

Executive Summary

Lake Wawasee and Syracuse Lake are located in Kosciusko County, Indiana near the town of Syracuse. Lake Wawasee has 3,060 surface acres with a maximum depth of 77 feet and an average depth of 22 feet. Syracuse Lake has 414 surface acres with a maximum depth of 34 feet and an average depth of 13 feet. Eurasian watermilfoil (*Myriophyllum spicatum*) and Starry stonewort (*Nitellopsis obtusa*) are exotic plant species that are now present in both lakes. The following report summarizes Eurasian watermilfoil (EWM) and starry stonewort (SSW) control practices implemented on Lake Wawasee and Syracuse Lake and outline a plan for future management of these exotic species.

The first aquatic vegetation management plan developed for Syracuse Lake was completed in 2005, and the first plan developed for Lake Wawasee was completed in 2006. These plans focused on annual control of EWM in areas of high recreational use. At this time, SSW had not yet been discovered in either lake. Large scale EWM treatments (35-50 acres) were performed on Syracuse Lake in 2005, 2006, 2008, and 2009. Areas of high use in Lake Wawasee (25 -50 acres) were treated in 2007, 2008, and 2009. All EWM treatment on both lakes used liquid DMA-4 herbicide at a rate of 2 parts per million to selectively control EWM without damaging native vegetation.

SSW was first observed in summer of 2008 on Lake Wawasee in the channels on the west side of Johnson's Bay. In August of 2009, 15 acres in Johnson's Bay were treated with Nautique herbicide for the control of SSW.

In 2010, LARE funding was used to treat areas of SSW in Johnson's Bay. On June 7th and July 14th, Nautique herbicide was used at a rate of 0.8 parts per million to treat approximately 20 acres of SSW. The success of these treatments was limited. On August 10, 2011 three small test areas in Johnson's Bay were treated with varying rates and formulations of Cutrine Ultra and Hydrothol herbicides. Based on these tests, it was determined that using Cutrine Ultra at a rate of 2.4 gallons per acre-foot in combination with Hydrothol 191 at a rate of 1 quart per surface acre was the most effective treatment. On September 16, 2010, four areas in Johnsons Bay were treated with this new herbicide prescription.

In 2011, SSW was first discovered in Syracuse Lake in the 4.5 acre access channel adjacent to Syracuse Park.

Also in 2011, the IDNR received a grant through the Great Lakes Restoration Initiative for the control of exotic aquatic plant species. Since 2011, the IDNR has fully funded numerous SSW treatments on both Lake Wawasee and Syracuse Lake. These treatments have ranged from 11.29 acres to 67.39 acres and have used a combination of Cutrine Ultra herbicide at a rate of 2.4 gallons per acre foot with Hydrothol 191 herbicide at variable rates to control SSW.

Two tier II vegetation surveys were performed on Lake Wawasee and Syracuse Lake in 2011 and 2012. The most recent survey data from August of 2012 showed that EWM site frequency was 23.7 percent in Lake Wawasee and 46.0 percent in Syracuse Lake. In August of 2012, SSW frequency was 23.1 percent in Lake Wawasee and 2.0 percent in Syracuse Lake.

Despite large scale efforts to control SSW, its acreage has increased steadily each year since 2009. In August of 2009, total SSW acreage in Lake Wawasee was estimated at 15 acres. In the fall of 2012, total SSW acreage in Wawasee was estimated at 159 acres. Total SSW acreage in Syracuse Lake was estimated at 7.5 acres in fall of 2012. Chemical applications temporarily control SSW, but no

long term control of the plant has been observed. Multiple applications are needed in the same treatment area throughout the course of the season to keep SSW suppressed.

Starry Stonewort may be considered the highest treatment priority, based on the large amount of perceived available habitat into which it could expand in both these lakes. It appears to be very aggressive and severely inhibits lake use when established. While EWM can be very problematic, it has been present in the lakes for decades and is likely already present in most areas of suitable habitat. Currently, total EWM acreage in Lake Wawasee is estimated at 579 acres. Any treatment of EWM must also be balanced against the possibility that SSW could expand into areas where EWM is controlled.

In 2013, all areas of nuisance SSW infestation should be treated if possible. Realistically, it may be difficult to fund treatment of the total acreage of SSW in these lakes. If the decision is made not to treat all areas of nuisance SSW infestation, then treatment areas should be prioritized based on lake use. Boat ramps, marinas, and other high traffic areas will rank high in treatment priority. Treating these areas will not only improve lake use, but also control SSW in areas where it is most likely to be cut and spread by boat propellers.

EWM could also be treated in areas where it is severely impeding use of these lakes. It is estimated that 50 acres of EWM in Syracuse would be good candidates for EWM treatments and that approximately 75 acres in Lake Wawasee would be good candidates for EWM treatments to improve lake use. Cost estimates for these projects are listed below:

<u>Eurasian Watermilfoil</u>	<u>Cost Estimates</u>
Treat 50 acres of EWM on Syracuse Lake (DMA-4 herbicide at 2ppm, 4 foot avg. depth)	\$ 17,500
Treat 75 acres of EWM on Lake Wawasee (DMA-4 herbicide at 2ppm, 4 foot avg. depth)	\$ 26,250
Spring and Summer Tier II surveys, AVMP update	\$ 11,000
Total Cost Estimate	\$ 54,750
LARE grant request (80% - subject to availability)	\$ 43,800
Association's cost-share (20%)	\$ 10,950

Starry Stonewort Budget

At this time it is unclear if funding from the Great Lakes Restoration Initiative will be available to treat SSW as it has in the past. Cutrine Ultra was used in combination with Hydrothol 191 to control SSW in 2012. The cost for SSW treatments at Lake Wawasee and Syracuse Lake in 2012 was \$1,998.11 per 25 acre-feet treated with Cutrine Ultra. The additional cost for Hydrothol was \$25.41 per quart used. At this time, it is estimated that there are 825 acre-feet of water in current SSW beds in Lake Wawasee and 35 acre feet in Syracuse Lake. Total SSW acreage could change significantly in 2012 as the plant appears to continue to spread in these lakes.

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Problem Statement

Starry Stonewort (SSW) and Eurasian watermilfoil (EWM) are impacting the use of Lake Wawasee and Syracuse Lake in many areas. Both SSW and EWM form dense mats in shallow areas, which can inhibit fishing, swimming, and boating. Observations from Lake Wawasee and Syracuse Lake over the past 3 years indicate that SSW is extremely aggressive and even appears to be out-competing EWM in many areas. These invasive plants beds may also prevent the growth of beneficial native species which often provide less recreational interference and better quality fish habitat.

Objectives:

The following specific, quantifiable objectives are recommended to evaluate the success of EWM and SSW management activities at Lake Wawasee and Syracuse Lake:

1. Limit the frequency of occurrence of EWM in summer tier II sampling to 10 percent or less in both lakes (IDNR, 2013).
2. Limit the frequency of occurrence of SSW in summer tier II sampling to 5 percent or less in Syracuse Lake.
3. Limit the frequency of occurrence of SSW in summer tier II sampling to 20 percent or less in Lake Wawasee
4. Maintain a minimum of 11 native species collected each year in tier II surveys in Syracuse Lake.
5. Maintain a minimum of 13 native species collected each year in tier II surveys in Lake Wawasee.

Treating SSW and EWM is not likely to eradicate them from Lake Wawasee and Syracuse Lake. In fact, SSW acreage in Lake Wawasee and Syracuse Lake may be expected to increase in coming years based on the perceived amount of suitable habitat available for its expansion. However, if these objectives are met each year, the indication would be that SSW and EWM are being managed effectively on a seasonal basis, without causing significant damage to the native plant community.

Aquatic Vegetation Management History

Table 1 and Table 2 summarize the treatment history of Lake Wawasee and Syracuse Lake from the beginning of their involvement with the LARE program. The two main target species have been EWM and SSW. SSW treatments were funded 100% by the IDNR, while Eurasian watermilfoil treatments were funded by the Wawasee Area Conservancy Foundation (WACF), the Syracuse Lake Association, and the LARE program.

Table 1: Lake Wawasee Treatment History

Year	Target species	Month	Acres	Areas	Herbicide	Rate
2007	EWM	July	25 ac		DMA-4	2.0 ppm
2008	EWM	July	50 ac		DMA-4	2.0 ppm
2009	EWM	July	25 ac		DMA-4	2.0 ppm
	EWM	August	25 ac		DMA-4	2.0 ppm
	SSW	August	15 ac	Johnsons Bay	Nautique	1.0 ppm
2010	SSW	June 7	20 ac	Johnsons Bay	Nautique	0.8 ppm
	SSW	July 14	20 ac	Johnsons Bay	Nautique	0.8 ppm
	SSW	August 10	1.0 ac	A – Johnson’s Bay	Citrine ultra + hydrothol	2.4 gal/acre foot +1qt/surface acre Hydrothol
	SSW	August 10	1.0 ac	D1 – Johnson’s Bay	Citrine ultra + hydrothol	2.4 gal/acre foot + 1 qt/acre-foot Hydrothol
		August 10	0.6 ac	B3-Johnson’s Bay	Granular Hydrothol	82 lbs/ac-foot (0.8 ppm)
2011	SSW	June 29	30.76 ac		Citrine ultra + hydrothol	2.4 gal/acre foot +Hydrothol
	SSW	July 26	56.56 ac		Citrine ultra + hydrothol	2.4 gal/acre foot +Hydrothol***
	SSW	September 15	20.26 ac	1,2,3,10,11*	Citrine ultra + hydrothol	2.4 gal/acre foot +Hydrothol***
	SSW	September 22	11.29 ac	Johnson’s Bay	Citrine ultra + hydrothol	2.4 gal/acre foot +Hydrothol***
	SSW	September 22	30.72 ac	Johnson’s Bay	Captan XTR + hydrothol	2.4 gal/acre foot +Hydrothol***
2012	SSW	May 8	20.26 ac	1,2,3,10,11*	Citrine ultra + hydrothol	2.4 gal/acre foot +Hydrothol***
	SSW	June 21	67.39 ac	1,2,3,10,11*+ Johnsons Bay channels	Citrine ultra + hydrothol	2.4 gal/acre foot +Hydrothol***
	SSW	July 24	22.69 ac	1,2,3,10,11*	Captain XTR + Hydrothol	2.4 gal/acre foot +Hydrothol***
	SSW	October 2	23.57 ac	1,2,3,10,11*	Citrine ultra + hydrothol	2.4 gal/acre foot +Hydrothol***

***Hydrothol rates vary depending on treatment location. In general, Hydrothol was used at a rate of 1 quart per surface acre in all channels and confined water areas. Along open shoreline and main lake areas, Hydrothol was used at a rate of 1 quart per acre foot. These differing rates were used to avoid fish toxicity issues.

*Areas refer to Figure 2.

Table 2: Syracuse Lake Treatment History

Year	Target species	Month	Acres	Herbicide	Rate
2005	EWM	July	35 ac	DMA-4	2 ppm
2006	EWM	July	50 ac	DMA-4	2 ppm
2007	none	--	--	--	--
2008	EWM	July	50 ac	DMA-4	2 ppm
2009	EWM	July	50 ac	DMA-4	2 ppm
2010	No treatment				
2011	SSW	September 6	4.5 ac	Citrine ultra + hydrothol	2.4 gal/acre foot + 1 qt/acre Hydrothol
	SSW	September 22	4.5 ac	Citrine ultra + hydrothol	2.4 gal/acre foot + 1 qt/acre Hydrothol
2012	SSW	May 8	4.5 ac	Citrine ultra + hydrothol	2.4 gal/acre foot + 1 qt/acre Hydrothol
	SSW	June 21	6.5	Citrine ultra + hydrothol	2.4 gal/acre foot + 1 qt/acre Hydrothol
	SSW	July 24	6.5 ac	Captain XTR	2.4 gal/acre foot + 1 qt/acre Hydrothol
	SSW	October 2	7.5 ac	Citrine ultra + hydrothol	2.4 gal/acre foot + 1 qt/acre Hydrothol

2012 Vegetation Treatments

No EWM treatments of any kind were funded on either Lake Wawasee or Syracuse Lake in 2012.

Syracuse Lake SSW Treatments

Syracuse Lake was treated for SSW control four times in 2012. Treatment areas are described in Figure 1. The access channel (Area 1) was treated on May 8, 2012. On June 21, areas 1, 2, and 3 were treated with Citrine Ultra at a rate of 2.4 gallons per acre foot in combination with Hydrothol 191. On July 24, Captain XTR was used in areas 1, 2, and 3 at a rate of 2.4 gallons per acre foot in combination with Hydrothol 191. In Area 3, Hydrothol was used at a rate of 1 quart per acre foot, while the other areas used one quart of Hydrothol per surface acre in both of these treatments. Area 4 was discovered in the August tier II survey and was treated along with all of the other areas on October 2, 2012 with Citrine Ultra and Hydrothol.

