristics for Poskin Lake (WDNR 2011)

County	Barron
ID# (WBIC)	20-980-00
Surface Area *(acres)*	150
Maximum Depth *(ft)*	30
Mean Depth *(ft)*	16
Watershed Area *(acres)*	14,450
Trophic State	eutrophic

Figure 3. Map showing the surveyed portions of Poskin Lake and location of sample points (provided by SEH Inc.)



Sampling & Analysis Methods

Sample Collection and Processing

Previously conducted plant surveys indicated that most of the curlyleaf growth in Poskin Lake occurred in a few isolated patches. Accordingly, the 2011 curlyleaf turion survey was confined to these areas of the lake basin (Fig. 3). We randomly selected a total of 12 sample locations within the designated survey areas using ArcGIS software (locations provided by SEH Inc.). These sample locations were loaded onto a handheld GPS unit (Garmin GPSMAP-78) to enable navigation to each point while in the field.

On October 27, 2011 Freshwater Scientific Services, LLC collected sediment samples at all 12 identified sample locations (Fig. 3). At each location, we collected one sediment sample using a petite Ponar dredge (225 cm^2 basal area, sample depth ~10 cm). Upon retrieving each sediment sample, we removed any material from the outside of the closed dredge, emptied the sampler contents into a sifting bucket (1-mm screen), and gently sifted the sample to remove fine sediment. The contents remaining in the bucket after sifting were placed into a labeled plastic bag and stored in a cooler while in the field. In the lab, we manually sorted turions from other debris and recorded total turion counts for each sample. Small turion fragments (those that did not included a portion of a central turion stem) and severely decayed turions (those that did not retain their shape when lightly squeezed) were discarded and were not included in the final turion counts.

We calculated turion abundance (turions/m^2) for each sampled location (number of turions ÷ 0.0225 m^2), and then calculated average turion abundance within the sampled portion of the lake.

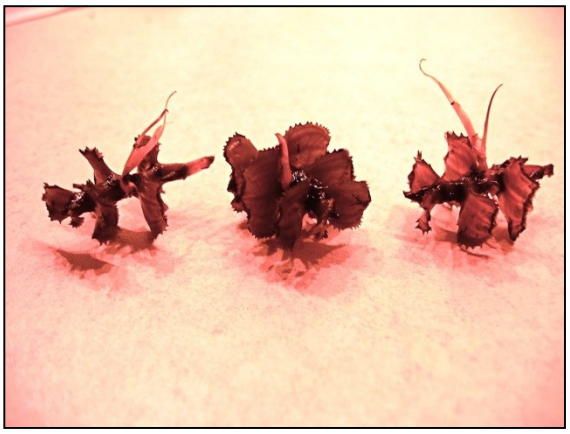


Figure 4. J. Johnson (Freshwater Scientific Services, LLC) collecting sediment samples with a petite Ponar grab sampler (left); sprouted curlyleaf pondweed turions (above)

Results & Discussion

We found turions at 42% of the sampled locations (Fig. 5, Table 2), however, the average turion abundance across the surveyed areas (56 ±36 turions/m^2) was much lower than typically seen in heavily infested lakes (400 ±90 turions/m^2, Johnson 2012). Only one of the sampled locations (in the far southwest end of the lake) had a high turion density (444 turions/m^2) that indicated a potential for dense, nuisance-level curlyleaf growth (Fig. 5). Turion abundance in all of the remaining samples was below 100 turions/m^2, with over half of the samples having no turions at all. Previous studies indicate that curlyleaf pondweed densities below 150 stems/m^2 do not generally impair lake recreation, while densities >400 stems/m^2 represent a severe nuisance (McComas 2008). This suggests that although turions may be widespread in Poskin Lake, only a few areas supported nuisance-level growth in 2011.

Figure 5. Map of curlyleaf pondweed distribution and abundance in Poskin Lake; Oct 2011

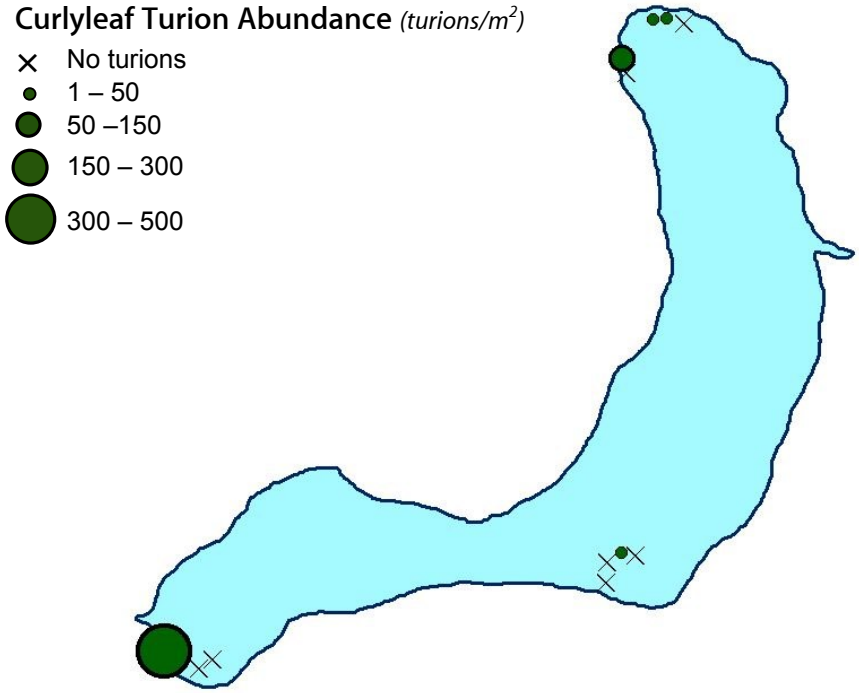


Table 2. Statistics for curlyleaf pondweed turion distribution and abundance in Poskin Lake; Oct 2011.

Total Locations Sampled	12
Number of Locations with Turions	5
% of Locations with Turions	42 %
Average Turion Abundance *(turions/m^2, ±1SE)*	56 ±36
Maximum Turion Abundance *(turions/m^2)*	444

Management Context

Most evaluations of curlyleaf pondweed in infested lakes focus on the distribution and density of curlyleaf plants in a lake. However, curlyleaf pondweed growth is highly dependent upon in-lake conditions and weather (Johnson 2012, Tobiessen and Snow 1984). Consequently, the distribution and density of curlyleaf growth in infested lakes can vary substantially from year to year, even if turion abundance and distribution remain relatively constant. Turion abundance provides an assessment of the potential for widespread dense growth under ideal growing conditions, and thus provides a more stable measure of curlyleaf infestation that is not as sensitive to weather. This allows us to track changes in the level of curlyleaf infestation and better assess the effects of any future management upon curlyleaf pondweed in the lake.