Figure 1: Syracuse Lake 2012 Treatment Areas



Table 3 gives details of the 2012 Syracuse Lake SSW treatment areas. These areas correspond to Figure 1.

Table 3: Syracuse Lake 2012 SSW Treatment Areas

Area	Dates Treated	Target	Acres	Avg Depth	Acre-feet	Amount
Area 1	May 8, June 21 July 24 October 2	SSW	4.5	3.5	15.75	37.8 gal Cutrine + Hydrothol
Area 2	June 21 July 24 October 2	SSW	1.0	3	3	7.2 gal Cutrine + Hydrothol
Area 3	June 21 July 24 October 2	SSW	1.0	14	14	33.6 gal Cutrine + Hydrothol
Area 4	October 2	SSW	1.0	3	3	7.2 gal Cutrine + Hydrothol
Totals			7.5		35.75	85.8 gal Cutrine + Hydrothol

2012 Lake Wawasee SSW Treatments

In 2012, four separate treatments were conducted for SSW control on Lake Wawasee. The public access site at the lake's southeast end was included in every treatment to keep SSW from being cut and spread to other areas or even other lakes. The high use areas of Griffith's Marina, the Macy's Slip area, the Main Channel Marina and the channel between Syracuse and Wawasee were all treated four times in order to keep SSW under control. In addition to these areas, the channel system at the west end of Conklin Bay, most channels in Johnson's Bay, and various other channels were treated at least once to improve lake use. All SSW Treatments on Wawasee used Cutrine Ultra Herbicide at a rate of 2.4 gallons per acre foot in combination with Hydrothol 191 herbicide. In general, open water areas were treated with Hydrothol at a rate of 1 quart per acre foot while the Hydrothol rate was reduced to 1 quart per surface acre in more confined spaces.

Many maps have been used to delineate treatment areas of the past three years, as the SSW acreage continues to increase. Figure 2 is not all inclusive of every SSW area on Lake Wawasee but attempts to describe areas treated for SSW in 2012. Instead all SSW beds in Lake Wawasee are described in Figure 15. An effort has been made to consolidate information from 28 potential treatment areas into one map and one table (Figure 15 and Table 5). More detailed information about treatment acreage, average depths, rates, and recommendations is included in the action plan of this report.

Table 4: Lake Wawasee 2012 SSW Treatments

	Target	Date	Acreage	Areas**	Herbicides/Rates
2012	SSW	May 8	20.26 ac	1,2,3,10,11,	Cutrine ultra at 2.4 gal/acre-foot + hydrothol****
	SSW	June 21	67.39 ac	1,2,3,10,11,12, 13+ Johnsons Bay channels and frontages in areas 5, 6, 7, 8, 9, and 14. (Large open water portions of Areas 8 and 9 were not treated.)	Cutrine ultra at 2.4 gal/acre-foot + Hydrothol****
	SSW	July 24	22.69 ac	1,2,3,10,11,12,13 (Some expansion in these areas from May)	Captain XTR at 2.4 gal/acre-foot + Hydrothol
	SSW	October 2	23.57 ac	1,2,3,10,11,12,13 (some expansion in these areas from July)	Cutrine ultra at 2.4 gal/acre-foot + Hydrothol****

**Areas in this table correspond to Figure 2.

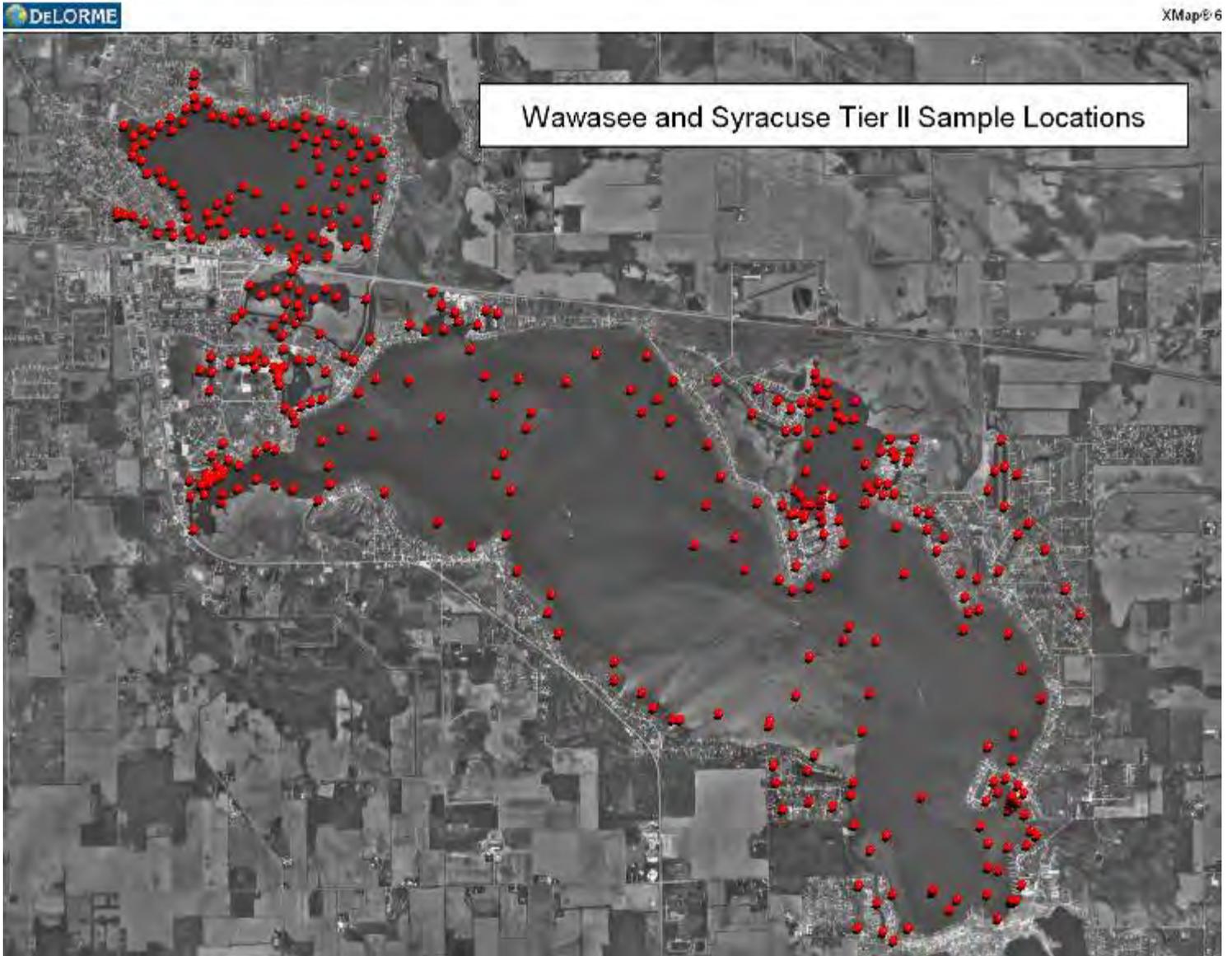
Figure 2: Lake Wawasee 2012 SSW Treatments



Tier II Survey Results

Two tier II vegetation surveys were performed on Lake Wawasee and Syracuse Lake in 2012. The spring survey on Lake Wawasee was conducted on May 30 and May 31 while the spring survey on Syracuse Lake took place on June 1. The summer survey on Syracuse Lake took place on August 16 while the summer survey on Lake Wawasee took place on August 22 and 23. Aquatic plant sampling methods used for surveys on Lake Wawasee and Syracuse Lake are outlined in the Tier II Aquatic Vegetation Survey Protocol (IDNR 2010). In Syracuse Lake, 100 sample sites are distributed randomly throughout the littoral zone. In Lake Wawasee, 300 sample sites are distributed throughout the littoral zone. Channels are typically excluded from vegetation surveys; however channels were included in 2011 and 2012 in an effort to locate starry stonewort. Data presented below excludes any sampling locations within channels and only describes the “main lake” samples. Common and scientific names for aquatic plants are consistent with those listed in the original AVMPs for these lakes. Figure 3 shows the tier II sample locations on Lake Wawasee and Syracuse Lake.

Figure 3: Wawasee and Syracuse Tier II Sample Locations



Invasive species

EWM

****All data used for discussion of site frequencies for EWM is from sample sites on the main lake only. Data from tier II sites located in channels is excluded.**

In Lake Wawasee, EWM site frequency was 33.7 percent in spring of 2012 and 23.7 percent in summer of 2012. In 2011, spring frequency of EWM was 29.7 percent, and summer frequency was 23.7 percent. This data indicates that EWM abundance seems stable from 2011 to 2012. EWM distribution in Lake Wawasee is described in Figure 5. In Figure 5, tier II data from multiple tier II surveys, as well as depth contour information were used to estimate total EWM acreage in Lake Wawasee. Although EWM acreage is high at approximately 579 acres, the population has remained somewhat constant in recent years.

In Syracuse Lake, spring EWM frequency was 30 percent and summer frequency was 46 percent. Summer EWM frequency in 2012 was higher than at any time since 2004 when the first tier II survey took place. Water clarity has been good in Syracuse Lake in 2011 and 2012 which could be allowing EWM to grow in somewhat deeper water. EWM acreage in Syracuse Lake is likely over 100 acres, although EWM may not be dominant in all these areas. EWM distribution in Syracuse Lake is described in Figure 4.

SSW

****All data used for discussion of SSW includes sample sites located in channels as well as those on the main lake. Extra samples were taken in channels specifically to document SSW distribution.**

In Syracuse Lake, SSW frequency was 3 percent in spring and 2 percent in summer. Although SSW frequency remains low, it appears to be spreading and the large amount of suitable habitat in Syracuse Lake is of concern. Total SSW acreage in Syracuse Lake is described in Figure 6.

In Lake Wawasee, summer SSW frequency was 23.1 percent. This represents the highest SSW frequency found in any survey thus far in Lake Wawasee. In summer of 2011, SSW frequency was just 14.7 percent. Total SSW acreage in Lake Wawasee is described in Figure 7.

Despite large scale efforts to control SSW, its acreage has increased steadily each year since 2009. In August of 2009, total SSW acreage in Lake Wawasee was estimated at 15 acres. In fall of 2012, total SSW acreage in Wawasee was estimated at 159 acres. Total SSW acreage in Syracuse Lake was estimated at 7.5 acres in fall of 2012.

Curly-leaf Pondweed (CLP)

In Syracuse Lake, CLP does not appear to be problematic. It was not collected in 2011, and it had a site frequency of just 2 percent of all sites in spring of 2012.

In Lake Wawasee, CLP is somewhat more abundant although it is generally not present in nuisance levels on the main lake. CLP frequency was 8.7 percent in spring of 2011 and 10.7 percent of all sites in spring of 2012.

Figure 4: Syracuse Lake Summer 2012 Tier II EWM Locations

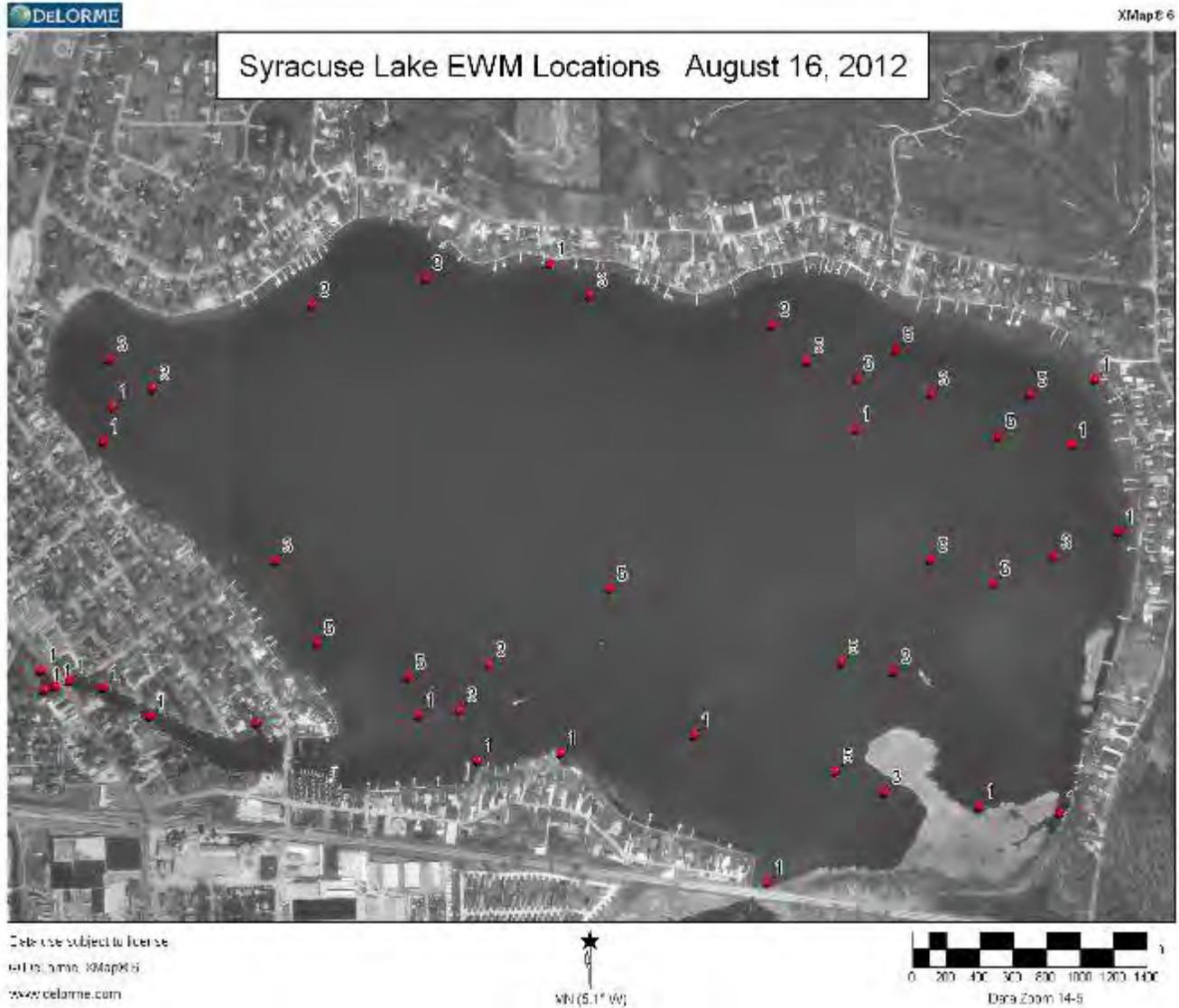


Figure 5 estimates total EWM acreage in Lake Wawasee based on Tier II sampling, visual observation, gps coordinates and depth contour data.

Figure 5: Lake Wawasee EWM Beds- As of Summer 2012

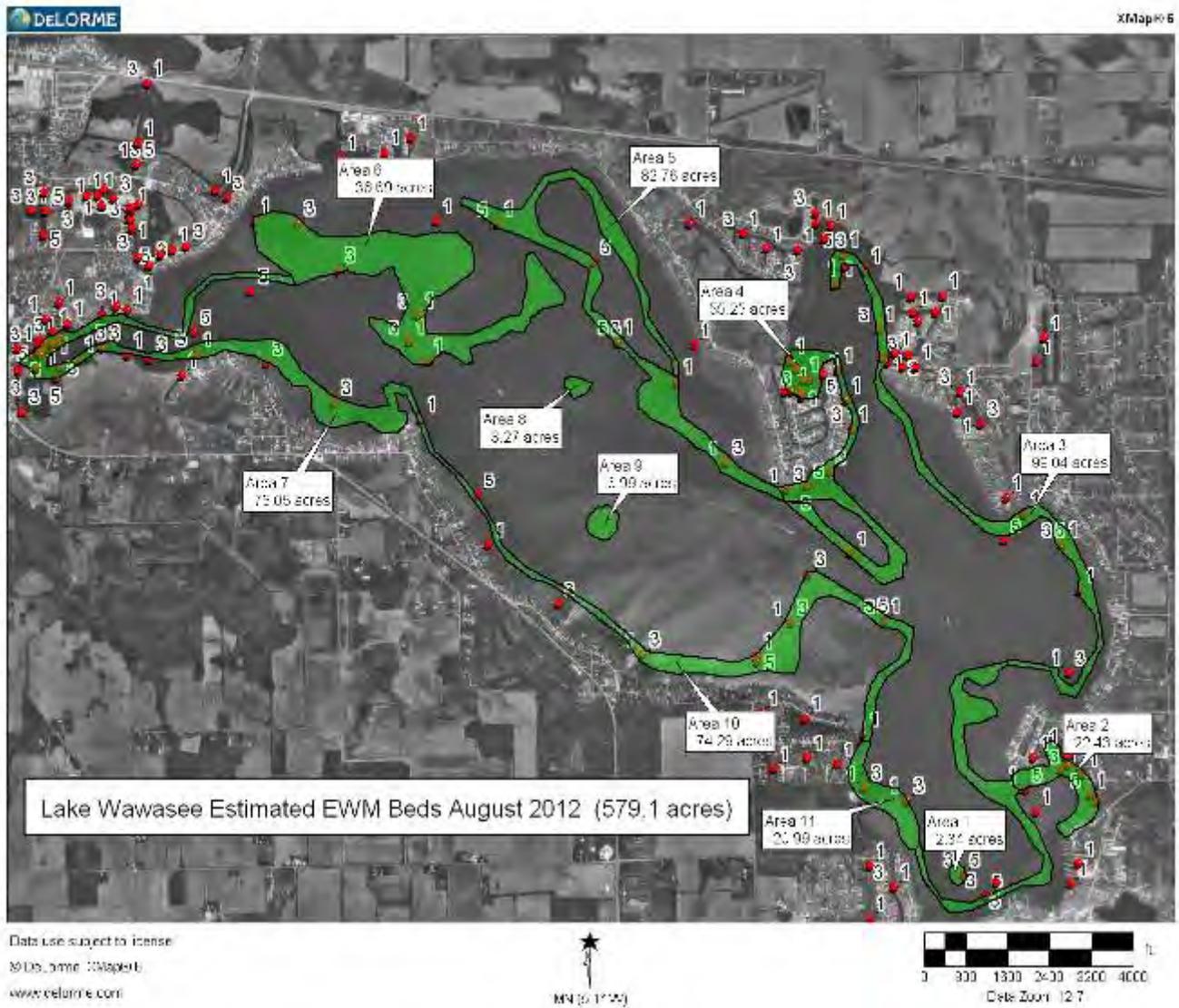
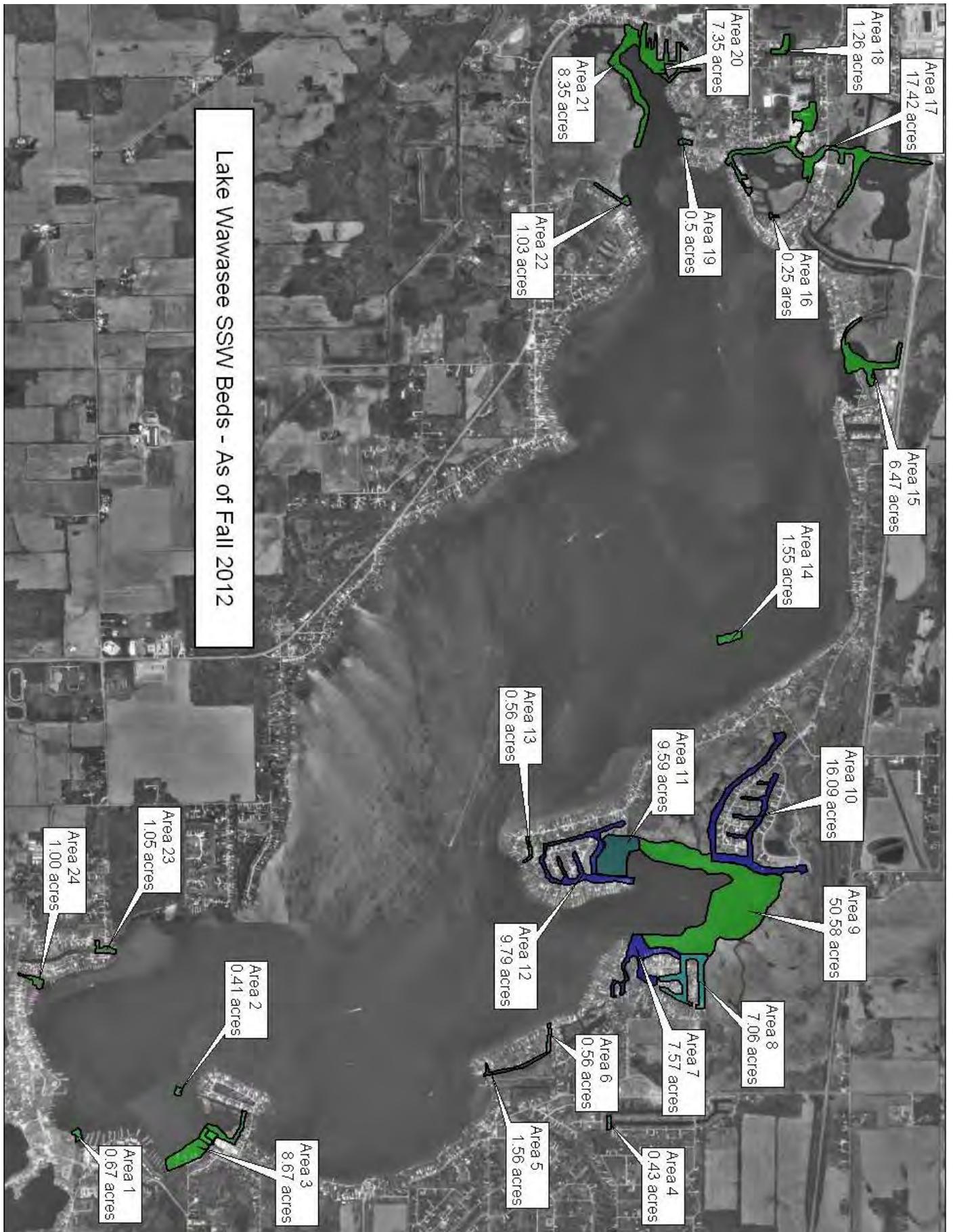


Figure 6: Syracuse Lake Summer 2012 Starry Stonewort Beds



Figure 7: Lake Wawasee Total SSW Acreage - As of Fall 2012



2012 Tier II Data

***All tier II data tables are for “main lake” sites only in Lake Wawasee including the multi-year data presentation. Channel sites are excluded from this data.

Results from the spring and summer tier II surveys are included in the following tables. Figure 8 and Figure 9 describe data collected on the main lake in the spring and summer tier II surveys conducted on Lake Wawasee in 2012. Site frequency, dominance, diversity, and other metrics are shown for the entire survey (overall) and also for each 5 foot depth contour where plants were present.

Figure 10 and Figure 11 show summaries of data from every tier II survey in Lake Wawasee during its involvement in the LARE Program. Every species collected in every survey is included in these tables. Figure 10 shows data for all sites of each survey, while Figure 11 shows data from the portion of sample locations on the main lake in 2011 and 2012. Presenting the data in both forms should provide a quick reference point for future years.

Figure 12 and Figure 13 describe spring and summer 2012 tier II data from Syracuse Lake. Site frequency, dominance, diversity, and other metrics are shown for the entire survey (overall) and also for each 5 foot depth contour where plants were present.

Figure 14 shows a summary of tier II data collected on Syracuse Lake since the beginning of its involvement in the LARE program in 2004. Sampling methods changed in 2006 and again in 2010 and should be taken into account when evaluating this data. Every species collected in every survey on Syracuse Lake is included in this table.