Although most studies suggest that turions are by far the most important source of new curlyleaf pondweed growth in northern lakes, emergence from seeds and persistent roots or rhizomes may also play an important role under some conditions (Bolduan et al. 1994, Rogers and Breen 1980). Additional turion surveys and detailed delineation of curlyleaf beds in Poskin Lake over the coming years would provide valuable information about the relationship between turion abundance and curlyleaf density in the lake. Furthermore, a more comprehensive turion survey (more sample locations to cover the entire littoral area) would provide a lake-wide estimate of turion density. This would be helpful in guiding future curlyleaf management decisions in Poskin Lake.

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Sastroutomo SS. 1981. Turion formation, dormancy and germination of curly pondweed, Potamogeton crispus L. Aquat Bot. 10:161-173.

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Wehrmeister JR, Stuckey RL. 1992. The life history of Potamogeton crispus. Mich Bot. 31:3-16.

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Appendix C

Lake and Tributary Water Quality Sampling Results

Water Quality - 2011 Nutrient Testing Results

DNR Parameter	Description	Result	Units	Start Date/Time	Location Description	Station ID	Station Name
671	PHOSPHATE ORTHO DISS	**	MG/L	5/25/2011 11:00	POSKIN LAKE - DEEP HOLE - APRIL	33187	Poskin Lake - Deep Hole
631	NITROGEN NO3+NO2 DISS (AS N)	*0.089	MG/L	5/25/2011 11:00	POSKIN LAKE - DEEP HOLE - APRIL	33187	Poskin Lake - Deep Hole
625	NITROGEN KJELDAHL TOTAL	*0.66	MG/L	5/25/2011 11:00	POSKIN LAKE - DEEP HOLE - APRIL	33187	Poskin Lake - Deep Hole
608	NITROGEN NH3-N DISS	*ND	MG/L	5/25/2011 11:00	POSKIN LAKE - DEEP HOLE - APRIL	33187	Poskin Lake - Deep Hole
99717	CHLOROPHYLL A, FLUORESCENCE (WELSCHMAYER 1994)	29.8	UG/L	6/22/2011 11:00	POSKIN LAKE - AT DEEP HOLE	33187	Poskin Lake - Deep Hole
671	PHOSPHATE ORTHO DISS	ND	MG/L	6/22/2011 11:00	POSKIN LAKE - AT DEEP HOLE	33187	Poskin Lake - Deep Hole
665	PHOSPHORUS TOTAL	0.049	MG/L	6/22/2011 11:00	POSKIN LAKE - AT DEEP HOLE	33187	Poskin Lake - Deep Hole
99717	CHLOROPHYLL A, FLUORESCENCE (WELSCHMAYER 1994)	51.2	UG/L	7/27/2011 13:00	POSKIN LAKE - DEEP HOLE, LAKE SAMPLE	33187	Poskin Lake - Deep Hole
671	PHOSPHATE ORTHO DISS	**	MG/L	7/27/2011 13:00	POSKIN LAKE - DEEP HOLE, LAKE SAMPLE	33187	Poskin Lake - Deep Hole
631	NITROGEN NO3+NO2 DISS (AS N)	ND	MG/L	7/27/2011 13:00	POSKIN LAKE - DEEP HOLE, LAKE SAMPLE	33187	Poskin Lake - Deep Hole
625	NITROGEN KJELDAHL TOTAL	*1.36	MG/L	7/27/2011 13:00	POSKIN LAKE - DEEP HOLE, LAKE SAMPLE	33187	Poskin Lake - Deep Hole
608	NITROGEN NH3-N DISS	ND	MG/L	7/27/2011 13:00	POSKIN LAKE - DEEP HOLE, LAKE SAMPLE	33187	Poskin Lake - Deep Hole
99717	CHLOROPHYLL A, FLUORESCENCE (WELSCHMAYER 1994)	*55.2	UG/L	8/31/2011 12:30	POSKIN LAKE - DEEP HOLE - LAKE SAMPLE	33187	Poskin Lake - Deep Hole
671	PHOSPHATE ORTHO DISS	*ND	MG/L	8/31/2011 12:30	POSKIN LAKE - DEEP HOLE - LAKE SAMPLE	33187	Poskin Lake - Deep Hole