Figure 8: Lake Wawasee (Main Lake) Spring 2012 Tier II Data

Occurrence and Abundance of Submersed Aquatic Plants - Overall						
Lake:	Wawasee	Secchi(ft):	8.0	SE Mean species / site:	0.11	
Date:	6/22/2011	Littoral sites with plants:	136	Mean natives / site:	1.18	
Littoral Depth (ft):	23.0	Number of species:	19	SE Mean natives / site:	0.09	
Littoral Sites:	23	Maximum species / site:	7	Species diversity:	0.90	
Total Sites:	169	Mean species / site:	1.75	Native diversity:	0.88	
Species	Frequency of Occurrence	Score Frequency				Dominance
Eurasian milfoil	29.6	0	1	3	5	14.4
Coontail	23.1	70.4	14.8	8.3	6.5	14.6
Chara	23.1	76.9	3.0	15.4	4.7	12.2
Starry Stonewort	17.8	76.9	7.1	13.0	3.0	10.7
Eel grass	13.6	82.2	4.7	8.3	4.7	6.5
Illinois Pondweed	11.2	86.4	4.7	8.3	0.6	5.6
Curly leaf Pondweed	8.9	88.8	3.6	7.1	0.6	4.1
Bladderwort	7.7	91.1	3.0	5.9	0.0	3.9
Sago Pondweed	6.5	92.3	1.8	5.9	0.0	3.2
Flat-stemmed Pondweed	6.5	93.5	2.4	3.6	0.6	2.7
Richardson's Pondweed	5.9	93.5	3.0	3.6	0.0	3.6
Whorled milfoil	5.3	94.1	0.6	4.7	0.6	2.5
Small Pondweed	4.1	94.7	1.8	3.6	0.0	2.2
Nitella	4.1	95.9	2.4	0.0	1.8	1.5
Sagittaria sp.	3.0	95.9	2.4	1.8	0.0	1.1
American Pondweed	2.4	97.0	1.8	1.2	0.0	1.4
Elodea	0.6	97.6	0.0	2.4	0.0	0.4
Largeleaf Pondweed	0.6	98.4	0.0	0.6	0.0	0.1
Slender Naiad	0.6	98.4	0.6	0.0	0.0	0.1
Occurrence and Abundance of Submersed Aquatic Plants - 0 to 5 ft.						
Lake:	Wawasee	Secchi(ft):	8.0	SE Mean species / site:	0.20	
Date:	6/22/2011	Littoral sites with plants:	54	Mean natives / site:	1.71	
Littoral Depth (ft):	23.0	Number of species:	17	SE Mean natives / site:	0.18	
Littoral Sites:	62	Maximum species / site:	7	Species diversity:	0.92	
Total Sites:	62	Mean species / site:	2.19	Native diversity:	0.89	
Species	Frequency of Occurrence	Score Frequency				Dominance
Eel grass	30.6	69.4	8.1	21.0	1.6	15.8
Coontail	25.8	74.2	4.8	16.1	4.8	15.5
Eurasian milfoil	24.2	75.8	16.1	4.8	3.2	9.4
Chara	22.6	77.4	8.1	12.9	1.6	11.0
Starry Stonewort	19.4	80.6	3.2	8.1	8.1	13.5
Illinois Pondweed	16.1	83.9	4.8	9.7	1.6	8.4
Bladderwort	12.9	87.1	4.8	8.1	0.0	5.8
Flat-stemmed Pondweed	11.3	88.7	6.5	4.8	0.0	4.2
Sago Pondweed	9.7	90.3	3.2	6.5	0.0	4.5
Small Pondweed	9.7	90.3	6.5	0.0	3.2	4.5
Whorled milfoil	9.7	90.3	3.2	6.5	0.0	4.5
Richardson's Pondweed	8.1	91.9	0.0	6.5	1.6	5.5
Sagittaria sp.	6.5	93.5	3.2	3.2	0.0	2.6
American Pondweed	4.8	95.2	0.0	4.8	0.0	2.9
Curly leaf Pondweed	4.8	95.2	0.0	4.8	0.0	2.9
Elodea	1.6	98.4	0.0	1.6	0.0	1.0
Largeleaf Pondweed	1.6	98.4	1.6	0.0	0.0	0.3
Occurrence and Abundance of Submersed Aquatic Plants - 5 to 10 ft.						
Lake:	Wawasee	Secchi(ft):	8.0	SE Mean species / site:	0.18	
Date:	6/22/2011	Littoral sites with plants:	36	Mean natives / site:	1.04	
Littoral Depth (ft):	23.0	Number of species:	15	SE Mean natives / site:	0.16	
Littoral Sites:	45	Maximum species / site:	4	Species diversity:	0.88	
Total Sites:	45	Mean species / site:	1.73	Native diversity:	0.83	
Species	Frequency of Occurrence	Score Frequency				Dominance
Chara	35.6	64.4	6.7	22.2	6.7	21.3
Eurasian milfoil	33.3	66.7	13.3	11.1	8.9	18.2
Starry Stonewort	26.7	73.3	13.3	8.9	4.4	12.4
Illinois Pondweed	13.3	86.7	4.4	8.9	0.0	6.2
Bladderwort	8.9	91.1	0.0	8.9	0.0	5.3
Curly leaf Pondweed	8.9	91.1	4.4	4.4	0.0	3.6
Eel grass	8.9	91.1	6.7	2.2	0.0	2.7
Coontail	6.7	93.3	0.0	4.4	2.2	4.9
Richardson's Pondweed	6.7	93.3	0.0	6.7	0.0	4.0
Sago Pondweed	6.7	93.3	2.2	2.2	2.2	4.0
Flat-stemmed Pondweed	6.7	93.3	2.2	4.4	0.0	3.1
Nitella	4.4	95.6	2.2	2.2	0.0	1.8
American Pondweed	2.2	97.8	0.0	2.2	0.0	1.3
Sagittaria sp.	2.2	97.8	2.2	0.0	0.0	0.4
Whorled milfoil	2.2	97.8	2.2	0.0	0.0	0.4
Occurrence and Abundance of Submersed Aquatic Plants - 10 to 15 ft.						
Lake:	Wawasee	Secchi(ft):	8.0	SE Mean species / site:	0.23	
Date:	6/22/2011	Littoral sites with plants:	26	Mean natives / site:	1.00	
Littoral Depth (ft):	23.0	Number of species:	13	SE Mean natives / site:	0.15	
Littoral Sites:	28	Maximum species / site:	5	Species diversity:	0.84	
Total Sites:	28	Mean species / site:	1.79	Native diversity:	0.79	
Species	Frequency of Occurrence	Score Frequency				Dominance
Eurasian milfoil	50.0	50.0	14.3	17.9	17.9	31.4
Coontail	35.7	64.3	7.1	25.0	3.6	20.0
Chara	25.0	75.0	10.7	10.7	3.6	12.1
Curly leaf Pondweed	21.4	78.6	7.1	14.3	0.0	10.0
Starry Stonewort	7.1	92.9	0.0	3.6	3.6	5.7
Whorled milfoil	7.1	92.9	0.0	7.1	0.0	4.3
Richardson's Pondweed	7.1	92.9	3.6	3.6	0.0	2.9
Sago Pondweed	7.1	92.9	3.6	3.6	0.0	2.9
Small Pondweed	3.6	96.4	0.0	0.0	3.6	3.6
Bladderwort	3.6	96.4	0.0	3.6	0.0	2.1
Flat-stemmed Pondweed	3.6	96.4	0.0	3.6	0.0	2.1
Illinois Pondweed	3.6	92.9	0.0	3.6	0.0	2.1
Slender Naiad	3.6	96.4	3.6	0.0	0.0	0.7
Occurrence and Abundance of Submersed Aquatic Plants - 15 to 20 ft.						
Lake:	Wawasee	Secchi(ft):	8.0	SE Mean species / site:	0.19	
Date:	6/22/2011	Littoral sites with plants:	17	Mean natives / site:	0.67	
Littoral Depth (ft):	23.0	Number of species:	7	SE Mean natives / site:	#DIV/0!	
Littoral Sites:	24	Maximum species / site:	3	Species diversity:	0.79	
Total Sites:	24	Mean species / site:	1.13	Native diversity:	0.62	
Species	Frequency of Occurrence	Score Frequency				Dominance
Coontail	37.5	62.5	0.0	25.0	12.5	27.5
Eurasian milfoil	25.0	75.0	20.8	4.2	0.0	6.7
Starry Stonewort	16.7	83.3	0.0	16.7	0.0	10.0
Nitella	12.5	87.5	8.3	4.2	0.0	4.2
Chara	8.3	91.7	4.2	4.2	0.0	3.3
Illinois Pondweed	8.3	91.7	4.2	4.2	0.0	3.3
Curly leaf Pondweed	4.2	95.8	0.0	4.2	0.0	2.5
Occurrence and Abundance of Submersed Aquatic Plants - 20 to 25 ft.						
Lake:	Wawasee	Secchi(ft):	8.0	SE Mean species / site:	0.22	
Date:	6/22/2011	Littoral sites with plants:	3	Mean natives / site:	0.30	
Littoral Depth (ft):	23.0	Number of species:	3	SE Mean natives / site:	0.15	
Littoral Sites:	10	Maximum species / site:	2	Species diversity:	0.63	
Total Sites:	10	Mean species / site:	0.40	Native diversity:	0.44	
Species	Frequency of Occurrence	Score Frequency				Dominance
Nitella	20.0	80.0	10.0	10.0	0.0	8.0
Coontail	10.0	90.0	0.0	10.0	0.0	6.0
Curly leaf Pondweed	10.0	90.0	10.0	0.0	0.0	2.0