DNR Param	Description	Result	Units	Present/Ab	Start Date/Time	Lab Comm	Location Description	Station ID	Station Name
608	NITROGEN NH3-N DISS	ND	MG/L		4/26/2011 14:37		VERMILLION R - 16 ST - APRIL	33221	Vermillion River - 16th St
631	NITROGEN NO3+NO2 DISS (AS N)	0.304	MG/L		4/26/2011 14:37		VERMILLION R - 16 ST - APRIL	33221	Vermillion River - 16th St
625	NITROGEN KJELDAHL TOTAL	0.48	MG/L		4/26/2011 14:37		VERMILLION R - 16 ST - APRIL	33221	Vermillion River - 16th St
665	PHOSPHORUS TOTAL	0.058	MG/L		4/26/2011 14:37		VERMILLION R - 16 ST - APRIL	33221	Vermillion River - 16th St
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	6	MG/L		4/26/2011 14:37		VERMILLION R - 16 ST - APRIL	33221	Vermillion River - 16th St
136	TEMPERATURE AT LAB	ICED	C		4/26/2011 14:37		VERMILLION R - 16 ST - APRIL	33221	Vermillion River - 16th St
671	PHOSPHATE ORTHO DISS	0.021	MG/L		4/26/2011 14:37		VERMILLION R - 16 ST - APRIL	33221	Vermillion River - 16th St
136	TEMPERATURE AT LAB	ICED	C		4/26/2011 14:37		VERMILLION R - 16 ST - APRIL	33221	Vermillion River - 16th St
608	NITROGEN NH3-N DISS	0.077	MG/L		8/2/2011 12:30		VERMILLION RIVER - 16TH STREET	33221	Vermillion River - 16th St
631	NITROGEN NO3+NO2 DISS (AS N)	0.579	MG/L		8/2/2011 12:30		VERMILLION RIVER - 16TH STREET	33221	Vermillion River - 16th St
625	NITROGEN KJELDAHL TOTAL	1.69	MG/L		8/2/2011 12:30		VERMILLION RIVER - 16TH STREET	33221	Vermillion River - 16th St
665	PHOSPHORUS TOTAL	0.501	MG/L		8/2/2011 12:30		VERMILLION RIVER - 16TH STREET	33221	Vermillion River - 16th St
671	PHOSPHATE ORTHO DISS	0.17	MG/L		8/2/2011 12:30		VERMILLION RIVER - 16TH STREET	33221	Vermillion River - 16th St
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*90	MG/L		8/2/2011 12:30	MATRIX DU	VERMILLION RIVER - 16TH STREET	33221	Vermillion River - 16th St
136	TEMPERATURE AT LAB	ICED	C		8/2/2011 12:30		VERMILLION RIVER - 16TH STREET	33221	Vermillion River - 16th St
608	NITROGEN NH3-N DISS	0.172	MG/L		4/26/2011 15:00		VERMILLION R - 15 AVE - APR	10030413	Vermillion River - 15th Ave.
631	NITROGEN NO3+NO2 DISS (AS N)	0.425	MG/L		4/26/2011 15:00		VERMILLION R - 15 AVE - APR	10030413	Vermillion River - 15th Ave.
625	NITROGEN KJELDAHL TOTAL	0.87	MG/L		4/26/2011 15:00		VERMILLION R - 15 AVE - APR	10030413	Vermillion River - 15th Ave.
665	PHOSPHORUS TOTAL	0.089	MG/L		4/26/2011 15:00		VERMILLION R - 15 AVE - APR	10030413	Vermillion River - 15th Ave.
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	11	MG/L		4/26/2011 15:00		VERMILLION R - 15 AVE - APR	10030413	Vermillion River - 15th Ave.
136	TEMPERATURE AT LAB	ICED	C		4/26/2011 15:00		VERMILLION R - 15 AVE - APR	10030413	Vermillion River - 15th Ave.
671	PHOSPHATE ORTHO DISS	0.014	MG/L		4/26/2011 15:00		VERMILLION R - 15 AVE - APR	10030413	Vermillion River - 15th Ave.
136	TEMPERATURE AT LAB	ICED	C		4/26/2011 15:00		VERMILLION R - 15 AVE - APR	10030413	Vermillion River - 15th Ave.
608	NITROGEN NH3-N DISS	0.1	MG/L		8/2/2011 13:15		VERMILLION RIVER - 15TH AVENUE	10030413	Vermillion River - 15th Ave.
631	NITROGEN NO3+NO2 DISS (AS N)	0.378	MG/L		8/2/2011 13:15		VERMILLION RIVER - 15TH AVENUE	10030413	Vermillion River - 15th Ave.
625	NITROGEN KJELDAHL TOTAL	0.99	MG/L		8/2/2011 13:15		VERMILLION RIVER - 15TH AVENUE	10030413	Vermillion River - 15th Ave.
665	PHOSPHORUS TOTAL	0.135	MG/L		8/2/2011 13:15		VERMILLION RIVER - 15TH AVENUE	10030413	Vermillion River - 15th Ave.
671	PHOSPHATE ORTHO DISS	0.035	MG/L		8/2/2011 13:15		VERMILLION RIVER - 15TH AVENUE	10030413	Vermillion River - 15th Ave.
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*24	MG/L		8/2/2011 13:15	DUPLICATE	VERMILLION RIVER - 15TH AVENUE	10030413	Vermillion River - 15th Ave.
136	TEMPERATURE AT LAB	ICED	C		8/2/2011 13:15		VERMILLION RIVER - 15TH AVENUE	10030413	Vermillion River - 15th Ave.
608	NITROGEN NH3-N DISS	1.76	MG/L		4/26/2011 14:45		VERMILLION R - EPHEMERAL TRIBUTARY - APRIL	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
631	NITROGEN NO3+NO2 DISS (AS N)	2.12	MG/L		4/26/2011 14:45		VERMILLION R - EPHEMERAL TRIBUTARY - APRIL	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
625	NITROGEN KJELDAHL TOTAL	7.08	MG/L		4/26/2011 14:45		VERMILLION R - EPHEMERAL TRIBUTARY - APRIL	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
665	PHOSPHORUS TOTAL	1.17	MG/L		4/26/2011 14:45		VERMILLION R - EPHEMERAL TRIBUTARY - APRIL	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	182	MG/L		4/26/2011 14:45		VERMILLION R - EPHEMERAL TRIBUTARY - APRIL	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
136	TEMPERATURE AT LAB	ICED	C		4/26/2011 14:45		VERMILLION R - EPHEMERAL TRIBUTARY - APRIL	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
671	PHOSPHATE ORTHO DISS	0.493	MG/L		4/26/2011 14:45		VERMILLION R - EPHEMERAL TRIBUTARY - APRIL	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
136	TEMPERATURE AT LAB	ICED	C		4/26/2011 14:45		VERMILLION R - EPHEMERAL TRIBUTARY - APRIL	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
631	NITROGEN NO3+NO2 DISS (AS N)	2.98	MG/L		8/2/2011 12:00		VERMILLION RIVER - EPHEMERAL TRIBUTARY	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
625	NITROGEN KJELDAHL TOTAL	2.28	MG/L		8/2/2011 12:00		VERMILLION RIVER - EPHEMERAL TRIBUTARY	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
665	PHOSPHORUS TOTAL	0.638	MG/L		8/2/2011 12:00		VERMILLION RIVER - EPHEMERAL TRIBUTARY	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
671	PHOSPHATE ORTHO DISS	0.286	MG/L		8/2/2011 12:00		VERMILLION RIVER - EPHEMERAL TRIBUTARY	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*204	MG/L		8/2/2011 12:00	MATRIX DU	VERMILLION RIVER - EPHEMERAL TRIBUTARY	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
136	TEMPERATURE AT LAB	ICED	C		8/2/2011 12:00		VERMILLION RIVER - EPHEMERAL TRIBUTARY	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street
608	NITROGEN NH3-N DISS	0.167	MG/L		8/2/2011 12:00		VERMILLION RIVER - EPHEMERAL TRIBUTARY	10033489	Ephemeral Tributary to Vermillion River near 9-1/4 Street

Appendix D

Precipitation Monitoring Results

POSKIN LAKE Rainfall 2011 Denny Landro (southside)

1.1

4-26	1.1 inches	STAFF reading at Dam (1 is normal)
5-1	.25	
5-5	.30	
5-9	.50	
5-12	.10	2.75"
5-21	.40	
5-22	.60	
5-28	.40	
5-30	.20	
6-10	.20	
6-11	.10	
6-15	.70	3.65"
6-16	.80	
6-18	.60	
6-19	.40	
6-21	.80	
6-23	.05	
7-10	1.10	
7-15	.50	
7-16	2.50	8.25"
7-23	2.40	
7-26	.75	
7-30	1.00	
8-1	.50	
8-2	2.50	6.15"
8-6	2.00	
8-16	.50	
8-23	.15	
8-31	.50	
9-2	.30	
9-18	.50	1.3
9-21	.20	
9-27	.10	
9-29	.20	

23.2"

7/15	1.3	=	+3.6 inches above	
7/23	1.6	=	+7.2	INCHES
7/24	1.5	=	+6.0	"
7/26	1.4	=	+4.8	"
8/1	1.9	=	+10.8	"
8/2	2.1	=	+13.2	"
8/5	1.85	=	+10.2	"
8/7	1.80	=	+9.6	"
8/13	1.45	=	+5.4	"

7/18 - 8/6 = 13.25 (57.90)

Appendix E

Poskin Lake Public Boat Landing Shoreland Improvement Plan

White Pine Landscape Design

Laura Nackerud
59 S. Horseshoe Dr.
Turtle Lake, WI 54889
763.464.0750
laura.nackerud@gmail.com

September 13, 2011

Poskin Lake Public Landing
15 ½ & 8 ¾ St
Almena WI 54805

SHORELINE RESTORATION AND STORM WATER MANAGEMENT PLAN

There are two elements included in this Management Plan for the Poskin Lake Public Landing, Shoreline Restoration and Storm Water Runoff Management.

Shoreline Restoration: Currently there is an existing natural shoreline buffer of trees, shrubs and forbs which is 12-18 ft deep along 121 ft of the shoreline. There is a viewing area of 29 ft, which includes the landing road. This is within the 30 ft max allowed for the viewing area. The grade of the buffer is such that the water runoff goes gently away from the shoreline and down towards the landing road.

The plan recommendation is that this existing shoreline buffer be allowed to remain undisturbed, unmowed and planted in the native vegetation that are already established there. Additionally, the shoreline buffer would be enlarged to 35 ft deep and incorporate a mulched pathway to the dock. The newly established buffer area will be planted with a mixture of native shrubs, grasses, sedges, and wildflowers. In order to assist in redirecting the parking pattern, sections of a split rail fence and a couple of rock boulders would be placed at the front of the planted buffer area. This would not impact the amount of parking spaces as there is a huge field of available parking at the landing.

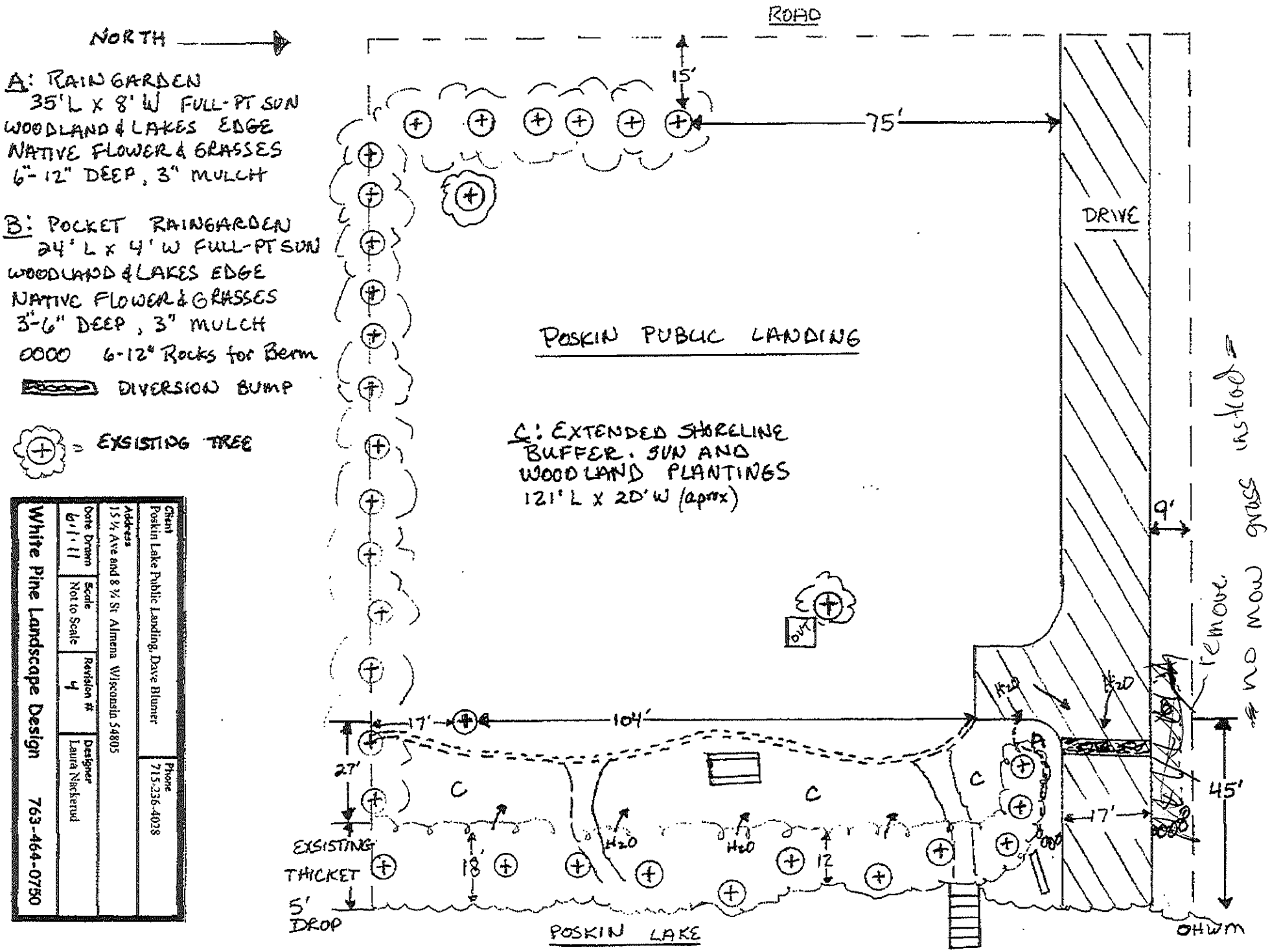
The existing turf grass in this expanded buffer area would be sprayed with Round Up. After 2 weeks planting would take place. Newspaper or other paper would be laid down first on top of the dead grass and then 2" of shredded hardwood mulch would be spread over the paper. A bulb planting bit can be used on an electric drill in order to make planting holes for the smaller plants. Black plastic edging or bullet edgers would be installed along the edge of the new shoreline buffer in order to keep the grass out and the mulch in.

All plants will have to be completely watered in on planting day and regularly after that. Lake water is the best choice as it luke warm and full of nutrients. Planting, operation and maintenance instructions are included in this plan.

Storm Water Runoff Management: Currently, much of the storm water runoff goes down the road and into the lake. This Management Plan recommends the implementation of two Rain gardens along the landing road. Rain gardens are sunken areas planted with flowers, shrubs or trees and are designed to allow most of the runoff to infiltrate in the garden instead of dumping into the lake. In order to direct the water runoff into these Rain gardens, a Diversion Bump will need to be added in a strategic location on the landing road. This bump will slow the water down and redirect it into the gardens where it can infiltrate into the ground (see site plan drawing).

The Rain gardens will be located on either side of the diversion bump. Small boulder rocks will line the downward ends of the gardens in order to assist in retaining the runoff water in the gardens. Garden A (see diagram) will be approximately 40 ft long and 8 ft wide, hugging the inside of the turnaround. There will be an additional row of small boulders placed in the middle of the garden to further help slow the runoff. Garden B will be more of a pocket garden along the other side of the driveway, approximately 24 ft long and 4 ft wide.

The depth of the gardens will be dug down 2-6 inches as the slope allows. Mixed plantings of native flowers, grasses and small shrubs will be placed inside the gardens (see attached plant list). Shredded hardwood mulch, 2 inches deep will be placed around all plants in order to maintain moisture and cut down on weed growth. In order for your Rain gardens to be a pleasing site in the years to come, proper maintenance must be preformed. Please refer to the Operation and Maintenance Plan page in this packet.