Figure 9: Lake Wawasee (Main Lake) Summer 2012 Tier II Data

Occurrence and Abundance of Submersed Aquatic Plants in Lake Wawasee						
County:	Kosciusko	Secchi (ft):	11.2	Mean species/site:	1.83	
Date:	8/22/2012	Sites with plants:	142	SE Mean species/site:	0.11	
Littoral Depth (ft):	23.0	Sites with native plants:	116	Mean native species/site:	1.36	
Littoral Sites:	169	Number of species:	17	SE Mean natives/site:	0.10	
Total Sites:	169	Number of native species:	14	Species diversity:	0.90	
		Maximum species/site:	7	Native species diversity:	0.87	
All Depths	Frequency of Occurrence	Rake score frequency per species				Plant
Species		0	1	3	5	Dominance
Chara	29.6	70.4	10.7	16.6	2.4	14.4
Eurasian Watermilfoil	23.7	76.3	11.2	8.3	4.1	11.4
Starry Stonewort	23.1	76.9	3.6	11.8	7.7	15.5
Eel grass	19.5	80.5	8.9	9.5	1.2	8.6
Coontail	17.8	82.2	5.3	8.9	3.6	9.9
Illinois Pondweed	17.8	82.2	10.7	6.5	0.6	6.6
Sago Pondweed	15.4	84.6	7.1	7.7	0.6	6.6
Slender Naiad	15.4	84.6	13.0	1.8	0.6	4.3
Whorled milfoil	5.3	94.7	1.2	4.1	0.0	2.7
Bladderwort	4.7	95.3	0.6	4.1	0.0	2.6
Richardson's Pondweed	4.1	95.9	1.2	3.0	0.0	2.0
Nitella	1.8	98.2	0.6	1.2	0.0	0.8
Small Pondweed	1.8	98.2	1.2	0.6	0.0	0.6
American Pondweed	1.2	98.8	0.6	0.6	0.0	0.5
Elodea	1.2	98.8	0.0	1.2	0.0	0.7
Curly-leaf Pondweed	0.6	99.4	0.6	0.0	0.0	0.1
Sagittaria sp.	0.6	99.4	0.0	0.6	0.0	0.4
Filamentous Algae	7.1					
Occurrence and Abundance of Submersed Aquatic Plants in Lake Wawasee						
County:	Kosciusko	Secchi (ft):	11.2	Mean species/site:	2.19	
Date:	8/22/2012	Sites with plants:	55	SE Mean species/site:	0.20	
Littoral Depth (ft):	23.0	Sites with native plants:	51	Mean native species/site:	1.79	
Littoral Sites:	62	Number of species:	14	SE Mean natives/site:	0.18	
Total Sites:	62	Number of native species:	12	Species diversity:	0.89	
		Maximum species/site:	6	Native species diversity:	0.87	
Depths: 0 to 5 ft	Frequency of Occurrence	Rake score frequency per species				Plant
Species		0	1	3	5	Dominance
Eel grass	37.1	62.9	17.7	16.1	3.2	16.5
Chara	32.3	67.7	19.4	12.9	0.0	11.6
Illinois Pondweed	25.8	74.2	16.1	9.7	0.0	9.0
Eurasian Watermilfoil	21.0	79.0	12.9	8.1	0.0	7.4
Slender Naiad	21.0	79.0	19.4	1.6	0.0	4.8
Starry Stonewort	19.4	80.6	3.2	8.1	8.1	13.5
Sago Pondweed	17.7	82.3	8.1	9.7	0.0	7.4
Coontail	16.1	83.9	6.5	6.5	3.2	8.4
Bladderwort	11.3	88.7	1.6	9.7	0.0	6.1
Richardson's Pondweed	6.5	93.5	1.6	4.8	0.0	3.2
Whorled milfoil	4.8	95.2	1.6	3.2	0.0	2.3
Elodea	3.2	96.8	0.0	3.2	0.0	1.9
American Pondweed	1.6	98.4	1.6	0.0	0.0	0.3
Sagittaria sp.	1.6	98.4	0.0	1.6	0.0	1.0
Filamentous Algae	11.3					
Occurrence and Abundance of Submersed Aquatic Plants in Lake Wawasee						
County:	Kosciusko	Secchi (ft):	11.2	Mean species/site:	2.07	
Date:	8/22/2012	Sites with plants:	41	SE Mean species/site:	0.25	
Littoral Depth (ft):	23.0	Sites with native plants:	30	Mean native species/site:	1.44	
Littoral Sites:	45	Number of species:	12	SE Mean natives/site:	0.20	
Total Sites:	45	Number of native species:	10	Species diversity:	0.89	
		Maximum species/site:	7	Native species diversity:	0.86	
Depths: 5 to 10 ft	Frequency of Occurrence	Rake score frequency per species				Plant
Species		0	1	3	5	Dominance
Starry Stonewort	35.6	64.4	8.9	22.2	4.4	19.6
Chara	31.1	68.9	2.2	24.4	4.4	19.6
Eurasian Watermilfoil	26.7	73.3	11.1	8.9	6.7	14.2
Illinois Pondweed	24.4	75.6	11.1	11.1	2.2	11.1
Sago Pondweed	20.0	80.0	13.3	4.4	2.2	7.6
Slender Naiad	20.0	80.0	20.0	0.0	0.0	4.0
Coontail	15.6	84.4	4.4	11.1	0.0	7.6
Eel grass	13.3	86.7	4.4	8.9	0.0	6.2
Whorled milfoil	8.9	91.1	2.2	6.7	0.0	4.4
Richardson's Pondweed	6.7	93.3	2.2	4.4	0.0	3.1
American Pondweed	2.2	97.8	0.0	2.2	0.0	1.3
Bladderwort	2.2	97.8	0.0	2.2	0.0	1.3
Filamentous Algae	6.7					
Occurrence and Abundance of Submersed Aquatic Plants in Lake Wawasee						
County:	Kosciusko	Secchi (ft):	11.2	Mean species/site:	1.75	
Date:	8/22/2012	Sites with plants:	24	SE Mean species/site:	0.24	
Littoral Depth (ft):	23.0	Sites with native plants:	22	Mean native species/site:	1.29	
Littoral Sites:	28	Number of species:	9	SE Mean natives/site:	0.19	
Total Sites:	28	Number of native species:	7	Species diversity:	0.82	
		Maximum species/site:	5	Native species diversity:	0.75	
Depths: 10 to 15 ft	Frequency of Occurrence	Rake score frequency per species				Plant
Species		0	1	3	5	Dominance
Chara	53.6	46.4	14.3	32.1	7.1	29.3
Eurasian Watermilfoil	35.7	64.3	10.7	14.3	10.7	21.4
Coontail	25.0	75.0	3.6	10.7	10.7	17.9
Eel grass	10.7	89.3	7.1	3.6	0.0	3.6
Illinois Pondweed	7.1	92.9	7.1	0.0	0.0	1.4
Filamentous Algae	3.6					
Occurrence and Abundance of Submersed Aquatic Plants in Lake Wawasee						
County:	Kosciusko	Secchi (ft):	11.2	Mean species/site:	1.21	
Date:	8/22/2012	Sites with plants:	20	SE Mean species/site:	0.19	
Littoral Depth (ft):	23.0	Sites with native plants:	12	Mean native species/site:	0.67	
Littoral Sites:	24	Number of species:	12	SE Mean natives/site:	0.16	
Total Sites:	24	Number of native species:	9	Species diversity:	0.84	
		Maximum species/site:	4	Native species diversity:	0.80	
Depths: 15 to 20 ft	Frequency of Occurrence	Rake score frequency per species				Plant
Species		0	1	3	5	Dominance
Coontail	25.0	75.0	8.3	12.5	4.2	13.3
Eurasian Watermilfoil	16.7	83.3	8.3	4.2	4.2	8.3
Chara	4.2	95.8	4.2	0.0	0.0	0.8
Curly-leaf Pondweed	4.2	95.8	4.2	0.0	0.0	0.8
Eel grass	4.2	95.8	0.0	4.2	0.0	2.5
Illinois Pondweed	4.2	95.8	4.2	0.0	0.0	0.8
Filamentous Algae	4.2					
Occurrence and Abundance of Submersed Aquatic Plants in Lake Wawasee						
County:	Kosciusko	Secchi (ft):	11.2	Mean species/site:	0.30	
Date:	8/22/2012	Sites with plants:	2	SE Mean species/site:	0.21	
Littoral Depth (ft):	23.0	Sites with native plants:	1	Mean native species/site:	0.20	
Littoral Sites:	10	Number of species:	3	SE Mean natives/site:	0.20	
Total Sites:	10	Number of native species:	2	Species diversity:	0.67	
		Maximum species/site:	2	Native species diversity:	0.50	
Depths: 20 to 25 ft	Frequency of Occurrence	Rake score frequency per species				Plant
Species		0	1	3	5	Dominance
Eurasian Watermilfoil	10.0	90.0	10.0	0.0	0.0	2.0

Figure 10: Lake Wawasee Multi-Year Data Presentation - All Sites

Lake Wawasee Multi-year Data Presentation (All Sites)								
Date:	5/26/2005	8/10/2005	3/29/2006	8/12/2009	6/22/2011	9/8/2011	5/30/2012	8/22/2012
Total Sites:	360	360	100.0	100	300	300	300	300
Secchi (ft):	10.0	10.0	8.0	8.5	8.0	7.8	15.5	11.2
Number of Species:	16	20	18	16	20	18	19	17
Number of Native Species:	14	18	16	14	17	16	16	14
Species Diversity:	0.81	0.88	1.00	0.85	0.91	0.91	0.89	0.90
Native Species Diversity:	0.75	0.86	0.99	0.83	0.89	0.89	0.89	0.88
Mean Native Species/Site:	1.33	1.93	2	1.15	1.17	1.22	0.87	1.30
Surveying organization	AWC	AWC	V3	V3	AWC	AWC	AWC	AWC
Species Frequency of Occurrence - All Depths								
Eurasian watermilfoil	12.8	11.1	28.0	33.0	24.3	18.7	32.7	25.7
Chara	59.7	55.3	49.0	39.0	21.7	18.0	17.0	22.3
Starry Stonewort	0.0	0.0	0.0	0.0	19.7	12.7	15.7	19.7
Coontail	10.6	15.3	31.0	18.0	23.7	17.7	14.7	18.3
Eel grass	2.5	14.7	12.0	14.0	12.7	15.7	5.0	17.7
Illinois Pondweed	0.0	2.2	7.0	3.0	8.7	15.3	10.0	16.0
Sago Pondweed	1.9	9.7	8.0	6.0	8.3	13.0	8.3	13.0
Slender Naiad	3.3	18.9	10.0	7.0	2.0	11.0	2.3	12.0
Whorled or various milfoil	3.9	7.2	4.0	4.0	6.7	10.3	9.3	11.0
Bladderwort	4.7	18.3	9.0	4.0	6.7	9.7	5.7	9.3
Richardson's Pondweed	10.3	4.7	2.0	7.0	4.7	4.7	1.7	2.7
Sagittaria sp.	0.0	2.5	0.0	0.0	2.0	1.0	1.3	2.3
American or floating Pondweed	0.0	0.0	0.0	1.0	1.7	0.7	1.0	1.7
Elodea	0.8	0.6	2.0	0.0	2.0	0.0	2.3	1.0
Nitella	1.7	0.3	8.0	5.0	2.7	0.7	2.7	1.0
Small or leafy Pondweed	0.0	0.0	2.0	1.0	4.7	1.3	3.0	1.0
Curly-leaf Pondweed	10.3	0.6	2.0	1.0	7.3	0.0	7.7	0.7
Flat-stemmed Pondweed	5.0	2.5	4.0	0.0	7.0	0.3	1.7	0.0
Variable Pondweed	0.0	18.6	9.0	0.0	0.3	0.0	0.3	0.0
Southern Naiad	0.0	2.5	2.0	0.0	0.0	1.7	0.0	0.0
Brittle/spiny Naiad	0.0	0.8	0.0	1.0	0.0	0.3	0.0	0.0
Largeleaf Pondweed	2.2	0.0	0.0	0.0	0.7	0.0	0.0	0.0
White stemmed Pondweed	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0
Northern watermilfoil	22.2	18.3	37.0	0.0	0.0	0.0	0.0	0.0
Horned pondweed	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Water Stargrass	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Species Frequency of Occurrence - 0 to 5 ft								
Eel grass	NA	NA	NA	6.9	20.8	18.8	7.4	24.8
Eurasian watermilfoil	NA	NA	NA	3.4	20.8	13.4	24.2	24.2
Chara	NA	NA	NA	62.1	22.8	16.1	18.8	22.8
Coontail	NA	NA	NA	3.4	24.8	18.1	15.4	19.5
Illinois Pondweed	NA	NA	NA	10.3	10.1	16.8	12.1	19.5
Slender Naiad	NA	NA	NA	10.3	2.0	14.1	4.0	15.4
Starry Stonewort	NA	NA	NA	0.0	20.1	13.4	16.1	14.8
Bladderwort	NA	NA	NA	0.0	8.7	9.4	8.1	14.8
Sago Pondweed	NA	NA	NA	0.0	8.1	12.1	7.4	14.1
Whorled milfoil	NA	NA	NA	0.0	10.1	14.1	10.1	13.4
Sagittaria sp.	NA	NA	NA	0.0	3.4	2.0	0.7	3.4
Richardson's Pondweed	NA	NA	NA	10.3	5.4	4.7	2.0	3.4
Elodea	NA	NA	NA	0.0	2.7	0.0	4.0	2.0
American or floating Pondweed	NA	NA	NA	3.4	2.7	1.3	1.3	2.0
Curly-leaf Pondweed	NA	NA	NA	0.0	6.7	0.0	6.0	0.7
Flat-stemmed Pondweed	NA	NA	NA	0.0	10.1	0.7	1.3	0.0
Small or leafy pondweed	NA	NA	NA	3.4	7.4	1.3	1.3	0.0
Nitella	NA	NA	NA	0.0	0.0	0.0	0.7	0.0
Southern Naiad	NA	NA	NA	0.0	0.0	2.7	0.0	0.0
Largeleaf Pondweed	NA	NA	NA	0.0	1.3	0.0	0.0	0.0
Spiny naiad	NA	NA	NA	1.0	0.0	0.0	0.0	0.0
Species Frequency of Occurrence - 5 to 10 ft								
Starry Stonewort	NA	NA	NA	0.0	27.7	10.8	20.0	30.1
Eurasian watermilfoil	NA	NA	NA	27.3	25.3	20.5	43.5	30.1
Chara	NA	NA	NA	59.1	26.5	24.1	17.6	20.5
Illinois Pondweed	NA	NA	NA	0.0	9.6	15.7	11.8	19.3
Coontail	NA	NA	NA	0.0	15.7	9.6	9.4	15.7
Eel grass	NA	NA	NA	31.8	8.4	16.9	4.7	14.5
Sago Pondweed	NA	NA	NA	13.6	13.3	10.8	12.9	14.5
Whorled or various milfoil	NA	NA	NA	9.1	3.6	10.8	12.9	13.3
Slender Naiad	NA	NA	NA	0.0	2.4	13.0	1.2	10.8
Bladderwort	NA	NA	NA	18.2	7.2	14.5	4.7	7.2
Richardson's Pondweed	NA	NA	NA	18.2	4.8	3.6	1.2	3.6
Sagittaria sp.	NA	NA	NA	0.0	0.0	0.0	3.5	2.4
American Pondweed	NA	NA	NA	0.0	1.2	0.0	1.2	2.4
Curly-leaf Pondweed	NA	NA	NA	0.0	4.8	0.0	8.2	0.0
Nitella	NA	NA	NA	0.0	3.6	0.0	3.5	0.0
Flat-stemmed Pondweed	NA	NA	NA	0.0	6.0	0.0	3.5	0.0
Small Pondweed	NA	NA	NA	0.0	2.4	2.4	2.4	0.0
Variable Pondweed	NA	NA	NA	0.0	1.2	0.0	1.2	0.0
Elodea	NA	NA	NA	0.0	2.4	0.0	0.0	0.0
White stemmed Pondweed	NA	NA	NA	13.6	0.0	0.0	0.0	0.0
Species Frequency of Occurrence - 10 to 15 ft								
Chara	NA	NA	NA	28.0	22.6	25.8	22.6	48.4
Eurasian watermilfoil	NA	NA	NA	60.0	45.2	35.5	58.1	35.5
Coontail	NA	NA	NA	24.0	32.3	19.4	29.0	22.6
Sago Pondweed	NA	NA	NA	12.0	6.5	16.1	9.7	16.1
Starry Stonewort	NA	NA	NA	0.0	6.5	9.7	3.2	12.9
Slender Naiad	NA	NA	NA	12.0	3.2	3.2	0.0	9.7
Eel grass	NA	NA	NA	20.0	0.0	16.1	0.0	9.7
Illinois Pondweed	NA	NA	NA	0.0	3.2	16.1	6.5	6.5
Small Pondweed	NA	NA	NA	0.0	3.2	0.0	12.9	3.2
Curly-leaf Pondweed	NA	NA	NA	0.0	19.4	0.0	19.4	0.0
Nitella	NA	NA	NA	4.0	0.0	0.0	6.5	0.0
Whorled or various milfoil	NA	NA	NA	4.0	6.5	3.2	6.5	0.0
Richardson's Pondweed	NA	NA	NA	4.0	6.5	6.5	3.2	0.0
Bladderwort	NA	NA	NA	0.0	3.2	3.2	3.2	0.0
Southern Naiad	NA	NA	NA	0.0	0.0	3.2	0.0	0.0
Flat-stemmed Pondweed	NA	NA	NA	0.0	3.2	0.0	0.0	0.0
White stemmed Pondweed	NA	NA	NA	8.0	0.0	0.0	0.0	0.0
Brittle/spiny Naiad	NA	NA	NA	4.0	0.0	0.0	0.0	0.0
Species Frequency of Occurrence 15 to 20 ft								
Starry Stonewort	NA	NA	NA	0.0	16.0	20.0	21.7	32.0
Coontail	NA	NA	NA	43.8	40.0	32.0	13.0	24.0
Eurasian watermilfoil	NA	NA	NA	50.0	28.0	20.0	30.4	16.0
Whorled or various milfoil	NA	NA	NA	6.3	0.0	0.0	0.0	8.0
Nitella	NA	NA	NA	18.8	12.0	8.0	4.3	8.0
Eel grass	NA	NA	NA	0.0	0.0	0.0	0.0	4.0
Sago Pondweed	NA	NA	NA	0.0	0.0	28.0	0.0	4.0
Slender Naiad	NA	NA	NA	6.3	0.0	4.0	0.0	4.0
Small Pondweed	NA	NA	NA	0.0	0.0	0.0	4.3	4.0
Chara	NA	NA	NA	6.3	8.0	8.0	4.3	4.0
Curly-leaf Pondweed	NA	NA	NA	6.3	4.0	0.0	0.0	4.0
Illinois Pondweed	NA	NA	NA	0.0	8.0	12.0	0.0	4.0
Richardson's Pondweed	NA	NA	NA	0.0	0.0	8.0	0.0	0.0
Bladderwort	NA	NA	NA	0.0	0.0	8.0	0.0	0.0
Brittle Naiad	NA	NA	NA	0.0	0.0	4.0	0.0	0.0
Species Frequency of Occurrence 20 to 25 ft								
Nitella	NA	NA	NA	12.5	20.0	0.0	10.0	10.0
Eurasian watermilfoil	NA	NA	NA	37.5	0.0	20.0	0.0	10.0
Small Pondweed	NA	NA	NA	0.0	0.0	0.0	0.0	10.0
Curly-leaf Pondweed	NA	NA	NA	0.0	10.0	0.0	10.0	0.0
Coontail	NA	NA	NA	50.0	10.0	40.0	10.0	0.0
Starry Stonewort	NA	NA	NA	0.0	0.0	10.0	0.0	0.0

Figure 11: Lake Wawasee Multi-Year Data Presentation - Main Lake Sites

Wawasee Multi-year Data Presentation (Main Lake Sites)				
Date:	6/22/2011	9/8/2011	5/30/2012	8/22/2012
Total Sites:	169	169	169	169
Secchi (ft):	8.0	7.8	15.5	11.2
Number of Species:	19	18	18	17
Number of Native Species:	16	16	15	14
Littoral sites with plants	136	129	123	142
Species Diversity:	0.90	0.90	0.89	0.90
Native Species Diversity:	0.88	0.88	0.88	0.87
Mean Native Species/Site:	1.18	1.33	0.89	1.36
Surveying organization	AWC	AWC	AWC	AWC
Species Frequency of Occurrence - All Depths				
Eurasian milfoil	29.6	23.7	33.7	23.7
Coontail	23.1	21.3	16.0	17.8
Chara	23.1	24.3	18.3	29.6
Starry Stonewort	17.8	14.2	17.2	23.1
Eel grass	13.6	16.0	4.1	19.5
Illinois Pondweed	11.2	17.8	11.8	17.8
Curly leaf Pondweed	8.9	0.0	10.7	0.6
Bladderwort	7.7	7.7	5.3	4.7
Sago Pondweed	6.5	16.0	8.9	15.4
Flat-stemmed Pondweed	6.5	0.0	0.6	0.0
Richardson's Pondweed	5.9	7.1	3.0	4.1
Whorled milfoil	5.3	1.8	8.9	5.3
Small Pondweed	4.1	1.2	3.6	1.8
Nitella	4.1	1.2	2.4	1.8
Sagittaria sp.	3.0	1.8	0.0	0.6
American Pondweed	2.4	0.6	1.2	1.2
Elodea	0.6	0.0	2.4	1.2
Largeleaf Pondweed	0.6	0.0	0.0	0.0
Slender Naiad	0.6	11.8	2.4	15.4
Southern Naiad	0.0	3.0	0.0	0.0
Brittle Naiad	0.0	0.6	0.0	0.0
Variable Pondweed	0.0	0.0	0.6	0.0
Species Frequency of Occurrence - 0 to 5 ft				
Eel grass	30.6	27.0	9.7	37.1
Coontail	25.8	20.6	19.4	16.1
Eurasian milfoil	24.2	20.6	21.0	21.0
Chara	22.6	22.2	17.7	32.3
Starry Stonewort	19.4	17.5	21.0	19.4
Illinois Pondweed	16.1	19.0	16.1	25.8
Bladderwort	12.9	7.9	8.1	11.3
Flat-stemmed Pondweed	11.3	1.6	0.0	0.0
Sago Pondweed	9.7	15.9	8.1	17.7
Small Pondweed	9.7	0.0	1.6	0.0
Whorled milfoil	9.7	3.2	11.3	4.8
Richardson's Pondweed	8.1	9.5	4.8	6.5
Sagittaria sp.	6.5	4.8	0.0	1.6
American Pondweed	4.8	1.6	3.2	1.6
Curly leaf Pondweed	4.8	0.0	8.1	0.0
Elodea	1.6	0.0	4.8	3.2
Largeleaf Pondweed	1.6	0.0	0.0	0.0
Slender Naiad	0.0	19.0	4.8	21.0
Southern Naiad	0.0	6.3	0.0	0.0
Species Frequency of Occurrence - 5 to 10 ft				
Chara	35.6	37.8	25.5	31.1
Eurasian milfoil	33.3	20.0	44.7	26.7
Starry Stonewort	26.7	11.1	21.3	35.6
Illinois Pondweed	13.3	22.2	17.0	24.4
Bladderwort	8.9	13.3	6.4	2.2
Curly leaf Pondweed	8.9	0.0	12.8	0.0
Eel grass	8.9	13.3	2.1	13.3
Coontail	6.7	11.1	4.3	15.6
Richardson's Pondweed	6.7	4.4	2.1	6.7
Sago Pondweed	6.7	11.1	17.0	20.0
Flat-stemmed Pondweed	6.7	0.0	2.1	0.0
Nitella	4.4	0.0	0.0	0.0
American Pondweed	2.2	0.0	0.0	2.2
Sagittaria sp.	2.2	0.0	0.0	0.0
Whorled milfoil	2.2	2.2	12.8	8.9
Slender Naiad	0.0	13.3	2.1	20.0
Small Pondweed	0.0	4.4	0.0	0.0
Variable Pondweed	0.0	0.0	2.1	0.0
Species Frequency of Occurrence - 10 to 15 ft				
Eurasian milfoil	50.0	40.7	57.1	35.7
Coontail	35.7	22.2	32.1	25.0
Chara	25.0	29.6	25.0	53.6
Curly leaf Pondweed	21.4	0.0	21.4	0.0
Starry Stonewort	7.1	7.4	3.6	10.7
Whorled milfoil	7.1	0.0	7.1	0.0
Richardson's Pondweed	7.1	7.4	3.6	0.0
Sago Pondweed	7.1	18.5	7.1	17.9
Small Pondweed	3.6	0.0	14.3	3.6
Bladderwort	3.6	3.7	3.6	0.0
Flat-stemmed Pondweed	3.6	0.0	0.0	0.0
Illinois Pondweed	3.6	18.5	7.1	7.1
Slender Naiad	3.6	3.7	0.0	10.7
Eel grass	0.0	14.8	0.0	10.7
Southern Naiad	0.0	3.7	0.0	0.0
Nitella	0.0	0.0	7.1	0.0
Species Frequency of Occurrence - 15 to 20 ft				
Coontail	37.5	33.3	13.6	25.0
Eurasian milfoil	25.0	20.8	31.8	16.7
Starry Stonewort	16.7	20.8	22.7	33.3
Nitella	12.5	8.3	4.5	8.3
Chara	8.3	8.3	4.5	4.2
Illinois Pondweed	8.3	12.5	0.0	4.2
Curly leaf Pondweed	4.2	0.0	0.0	4.2
Sago Pondweed	0.0	29.2	0.0	4.2
Richardson's Pondweed	0.0	8.3	0.0	0.0
Chara	0.0	8.3	0.0	4.2
Bladderwort	0.0	4.2	0.0	0.0
Slender Naiad	0.0	4.2	0.0	4.2
Brittle Naiad	0.0	4.2	0.0	0.0
Elodea	0.0	0.0	4.5	0.0
Small Pondweed	0.0	0.0	4.5	4.2
Whorled milfoil	0.0	0.0	0.0	8.3
Eelgrass	0.0	0.0	0.0	4.2
Species Frequency of Occurrence 20 to 25 ft				
Nitella	20.0	40.0	10.0	10.0
Coontail	10.0	0.0	10.0	0.0
Curly leaf Pondweed	10.0	0.0	10.0	0.0
Eurasian milfoil	0.0	20.0	0.0	10.0
Starry Stonewort	0.0	10.0	0.0	0.0
Small Pondweed	0.0	0.0	0.0	10.0