NORTH
ROAD
A: RAIN GARDEN
35'L x 8'W FULL-PT SUN
WOODLAND & LAKES EDGE
NATIVE FLOWER & GRASSES
6"-12" DEEP, 3" MULCH
B: POCKET RAINGARDEN
24'L x 4'W FULL-PT SUN
WOODLAND & LAKES EDGE
NATIVE FLOWER & GRASSES
3"-6" DEEP, 3" MULCH
6-12" Rocks for Berm
DIVERSION BUMP
= EXSISTING TREE
15'
75'
DRIVE
POSKIN PUBLIC LANDING
C: EXTENDED SHORELINE
BUFFER. SUN AND
WOODLAND PLANTINGS
121'L x 20'W (aprox)
9'
remove
104'
17'
27'
45'
EXSISTING
THICKET
5'
DROP
18'
12'
H2O
POSKIN LAKE
OHWM
Client
Poskin Lake Public Landing, Dave Blumer
Phone
715-236-4028
Address
15 ½ Ave and 8 ½ St Almena Wisconsin 54805
Date Drawn
6/1/11
Scale
Not to Scale
Revision #
4
Designer
Laura Nackerud
White Pine Landscape Design
763-464-0750

Estimated Cost of Materials Poskin Landing Sept 13, 2011

Rain Garden

Labor Estimate : 38 hours (divided by # volunteers)	
Native plants to cover 376 sq. ft.	
Dragonfly Gardens (www.dragonflygardens.net)	$515
Shredded hardwood mulch natural color, 2" deep	
2.5 cu yds @ $30/cu yd , bullet edgers	
Delivery and Trench Edger Rental	$360
(not including tax)	
Total	$875

Shoreline Buffer Extension

Labor Estimate : 61 hours (divided by # volunteers)	
Native plants to cover 2420 sq ft (including tax)	
Dragonfly Gardens (www.dragonflygardens.net)	$1107
Shredded hardwood mulch natural color, 2" deep	
23 cu yds @ $30/cu yds,	
(not including tax)	$480
Total	$1587

Additional Shoreline Buffer Options

Split Rail Fence –Cedar 10'sections, 2 rails 80' @ $2.50/ft - Menards	$200
Bullet Edger's - 12"ea, 140' @ $1ea - Menards	$140
Edger/Trencher rental 24hrs Nelsons True Value Cumberland	$50
Menards Delivery	$70
Weeding, Plant ID consultation following year WPLD 3 hrs @ $30/hr	$90
(not including tax)	
Total	$550

Client: Poskin Lake Public Landing	Shoreline Plant List 1					White Pine Landscape Design	
Site Conditions: Full Sun-Pt Shade,	Clay/Loam Soil Meadow-Woodland					Date: Sept 13, 2011	
Area/ Num	Common Name	Botanical Name	Sun	Moisture	Height ft	Quan/Type	Price
	Shrubs						
	Red Osier Dogwood	Cornus sericea	FS-PSH	Med-Moist	8'	2/1gal	2x$14.99=$29.98
	Dwarf Bush Honeysuckle	Diervilla lonicera	FS-PS	Dry-Moist	2-3'	2/1gal	2x$14.99=$29.98
	Pasture Rose	Rosa carolina	FS-PSH	Dry-Med	3-4'	2/1gal	2x$14.99=$29.98
	Stepple bush	Spiraea tomentosa	FS-PS	Dry-Med	2-4'	2/1gal	2x$14.99=$29.98
	Lowbush Blueberry	Vaccinium angustifolium	FS-PSH	Dry-Moist	2-3'	3/4.5pot	3x$3.99=$11.97
	Highbush Cranberry	Viburnum trilobum	FS-PS	Dry-Med	10-13'	2/1gal	2x$14.99=$29.98
	Perennials/Grass Collections						
	Butterfly Collection	Special Collections from	FS-PS	Dry-Med	1.5-3'	5/48plant	5x$35=$175
	Complete Prairie	Dragonfly Nursery	FS-PS	Dry-Med	2-5'	5/50plant	5x$35=$175
	Dry Wild Flowers	Include grasses, sedge, rush	FS-PS	Dry	1-3'	4/48plant	4x$35=$140
	Short Prairie	And suitable wildflowers	FS-PS	Dry	.5-1.5'	7/40plant	7x$35=$245
	Woodland Mix	(see attached Dragonfly collection listings)	PSH-FSH	Dry-Moist	.5-3'	6/40plant	6x$35=$210
		Plant total					$1106.87
		(Does not in tax)					
	Substitutions may be made						
	By Dragonfly Nursery due						
	To availability at the time.						

Client: Poskin Lake Public Landing	Rain Garden Native Plant List 1				White Pine Landscape Design	
Site Conditions: Full Sun-Pt Shade, Sloping Clay/Loam Soil	Meadow-Woodland				Date: Sept 13, 2011	
Area/ Num	Common Name	Botanical Name	Sun	Moisture	Height ft	Quan/Type	Price
2	**Dragonfly Nursery Collection**	Native Rain Garden variety (see attached collection listings)	FS-PSH	Dry-Moist	12-48"	50-60 plugs per collection	$35 / collection
	Grasses, Rushes, Sedges	Wildflowers for wet and dry				13 collections	13x $35 = $455
	Shrubs						
2	Bush Honeysuckle	Diervella lonicera	FS-FSH	Dry-Moist	1.5-3'	4 /1gal	4x$14.99=$59.96
	Mulch						
	Shredded hardwood, 2" deep	Natural Color (W/O Delivery)				2.5cu yds	2.5x$30=$75
	Bullet Edgers 1' long ea	Natural Color				130	130 x $1.19=$154.70
	Delivery from Menards	Rice Lake, WI store					$70
	Edge trencher rental	One day					$60
	20-30 sm/med rocks for the	Downhill side obtained by city					
	Grand Total						
		(no tax has been added in)					$874.66
		Diversion Bump not included					

Dragonfly Gardens Special Collections

Agonize no longer over what species you should plant! Allow us to select the best plants for you. Choose the best collections for your unique site conditions, plant these plugs 12-24" apart, and in no time, you will have a beautiful, low-maintenance, wildlife-nurturing habitat. Our collections are fabulous tools for conservation groups to encourage native habitat restorations. If used as a fundraiser, our reasonable prices allow you to add to the cost and still deliver an outstanding value to your patrons. Counties and conservation groups – you will be very satisfied with our quality and service. Individual homeowners – save time and hassle – let us do the technical work for you!

RAINGARDEN

If you have water issues around your house or somewhere on your property, a rain garden is the answer. Channel runoff into a properly constructed depression and allow these plants to help attenuate and clean this water rather than sending it into the gutter! The wet species of wildflowers and graminoids (grass-like plants) are for lower portions of the rain garden that will stay wet for the longest period of time. The mesic species should be planted in upper portions of the rain garden which are saturated or inundated for a shorter period of time.