Figure 12: Syracuse Lake Spring 2012 Tier II Data

Occurrence and Abundance of Submersed Aquatic Plants in Syracuse Lake						
County:	Kosciusko	Secchi (ft):	14	Mean species/site:		1.67
Date:	6/1/2012	Sites with plants:	87	SE Mean species/site:		0.11
Littoral Depth (ft):	20.0	Sites with native plants:	78	Mean native species/site:		1.32
Littoral Sites:	100	Number of species:	15	SE Mean natives/site:		0.10
Total Sites:	100	Number of native species:	13	Species diversity:		0.84
		Maximum species/site:	6	Native species diversity:		0.79
All Depths						
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
Chara	53.0	47.0	16.0	35.0	2.0	26.2
Eurasian milfoil	30.0	70.0	8.0	9.0	13.0	20.0
Sago Pondweed	18.0	82.0	12.0	6.0	0.0	6.0
Coontail	14.0	86.0	0.0	12.0	2.0	9.2
Nitella	12.0	88.0	2.0	10.0	0.0	6.4
Illinois Pondweed	9.0	91.0	8.0	1.0	0.0	2.2
Bladderwort	7.0	93.0	5.0	2.0	0.0	2.2
Eel grass	5.0	95.0	3.0	2.0	0.0	1.8
Flat-stemmed Pondweed	3.0	97.0	3.0	0.0	0.0	0.6
Naiad sp.	3.0	97.0	3.0	0.0	0.0	0.6
Starry Stonewort	3.0	97.0	0.0	2.0	1.0	2.2
American Pondweed	2.0	98.0	0.0	2.0	0.0	1.2
Curly Leaf Pondweed	2.0	98.0	0.0	2.0	0.0	1.2
Richardson's Pondweed	2.0	98.0	1.0	1.0	0.0	0.8
Small Pondweed	2.0	98.0	2.0	0.0	0.0	0.4
Whorled milfoil	2.0	98.0	2.0	0.0	0.0	0.4
Filamentous Algae	3.0					
Occurrence and Abundance of Submersed Aquatic Plants in Syracuse Lake						
County:	Kosciusko	Secchi (ft):	14	Mean species/site:		1.61
Date:	6/1/2012	Sites with plants:	36	SE Mean species/site:		0.21
Littoral Depth (ft):	20.0	Sites with native plants:	34	Mean native species/site:		1.34
Littoral Sites:	44	Number of species:	13	SE Mean natives/site:		0.17
Total Sites:	44	Number of native species:	11	Species diversity:		0.83
		Maximum species/site:	6	Native species diversity:		0.78
Depths: 0 to 5 ft						
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
Chara	54.5	45.5	15.9	38.6	0.0	26.4
Sago Pondweed	20.5	79.5	13.6	6.8	0.0	6.8
Eurasian milfoil	18.2	81.8	4.5	11.4	2.3	10.0
Illinois Pondweed	15.9	84.1	13.6	2.3	0.0	4.1
Bladderwort	13.6	86.4	9.1	4.5	0.0	4.5
Coontail	6.8	93.2	0.0	4.5	2.3	5.0
American Pondweed	4.5	95.5	0.0	4.5	0.0	2.7
Curly Leaf Pondweed	4.5	95.5	0.0	4.5	0.0	2.7
Eel grass	4.5	95.5	2.3	2.3	0.0	1.8
Naiad sp.	4.5	95.5	4.5	0.0	0.0	0.9
Starry Stonewort	4.5	95.5	0.0	4.5	0.0	2.7
Whorled milfoil	4.5	95.5	4.5	0.0	0.0	0.9
Flat-stemmed Pondweed	2.3	97.7	2.3	0.0	0.0	0.5
Small Pondweed	2.3	97.7	2.3	0.0	0.0	0.5
Filamentous Algae	6.8					
Occurrence and Abundance of Submersed Aquatic Plants in Syracuse Lake						
County:	Kosciusko	Secchi (ft):	14	Mean species/site:		1.60
Date:	6/1/2012	Sites with plants:	22	SE Mean species/site:		0.20
Littoral Depth (ft):	20.0	Sites with native plants:	19	Mean native species/site:		1.20
Littoral Sites:	25	Number of species:	11	SE Mean natives/site:		0.20
Total Sites:	25	Number of native species:	10	Species diversity:		0.79
		Maximum species/site:	4	Native species diversity:		0.74
Depths: 5 to 10 ft						
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
Chara	56.0	44.0	8.0	48.0	0.0	30.4
Eurasian milfoil	40.0	60.0	4.0	8.0	28.0	33.6
Sago Pondweed	20.0	80.0	12.0	8.0	0.0	7.2
Coontail	8.0	92.0	0.0	8.0	0.0	4.8
Eel grass	8.0	92.0	8.0	0.0	0.0	1.6
Illinois Pondweed	8.0	92.0	8.0	0.0	0.0	1.6
Bladderwort	4.0	96.0	4.0	0.0	0.0	0.8
Flat-stemmed Pondweed	4.0	96.0	4.0	0.0	0.0	0.8
Naiad sp.	4.0	96.0	4.0	0.0	0.0	0.8
Nitella	4.0	96.0	0.0	4.0	0.0	2.4
Small Pondweed	4.0	96.0	4.0	0.0	0.0	0.8
Filamentous Algae	0.0					
Occurrence and Abundance of Submersed Aquatic Plants in Syracuse Lake						
County:	Kosciusko	Secchi (ft):	14	Mean species/site:		1.95
Date:	6/1/2012	Sites with plants:	21	SE Mean species/site:		0.16
Littoral Depth (ft):	20.0	Sites with native plants:	18	Mean native species/site:		1.38
Littoral Sites:	21	Number of species:	8	SE Mean natives/site:		0.18
Total Sites:	21	Number of native species:	7	Species diversity:		0.78
		Maximum species/site:	4	Native species diversity:		0.71
Depths: 10 to 15 ft						
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
Chara	66.7	33.3	28.6	28.6	9.5	32.4
Eurasian milfoil	52.4	47.6	19.0	9.5	23.8	33.3
Coontail	19.0	81.0	0.0	14.3	4.8	13.3
Nitella	19.0	81.0	4.8	14.3	0.0	9.5
Sago Pondweed	14.3	85.7	9.5	4.8	0.0	4.8
Richardson's Pondweed	9.5	90.5	4.8	4.8	0.0	3.8
Eel grass	4.8	95.2	0.0	4.8	0.0	2.9
Flat-stemmed Pondweed	4.8	95.2	4.8	0.0	0.0	1.0
Starry Stonewort	4.8	95.2	0.0	0.0	4.8	4.8
Filamentous Algae	0.0					
Occurrence and Abundance of Submersed Aquatic Plants in Syracuse Lake						
County:	Kosciusko	Secchi (ft):	14	Mean species/site:		1.50
Date:	6/1/2012	Sites with plants:	8	SE Mean species/site:		0.31
Littoral Depth (ft):	20.0	Sites with native plants:	8	Mean native species/site:		1.40
Littoral Sites:	10	Number of species:	5	SE Mean natives/site:		0.27
Total Sites:	10	Number of native species:	4	Species diversity:		0.66
		Maximum species/site:	3	Native species diversity:		0.61
Depths: 15 to 20 ft						
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
Nitella	70.0	30.0	10.0	60.0	0.0	38.0
Coontail	50.0	50.0	0.0	50.0	0.0	30.0
Chara	10.0	90.0	10.0	0.0	0.0	2.0
Eurasian milfoil	10.0	90.0	10.0	0.0	0.0	2.0
Sago Pondweed	10.0	90.0	10.0	0.0	0.0	2.0
Filamentous Algae	0.0					

Figure 13: Syracuse Lake Summer 2012 Tier II Data

Occurrence and Abundance of Submersed Aquatic Plants in Syracuse Lake							
County:	Kosciusko	Secchi (ft):	13.7	Mean species/site:			2.57
Date:	8/16/2012	Sites with plants:	96	SE Mean species/site:			0.15
Littoral Depth (ft):	20.0	Sites with native plants:	92	Mean native species/site:			2.04
Littoral Sites:	100	Number of species:	18	SE Mean natives/site:			0.12
Total Sites:	100	Number of native species:	15	Species diversity:			0.87
		Maximum species/site:	7	Native species diversity:			0.85
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance	
		0	1	3	5		
Chara	59.0	41.0	28.0	21.0	10.0	28.2	
Eurasian milfoil	46.0	54.0	21.0	15.0	10.0	23.2	
Illinois Pondweed	30.0	70.0	15.0	15.0	0.0	12.0	
Sago Pondweed	27.0	73.0	21.0	3.0	3.0	9.0	
Eel grass	22.0	78.0	13.0	8.0	1.0	8.4	
Coontail	17.0	83.0	3.0	12.0	2.0	9.8	
Slender naiad	17.0	83.0	12.0	5.0	0.0	5.4	
Nitella	10.0	90.0	1.0	5.0	4.0	7.2	
Bladderwort	6.0	94.0	3.0	3.0	0.0	2.4	
Brittle Naiad	5.0	95.0	2.0	2.0	1.0	2.6	
American Pondweed	4.0	96.0	3.0	0.0	1.0	1.6	
Flat-stemmed Pondweed	3.0	97.0	2.0	1.0	0.0	1.0	
Richardson's Pondweed	3.0	97.0	0.0	3.0	0.0	1.8	
Whorled milfoil	3.0	97.0	1.0	2.0	0.0	1.4	
Starry Stonewort	2.0	98.0	0.0	2.0	0.0	1.2	
Elodea	1.0	99.0	1.0	0.0	0.0	0.2	
Sagittaria sp.	1.0	99.0	1.0	0.0	0.0	0.2	
Small Pondweed	1.0	99.0	0.0	1.0	0.0	0.6	
Filamentous Algae	2.0						
Occurrence and Abundance of Submersed Aquatic Plants in Syracuse Lake							
County:	Kosciusko	Secchi (ft):	13.7	Mean species/site:			2.59
Date:	8/16/2012	Sites with plants:	41	SE Mean species/site:			0.23
Littoral Depth (ft):	20.0	Sites with native plants:	40	Mean native species/site:			2.16
Littoral Sites:	44	Number of species:	16	SE Mean natives/site:			0.20
Total Sites:	44	Number of native species:	13	Species diversity:			0.86
		Maximum species/site:	6	Native species diversity:			0.83
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance	
		0	1	3	5		
Chara	61.4	38.6	27.3	20.5	13.6	31.4	
Illinois Pondweed	43.2	56.8	20.5	22.7	0.0	17.7	
Eurasian milfoil	38.6	61.4	34.1	4.5	0.0	9.5	
Sago Pondweed	29.5	70.5	29.5	0.0	0.0	5.9	
Eel grass	22.7	77.3	20.5	2.3	0.0	5.5	
Slender naiad	22.7	77.3	13.6	9.1	0.0	8.2	
Bladderwort	9.1	90.9	4.5	4.5	0.0	3.6	
American Pondweed	6.8	93.2	4.5	0.0	2.3	3.2	
Whorled milfoil	6.8	93.2	2.3	4.5	0.0	3.2	
Flat-stemmed Pondweed	4.5	95.5	2.3	2.3	0.0	1.8	
Brittle Naiad	2.3	97.7	0.0	2.3	0.0	1.4	
Coontail	2.3	97.7	2.3	0.0	0.0	0.5	
Elodea	2.3	97.7	2.3	0.0	0.0	0.5	
Richardson's Pondweed	2.3	97.7	0.0	2.3	0.0	1.4	
Sagittaria sp.	2.3	97.7	2.3	0.0	0.0	0.5	
Starry Stonewort	2.3	97.7	0.0	2.3	0.0	1.4	
Filamentous Algae	4.5						
Occurrence and Abundance of Submersed Aquatic Plants in Syracuse Lake							
County:	Kosciusko	Secchi (ft):	13.7	Mean species/site:			2.80
Date:	8/16/2012	Sites with plants:	25	SE Mean species/site:			0.27
Littoral Depth (ft):	20.0	Sites with native plants:	24	Mean native species/site:			2.20
Littoral Sites:	25	Number of species:	12	SE Mean natives/site:			0.22
Total Sites:	25	Number of native species:	10	Species diversity:			0.85
		Maximum species/site:	6	Native species diversity:			0.82
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance	
		0	1	3	5		
Chara	68.0	32.0	24.0	36.0	8.0	34.4	
Eurasian milfoil	56.0	44.0	8.0	20.0	28.0	41.6	
Sago Pondweed	40.0	60.0	24.0	12.0	4.0	16.0	
Eel grass	32.0	68.0	12.0	20.0	0.0	14.4	
Illinois Pondweed	32.0	68.0	20.0	12.0	0.0	11.2	
Coontail	20.0	80.0	0.0	16.0	4.0	13.6	
Slender naiad	12.0	88.0	8.0	4.0	0.0	4.0	
Bladderwort	4.0	96.0	4.0	0.0	0.0	0.8	
Brittle Naiad	4.0	96.0	4.0	0.0	0.0	0.8	
Flat-stemmed Pondweed	4.0	96.0	4.0	0.0	0.0	0.8	
Richardson's Pondweed	4.0	96.0	0.0	4.0	0.0	2.4	
Small Pondweed	4.0	96.0	0.0	4.0	0.0	2.4	
Filamentous Algae	0.0						
Occurrence and Abundance of Submersed Aquatic Plants in Syracuse Lake							
County:	Kosciusko	Secchi (ft):	13.7	Mean species/site:			2.90
Date:	8/16/2012	Sites with plants:	21	SE Mean species/site:			0.32
Littoral Depth (ft):	20.0	Sites with native plants:	19	Mean native species/site:			2.00
Littoral Sites:	21	Number of species:	13	SE Mean natives/site:			0.29
Total Sites:	21	Number of native species:	10	Species diversity:			0.85
		Maximum species/site:	7	Native species diversity:			0.81
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance	
		0	1	3	5		
Eurasian milfoil	71.4	28.6	19.0	38.1	14.3	41.0	
Chara	66.7	33.3	47.6	9.5	9.5	24.8	
Coontail	42.9	57.1	9.5	28.6	4.8	23.8	
Eel grass	19.0	81.0	4.8	9.5	4.8	11.4	
Sago Pondweed	19.0	81.0	9.5	0.0	9.5	11.4	
Brittle Naiad	14.3	85.7	4.8	4.8	4.8	8.6	
Illinois Pondweed	14.3	85.7	4.8	9.5	0.0	6.7	
Slender naiad	14.3	85.7	14.3	0.0	0.0	2.9	
Nitella	9.5	90.5	0.0	9.5	0.0	5.7	
American Pondweed	4.8	95.2	4.8	0.0	0.0	1.0	
Bladderwort	4.8	95.2	0.0	4.8	0.0	2.9	
Richardson's Pondweed	4.8	95.2	0.0	4.8	0.0	2.9	
Starry Stonewort	4.8	95.2	0.0	4.8	0.0	2.9	
Occurrence and Abundance of Submersed Aquatic Plants in Syracuse Lake							
County:	Kosciusko	Secchi (ft):	13.7	Mean species/site:			1.20
Date:	8/16/2012	Sites with plants:	9	SE Mean species/site:			0.25
Littoral Depth (ft):	20.0	Sites with native plants:	9	Mean native species/site:			1.20
Littoral Sites:	10	Number of species:	4	SE Mean natives/site:			0.25
Total Sites:	10	Number of native species:	4	Species diversity:			0.51
		Maximum species/site:	3	Native species diversity:			0.51
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance	
		0	1	3	5		
Nitella	80.0	20.0	10.0	30.0	40.0	60.0	
Coontail	20.0	80.0	0.0	20.0	0.0	12.0	
Chara	10.0	90.0	0.0	10.0	0.0	6.0	
Slender naiad	10.0	90.0	10.0	0.0	0.0	2.0	