Height: 12-48" 8 packs 50-60 plants $35.00

Wet Species: New England Aster, Swamp Milkweed, Spotted Joe-Pye Weed, Boneset, Cardinal Flower, Blue Lobelia, Monkeyflower, Marsh Blazing Star, Ironweed, Bottlebrush Sedge, Awl-fruit Sedge, Porcupine Sedge, Fox Sedge, Soft Rush, Path Rush, Sweet Flag, Wool Grass.

Mesic Species: Anise Hyssop, Smooth Aster, Stiff Coreopsis, Purple Prairie Clover, False Sunflower, Bergamot, Yellow Coneflower, Orange Coneflower, Sweet Black-eyed Susan, Showy Goldenrod, Rosinweed, Culver's Root, Little Bluestem, Side Oats Grama, Indian Grass, Switch Grass.

BUTTERFLY GARDEN

Attract a kalaidescope of butterflies with this fine assortment of native plants which provide a combination of nectar sources and caterpillar host plants.

Habitat: Dry Prairie/Forest Edge Height: 18-36" Full-Part Sun 8 packs 48 plants $35.00

Species: Pearly Everlasting, Butterfly Weed, Smooth Aster, New England Aster, Stiff Coreopsis, Rattlesnake Master, False Sunflower, Rough Blazing Star, Yellow Coneflower, Pale Purple Coneflower, Purple Coneflower, Black-eyed Susan, Heath Aster, Whorled Milkweed, Stiff Goldenrod, Hoary Vervain, Golden Alexander.

THE COMPLETE PRAIRIE

An entire prairie in a single flat. Includes the best prairie grasses and wildflowers combined! Fifty to sixty plants per flat will cover 50 - 120 ft^2. Free yourself from the oppression of mowing lawn one flat at a time!

Habitat: Dry/Mesic Prairie Height: 24-60" Full-Part Sun 8 packs 50-60 plants $35.00

Wildflower Species: Anise Hyssop, Aromatic Aster, Smooth Aster, Sky Blue Aster, Purple Prairie Clover, False Sunflower, Bergamot, Prairie Coneflower, Yellow Coneflower, Purple Coneflower, Black-eyed Susan, Prairie Spiderwort, Stiff Goldenrod, Smooth Penstemon, Culver's Root.

Grass Species: Little Bluestem, Big Bluestem, Side Oats Grama, Indian Grass.

Dragonfly Gardens Special Collections

THE COMPLETE WETLAND

Add some beautiful graminoids to some of our most beautiful wildflowers and you've got the ticket to stable, beautiful shorelands or wet areas that you need no longer mow.
Habitat: Wet Prairie/Marsh/Lake Edge Height: 24-48" Full Sun-Part Shade 8 packs 48 plants $35.00
Wildflower Species: New England Aster, Swamp Aster, Spotted Joe-Pye Weed, Cardinal Flower, Blue Lobelia, Boneset, Marsh Blazing Star, Grass Leaf Goldenrod, Sneezeweed, Flat Top Aster, Sweet Black Eyed Susan, Monkeyflower, Blue Vervain, Ironweed.
Grass Species: Bottlebrush Sedge, Porcupine Sedge, Caterpillar Sedge, Fox Sedge, Sweet Flag, Torrey's Rush, Path Rush, Soft Rush, Wool Grass.

DRY WILDFLOWERS

A fine collection of flowers for those sunny, hot, dry sites. Perfect for boulevard plantings!
Habitat: Dry Prairie/Forest Edge Height: 12-36" Full-Part Sun 8 packs 48 plants $35.00
Species: Anise Hyssop, Thimbleweed, Leadplant, Smooth Aster, Sky Blue Aster, Stiff Coreopsis, Heath Aster, Aromatic Aster, Prairie Coneflower, White Prairie Clover, Purple Prairie Clover, False Sunflower, Smooth Penstemon, Bergamot, Yellow Coneflower, Black-eyed Susan, Showy Goldenrod, Hoary Vervain, Golden Alexander.

MOIST WILDFLOWERS

A great mix for moist to wet lake margins and other wet areas suited to a variety of light levels. Stop mowing and start growing this stately mix which will add beauty and stabilize your shoreline at the same time!
Habitat: Mesic-Wet Prairie/Marsh Height: 24-48" Full Sun-Part Shade 8 packs 48 plants $35.00
Species: Swamp Milkweed, New England Aster, Swamp Aster, Flat-top Aster, Turtlehead, Spotted Joe-Pye Weed, Boneset, Sneezeweed, Sweet Black Eyed Susan, Grass Leaf Goldenrod, Marsh Blazing Star, Thick-spike Blazing Star, Cardinal Flower, Blue Lobelia, Monkeyflower, Mountain Mint, Purple Meadow Rue, Blue Vervain, Ironweed.

SHORT PRAIRIE WILDFLOWERS & GRASSES

This mixture includes the toughest, most drought-tolerant native prairie species available. These species thrive where turf grasses never will.
Habitat: Dry Prairie Height: 6-20" Full-Part Sun 8 packs 40-50 plants $35.00
Wildflower Species: Prairie Smoke, Wild Petunia, Drummond's Aster, Upland White Aster, Prairie Spiderwort, Aromatic Aster, Dwarf Blazing Star, Ground Plum, Nodding Wild Onion, Purple Prairie Clover, Dotted Mint, Stiff Coreopsis.
Grass Species: Blue Grama, June Grass.

WOODLAND

An outstanding combination of woodland plugs including wildflowers and grasses. Only shade tolerant species will thrive in forested conditions. This is the collection to begin restoring and beautifying any degraded woodland understory.
Height: 6-36" 8 packs 40-48 plants $35.00
Wildflower Species: Wild Columbine, Pearly Everlasting, Canada Anemone, Big Leaf Aster, Arrow-leaved Aster, Harebell, White Snakeroot, Woodland Strawberry, Jacob's Lader, Zig Zag Goldenrod.
Grass Species: Pennsylvania Sedge, Long Beaked Sedge, Bottlebrush Grass.

White Pine Landscape Design

59 S. Horseshoe Dr.
Turtle Lake, WI 54889
763.464.0750
laura.nackerud@gmail.com

Shoreline Site Preparation

Removing Undesirable Vegetation

Techniques to remove existing vegetation by smothering and/or applying herbicide are described below.

Smothering - Use Black Plastic

Black plastic spread over vegetation eliminates light and creates heat that kills existing plants. This method is suitable for almost any site. In areas with high exposure to wind, extra care must be taken to anchor the plastic in place.

1) You will need
   a) 3.5 mil or thicker black plastic to adequately cover the area, plus extra to overlap sheets at least 6 inches.
   b) 4 inch or longer, 11 gauge or heavier U-shaped metal staples (enough to space 1 foot apart where plastic overlaps and at the edges).
   c) Heavy objects like logs, cement blocks, boards, or tires to hold the plastic in place.

2) Prepare the site by mowing, weed whacking, or trimming vegetation to be removed.

3) If soil is dry, water thoroughly. This will increase the weed killing effectiveness.

4) Lay down the plastic. Overlap the plastic at least 6 inches if using more than one piece. Staple in place at one-foot intervals as it is laid down.

5) Place heavy objects over plastic. All seams and edges must be firmly anchored to exclude light. Edges can also be buried in a shallow trench to help hold them in place.

6) Leave the plastic in place for 4-6 weeks during spring or summer. Make certain there is no sign of living vegetation before removing it.

7) Remove plastic, but leave dead vegetation in place. If using plant mulch over the dead vegetation, plant directly through the mulch.

Applying Herbicide

A glyphosate herbicide like Roundup® is recommended. Avoid drift of herbicide to water. If herbicide is to be applied in or over the water, an aquatic glyphosate formulation such as Rodeo® must be used, and a Department of Natural Resources permit is required. Always follow label instructions carefully.

Timing of herbicide applications is crucial. Do not apply when rain is forecast in the next 24 hours. Do not apply on windy days, since vegetation you wish to preserve may be damaged by herbicide drift. Vegetation must be actively growing for glyphosate herbicides to be effective. To encourage growth, mow grass and allow it to re grow several inches. Air temperature must be between 50 and 75 degrees Fahrenheit for cool season plants like quack grass and brome grass to be actively growing, and therefore effectively killed by the herbicide.
Be certain that vegetation is dead before planting. If turf is still green or yellow-green after 7 - 10 days, a repeated herbicide application is recommended.

Soil Amendments

In most cases soil amendments are not required to plant native plants. Adding black dirt or manure can be detrimental to lakeshore plantings. These soil amendments will favor weed growth, and the native plants may grow more quickly and be less sturdy. The same is generally true with adding fertilizers. It you are going to use fertilizer, add a small pinch of organic phosphorus free (the middle number N-P-K) into each planting hole. Never broadcast spread as it will feed the weeds and run into the lake.

Avoid Soil Erosion — Leave Dead Vegetation In Place

Dead vegetation left in place after smothering or an herbicide application does not need to be removed. Leave the dead material to serve as a mulch to capture moisture, reduce weed growth, and add organic material to the soil. If planting seedlings, you can plant directly through the dead material. Be sure that the roots are buried in soil and not in the thatch of dead lawn, where the plant would quickly dry out and die. If seeding, additional soil preparation will be necessary.

Bare soils must be stabilized to avoid serious erosion problems. Bare soils may be present because Of erosion from runoff, bank instability, heavy use, or construction activities. Eliminate or minimize the cause of the bare soil and then stabilize the area following the guidelines below. Any bare sand or dirt should be planted with seeds and/or seedlings and mulched. Additional stabilization methods are necessary on sloped areas.

All sites	Seed or plant permanent vegetation and mulch
After Sept 15	Temporary seeding of annual rye Permanent seeding next growing season
Slopes >12%	Companion seeding of oats, annual rye, or Canada wild rye
Slopes >20%	Companion seeding of oats, annual rye, or Canada wild rye Mulch, net, and plant

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Shrub and Tree Planting Steps

1. Keep bare-root stock moist and cool before planting. Dormant bare-root shrubs can be ordered in the fall or winter for delivery in the spring. Plant bare-root stock as soon as it arrives. If you must wait to plant, store bare-root stock close to 34 degrees Fahrenheit to avoid breaking dormancy. Keep roots moist by periodically sprinkling with water. Do not soak roots in water because this will deprive them of oxygen.

2. Dig the hole deeply enough so that the roots won't curl or bunch up. The trees and shrubs should be planted about one-half inch deeper than they were in the nursery. Paler colored bark and a slight swelling on the stem mark the old soil line.

3. Pack soil firmly around the roots. Air pockets left around the roots will dry them out. Pack soil firmly but gently around the roots with your foot.

4. Water regularly to keep soil moist but not saturated.

5. Mulch a two-foot diameter circle around each plant 2-3 inches deep with shredded wood chips, straw or leaves. This will reduce competition with other plants. Keep this area free of other growth by weed-wacking or hand-pulling weeds for the first couple of years.

Seedling Planting Steps

Plant seedlings from May 15 until September 15. A planting density recommendation of 70-120 plants per 100 square ft. Plant at least 30 percent grasses to stabilize the soil and provide an attractive backdrop for flowers. Watering new seedlings regularly is extremely critical for their survival.

1. Assess existing vegetation. It might be possible to plant among existing native vegetation or into a poorly established lawn. Ask for assistance from the Land and Water Conservation Department if you are unsure. If native vegetation dominates or lawn grasses are poor, skip step 2.

2. Remove non-native competing vegetation such as turf grasses and invasive weeds through smothering or applying herbicide as described earlier.

3. Plan your planting scheme. Spacing plants 8-12 inches apart is recommended for very sandy soils, Spacing of 12 -18 inches is adequate for moist soils.

4. Lay mulch down prior to planting. Spread 3 inches of straw, leaves, or pine needles to conserve moisture and reduce weed growth. If you use oak leaves, we recommend chopping them up by running over them with a mower or through a leaf shredder. Avoid using field hay because it generally contains weed seeds. Two inches of wood chips can be used only in areas with moist, rich soils. Wood chips tend to shed moisture, retard spreading of plants, and demand nitrogen as they decay.

5. Be ready to water. Watering plant plugs is critical to their success. Be ready with hoses and sprinklers before you begin to plant.

6. Dig holes for plants. This will speed up planting. A bulb planter or bulb auger drill bit attached to an electric drill work well for planting. Make sure the holes for the plants penetrate the dead grass.

7. Fertilize. A small amount of organic, phosphorus-free or very low phosphorus fertilizer is recommended, The second number on the fertilizer label indicates the percentage of phosphorus. For a 6-0-6 NPK ratio, place a teaspoon in each plant hole. Excess fertilizer will encourage weed growth.

8. Place live plants in the ground soon after you they are brought to the site. If you must keep them a few days before planting; keep them in an area with partial sun such as on the east side of a building or under a deciduous tree. Do not leave them in a dark area for long periods; this will weaken plants. Water to keep packs moist once or twice a day.

9. Plant in the cool hours of the day. Plants will have a greater survival rate if planted on a cool day or during the morning or evening hours. To plant, separate the mulch, dig a hole, sprinkle organic fertilizer, place the plant plug in the hole, press the soil gently around the plug, and replace the mulch, being careful to keep mulch 1/2 inch from the stem of plants.

10. Water. Don't forget this important step to give your plants a good start! Water immediately after planting. Plan to water daily for the first few weeks or until plants are well established. If plants wilt or droop, a repeated watering during the day may be necessary. Once plants are established, water only if prolonged dry periods occur.

Steps for Planting Seeds

1. Remove non-native competing vegetation by smothering or applying herbicide as described in the site preparation section. Rake or till only enough to expose soil for planting seed - no more than 1-2 inches deep.

2. Select seed. Use 3-8 ounces of seed for every 1,000 square feet. Greater amounts of seed will result in denser growth and better chances for success. Include 1 ounce of Canada wild rye per 1,000 square feet as a companion seeding or cover crop if desired. This seed will germinate readily to indicate areas where seeding is successful and help to hold the soil in place. Canada wild rye is a short-lived native perennial grass.

3. Mix seeds with slightly moist sand. Fill an ice cream pail or similar one gallon bucket 2/3 full with moist, but not wet, sand. Add up to 4 ounces of seed and mix well. The seeds will adhere to the sand, so they can be spread more thinly and evenly.

4. Broadcast the seed/sand mixture. Use half of the seed/sand mixture to cover the entire area. Sow the remaining half by walking perpendicular to the line of the first pass to assure good seed distribution throughout the area you wish to plant. The sand will make it easier to see places that have not been seeded.

5. Press seed in by tamping down the soil with a rake or lightly raking the seeds in. You may also roll the site with a water-filled roller to insure good soil/seed contact. Never roil when soil is wet, this will compact the soil, decrease oxygen levels in the soil, and reduce seed germination.

6. Mulch lightly with 1/2 inch of weed-free straw. Do not use field hay, as it contains numerous weed seeds. Soil must be visible between the straw stems, or the mulch is too thick to allow seedlings to grow.

7. On steep slopes, hold the mulch in place by staking down a jute or plastic net. An excelsior erosion control blanket up to % inch thick may be used as an alternative to mulching and netting.

8. Water immediately following seedling. Don't forget this important step to give your plants a good start! Watering seeds and small seedlings after sprouting is critical for sandy soils. Plan to water daily, preferably in the morning, for the first few weeks or until plants are well established. Check to see that soil is moist beneath the mulch. Very sandy sites may require watering more than once daily for the first few weeks. Once plants are established, water only if prolonged dry periods occur.

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Rain Garden Installation & Planting Instructions

Planning

Have your landscape professional put together a Rain Garden Site Plan and Diagram for your site.
Using the site plan and diagram as your guide, lay out the perimeter of your garden with string, garden hose or spray marking paint. Make any adjustments necessary to accommodate your site. Take before pictures.

Digging

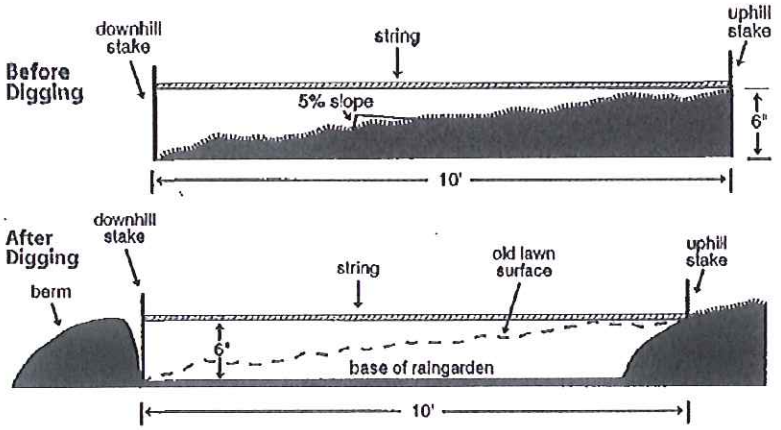
First you will need to remove all the sod from inside the perimeter. Loosen and remove soil to shape the garden bed. While digging to the correct depth, heap the soil around the edges where the berm will be. The berm is a low wall around three sides of the rain garden that holds the water in during a storm. On a steeper site, the lower part of the garden can be filled in with soil from the uphill half, and extra soil might need to be brought in for the berm. The uphill end might be dug out noticeably higher than the low end, as the goal is to have the center of the rain garden level. This is not always possible however, so as close as you can get is fine.

Soil Prep

Using a roto-tiller to work up compacted soil is a good idea but not mandatory. If you choose to add compost to amend the soil you need to dig the garden a few inches deeper. For best weed prevention, layer 3-5 sheets of newspaper underneath 3 inches of shredded hardwood mulch. After shaping the berm into a smooth ridge about a foot across, stomp on it. It is very important to have a well-compacted berm with gently sloping sides. Small boulders can be used on the downhill sides for added protection on hills if desired. The berm can be planted in grass, drought tolerant prairie plants or mulched.

Planting

Following the Rain Garden plant list and diagram, you can use steaks or string to roughly designate planting sections. Plant 3-7 of each plant type together in each section, with the taller, water tolerant plantings in the center. Shorter, dry tolerant plantings will go around the outside areas of the garden. Put all plant tags you have next to the plants for easier ID when weeding. Make sure the mulch isn't smothering the plants and water, water, water. The smaller the plants are the more often they will need to be watered. Follow the planting tips sheet enclosed, along with following up with the operation and maintenance sheet. Take after pictures now and again in two to three years.



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Rain Garden Operation & Maintenance Plan

Watering: Regular watering in the first two months of a spring or summer planting is one of the most important factors for success. Without supplemental watering, roots may not reach the soil moisture they need. Water plantings well at least 3-4 times a week when there is no rain, for the first month or two. The following month's watering may be reduced to 1-2 times a week until fall. Watering in the early morning is the best time. Use lake water if feasible, since this water often is warmer and more nutrient-rich than well water. The following years, hand watering is only necessary during dry spells in the heat of the summer.

Weeding: Weed control the first year is usually minimal, the following years is when one needs to watch out for invading weeds. Remove by hand only those plants you are certain are weeds. It can be helpful to contract with someone knowledgeable in plant identification to help you with weed control until you feel comfortable on your own. Try to get out all the roots of the weedy plants. In the third year and beyond the native grasses, sedges and wildflowers will begin to mature and will out-compete the weeds. Weeding isolated patches might still be needed on occasion.

Deer Browsing: Protect your garden with physical methods such as fencing or bird netting. Deer are discouraged by strong smells or tastes such as red pepper spray and other sprays, Irish Spring soap shavings, human and animal hair or urine. Use of these products need to be varied as deer become accustomed to their taste and smell. Deer feeding in the area around your plantings should be discouraged.

Spring Cleanup: Do not prune or cut back the new plants. After each growing season, the stems and seed heads can be left for winter interest, wildlife cover, bird food and reseeding of new plants. Once spring arrives and new growth is 4-6 inches tall, cut all tattered plants back. Hand cut the largest plants, and then use a string trimmer to cut the rest back. Do not remove all the dead vegetation, but leave some to decay. This becomes organic matter feeding the soil and your new plants.

Rebalancing: As some plants multiply quickly, others may dwindle or die out over the years. To keep your garden looking it's best you may choose to remove some plants or add new ones. Remember, you are in control of your new rain garden, do what you want with it. Enjoy!


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