Figure 14: Syracuse Lake Multi-Year Data Presentation

Syracuse Multi-year Data Presentation								
Date:	8/19/2004	8/5/2005	8/9/2006	8/12/2009	6/29/2011	8/25/2011	6/1/2012	8/16/2012
Total Sites:	80	80	80	80	100	100	100	100
Secchi (ft):	10.0	12.0	9.0	15.3	13.0	9.5	14.0	13.7
Number of Species:	11	14	16	17	13	17	15	18
Number of Native Species:	10	12	14	15	12	16	12	16
Species Diversity:	0.84	0.84	0.89	0.86	0.86	0.84	0.84	0.87
Native Species Diversity:	0.76	0.82	0.88	0.84	0.83	0.82	0.79	0.85
Mean Native Species/Site:	1.92	2.16	1.83	2.36	1.82	1.58	1.32	2.09
Surveying organization	AWC	AWC	AWC	AWC	AWC	AWC	AWC	AWC
Species Frequency of Occurrence - All Depths								
Chara	77.3	66.3	43.8	66.3	59.0	58.0	53.0	59.0
Eurasian milfoil	33.3	12.5	21.3	25.0	31.0	26.0	30.0	46.0
Illinois Pondweed	30.7	23.8	18.8	12.5	25.0	15.0	9.0	30.0
Sago Pondweed	12.0	17.5	20.0	16.3	14.0	10.0	18.0	27.0
Eel grass	9.3	10.0	15.0	27.5	16.0	21.0	5.0	22.0
Coontail	5.3	22.5	16.3	28.8	18.0	15.0	14.0	17.0
Slender naiad	9.3	3.8	13.8	8.8	4.0	6.0	3.0	17.0
Nitella	0.0	0.0	0.0	10.0	15.0	7.0	12.0	10.0
Bladderwort	0.0	48.8	22.5	17.5	17.0	12.0	7.0	6.0
Brittle naiad	0.0	0.0	5.0	1.3	0.0	2.0	0.0	5.0
American Pondweed	14.7	6.3	1.3	1.3	0.0	4.0	2.0	4.0
Richardson's Pondweed	0.0	0.0	12.5	2.5	5.0	2.0	2.0	3.0
Whorled milfoil	0.0	0.0	3.8	6.3	2.0	1.0	2.0	3.0
Flat-stemmed Pondweed	0.0	11.3	1.3	1.3	3.0	1.0	3.0	3.0
Starry Stonewort	0.0	0.0	0.0	0.0	0.0	0.0	3.0	2.0
Small Pondweed	0.0	0.0	6.3	3.8	4.0	1.0	2.0	1.0
Elodea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Sagittaria sp.	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0
Curly Leaf Pondweed	42.7	3.8	1.3	0.0	0.0	0.0	2.0	0.0
Southern naiad	0.0	0.0	0.0	6.3	0.0	2.0	0.0	0.0
Northern Watermilfoil	13.3	3.8	1.3	0.0	0.0	0.0	0.0	0.0
Waterstargrass	9.3	1.3	0.0	0.0	0.0	0.0	0.0	0.0
Large Leaf Pondweed	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0
Species Frequency of Occurrence - 0 to 5 ft								
Chara	NA	NA	84.0	92.0	84.1	70.5	54.5	61.4
Illinois Pondweed	NA	NA	36.0	24.0	38.6	25.0	15.9	43.2
Eurasian milfoil	NA	NA	0.0	8.0	18.2	9.1	18.2	38.6
Sago Pondweed	NA	NA	12.0	24.0	11.4	11.4	20.5	29.5
Slender naiad	NA	NA	16.0	16.0	6.8	6.8	4.5	22.7
Eel grass	NA	NA	8.0	24.0	18.2	9.1	4.5	22.7
Bladderwort	NA	NA	36.0	12.0	20.5	11.4	13.6	9.1
American Pondweed	NA	NA	4.0	4.0	0	9.1	4.5	6.8
Whorled milfoil	NA	NA	4.0	12.0	2.3	2.3	4.5	6.8
Flat-stemmed Pondweed	NA	NA	0.0	0.0	2.3	0.0	2.3	4.5
Brittle naiad	NA	NA	0.0	0.0	0	0.0	0.0	2.3
Richardson's Pondweed	NA	NA	0.0	8.0	2.3	2.3	0.0	2.3
Starry Stonewort	NA	NA	0.0	0.0	0	0.0	4.5	2.3
Coontail	NA	NA	4.0	8.0	4.5	6.8	6.8	2.3
Elodea	NA	NA	0.0	0.0	0	0.0	0.0	2.3
Sagittaria sp.	NA	NA	0.0	0.0	0	2.3	0.0	2.3
Curly Leaf Pondweed	NA	NA	0.0	0.0	0	0.0	4.5	0.0
Small Pondweed	NA	NA	4.0	0.0	6.8	0.0	2.3	0.0
Southern naiad	NA	NA	0.0	8.0	0	2.3	0.0	0.0
Northern Watermilfoil	NA	NA	0.0	0.0	0	0.0	0.0	0.0
Species Frequency of Occurrence - 5 to 10 ft								
Chara	NA	NA	52.2	70.8	52.0	80.0	56.0	68.0
Eurasian milfoil	NA	NA	26.1	33.3	52.0	36.0	40.0	56.0
Sago Pondweed	NA	NA	30.4	16.7	16.0	12.0	20.0	40.0
Eel grass	NA	NA	26.1	41.7	16.0	40.0	8.0	32.0
Illinois Pondweed	NA	NA	17.4	16.7	16.0	16.0	8.0	32.0
Coontail	NA	NA	21.7	33.3	20.0	8.0	8.0	20.0
Slender naiad	NA	NA	8.7	4.2	4.0	8.0	4.0	12.0
Richardson's Pondweed	NA	NA	13.0	0.0	8.0	0.0	0.0	4.0
Small Pondweed	NA	NA	8.7	8.3	4.0	0.0	4.0	4.0
Bladderwort	NA	NA	30.4	12.5	20.0	12.0	4.0	4.0
Brittle naiad	NA	NA	13.0	4.2	0.0	0.0	0.0	4.0
Flat-stemmed Pondweed	NA	NA	4.3	4.2	8.0	4.0	4.0	4.0
Nitella	NA	NA	0.0	0.0	0.0	0.0	4.0	0.0
Southern naiad	NA	NA	0.0	12.5	0.0	4.0	0.0	0.0
Whorled Milfoil	NA	NA	4.3	8.3	0.0	0.0	0.0	0.0
Curly Leaf Pondweed	NA	NA	4.3	0.0	0.0	0.0	0.0	0.0
Species Frequency of Occurrence - 10 to 15 ft								
Eurasian milfoil	NA	NA	45.5	47.6	47.6	57.1	52.4	71.4
Chara	NA	NA	9.1	52.4	38.1	33.3	66.7	66.7
Coontail	NA	NA	27.3	42.9	38.1	38.1	19.0	42.9
Eel grass	NA	NA	18.2	28.6	14.3	28.6	4.8	19.0
Sago Pondweed	NA	NA	22.7	14.3	23.8	9.5	14.3	19.0
Brittle naiad	NA	NA	4.5	0.0	0.0	9.5	0.0	14.3
Illinois Pondweed	NA	NA	9.1	0.0	19.0	0.0	0.0	14.3
Slender naiad	NA	NA	22.7	9.5	0.0	4.8	0.0	14.3
Nitella	NA	NA	0.0	9.5	33.3	19.0	19.0	9.5
Bladderwort	NA	NA	9.1	0.0	9.5	19.0	0.0	4.8
Richardson's Pondweed	NA	NA	9.1	0.0	9.5	4.8	9.5	4.8
Starry Stonewort	NA	NA	0.0	0.0	0.0	0.0	4.8	4.8
American Pondweed	NA	NA	0.0	0.0	0.0	0.0	0.0	4.8
Flat-stemmed Pondweed	NA	NA	0.0	0.0	0.0	0.0	4.8	0.0
Small Pondweed	NA	NA	9.1	4.8	0.0	4.8	0.0	0.0
Curly Leaf Pondweed	NA	NA	0.0	0.0	0.0	0.0	0.0	0.0
Whorled Milfoil	NA	NA	0.0	0.0	0.0	0.0	0.0	0.0
Species Frequency of Occurrence - 15 to 20 ft								
Nitella	NA	NA	0.0	60.0	80.0	30.0	70.0	80.0
Coontail	NA	NA	10.0	40.0	30.0	20.0	50.0	20.0
Chara	NA	NA	0.0	20.0	10.0	0.0	10.0	10.0
Slender naiad	NA	NA	0.0	0.0	0.0	0.0	0.0	10.0
Sago Pondweed	NA	NA	10.0	0.0	0.0	0.0	10.0	0.0
Eurasian Milfoil	NA	NA	10.0	0.0	0.0	10.0	0.0	0.0
Eel grass	NA	NA	10.0	0.0	10.0	10.0	0.0	0.0
Bladderwort	NA	NA	10.0	20.0	10.0	0.0	0.0	0.0
Whorled Milfoil	NA	NA	10.0	0.0	0.0	0.0	0.0	0.0

Tier II Discussion

Overall plant diversity and species richness are greater than those seen in many areas lakes. Water clarity has also been above average in 2011 and 2012, although drought-like conditions in 2012 may have contributed to increased water clarity. While native plant populations appear healthy, exotic plant species should be monitored.

The continued increase in SSW site frequency is likely biggest cause for concern in Lake Wawasee and Syracuse Lake. Despite large scale efforts to control SSW, its acreage has increased steadily each year since 2009. In August of 2009, total SSW acreage in Lake Wawasee was estimated at 15 acres. In the fall of 2012, total SSW acreage in Wawasee was estimated at 159 acres. Total SSW acreage in Syracuse Lake was estimated at 7.5 acres in the fall of 2012. Chemical applications temporarily control SSW, but no long term control of the plant has been observed. Multiple applications are needed in the same treatment area throughout the course of the season to keep SSW suppressed.

EWM is present throughout the littoral zone in both Lake Wawasee and Syracuse Lake. In Lake Wawasee, EWM total acreage is estimated at 579 acres although its site frequency seems to be stable. EWM has been in the lake for decades and may currently be growing in most if not all areas of suitable habitat. Its total acreage would not be expected to increase dramatically although its overall percentage of the plant community could become greater, especially if a decrease in water quality would occur.

In Syracuse Lake, the high frequency of EWM in summer of 2012 (46.0%) is somewhat concerning, as this is the highest frequency AWC has found on Syracuse Lake in the past 8 years. Aquatic plant growth in general was heavy across all of Northeast Indiana in 2012 because of the dry summer and increased water clarity. This along with a mild winter could have contributed to a “bumper crop” of EWM in 2012, but the EWM population should be monitored closely.

Action Plan

SSW Treatments

The treatment of starry stonewort should be the highest management priority for Lake Wawasee and Syracuse Lake in 2013. Starry stonewort treatments help to reduce biomass, although control is not always as complete, and multiple applications must be made to the same area each year to keep it in check. At this point, herbicide options for the control of SSW are very limited. Cutrine ultra applied at a rate of 2.4 gal per acre-foot in combination with Hydrothol 191 herbicide at varying rates is currently being used to provide temporary control of SSW. It is recommended that this treatment strategy be continued. Some funding for starry stonewort treatments will again be available from the IDNR through a grant from the Great Lakes Restoration Initiative. However, this funding is not guaranteed beyond 2013 and will need to be spent on high priority treatment areas (IDNR 2012).

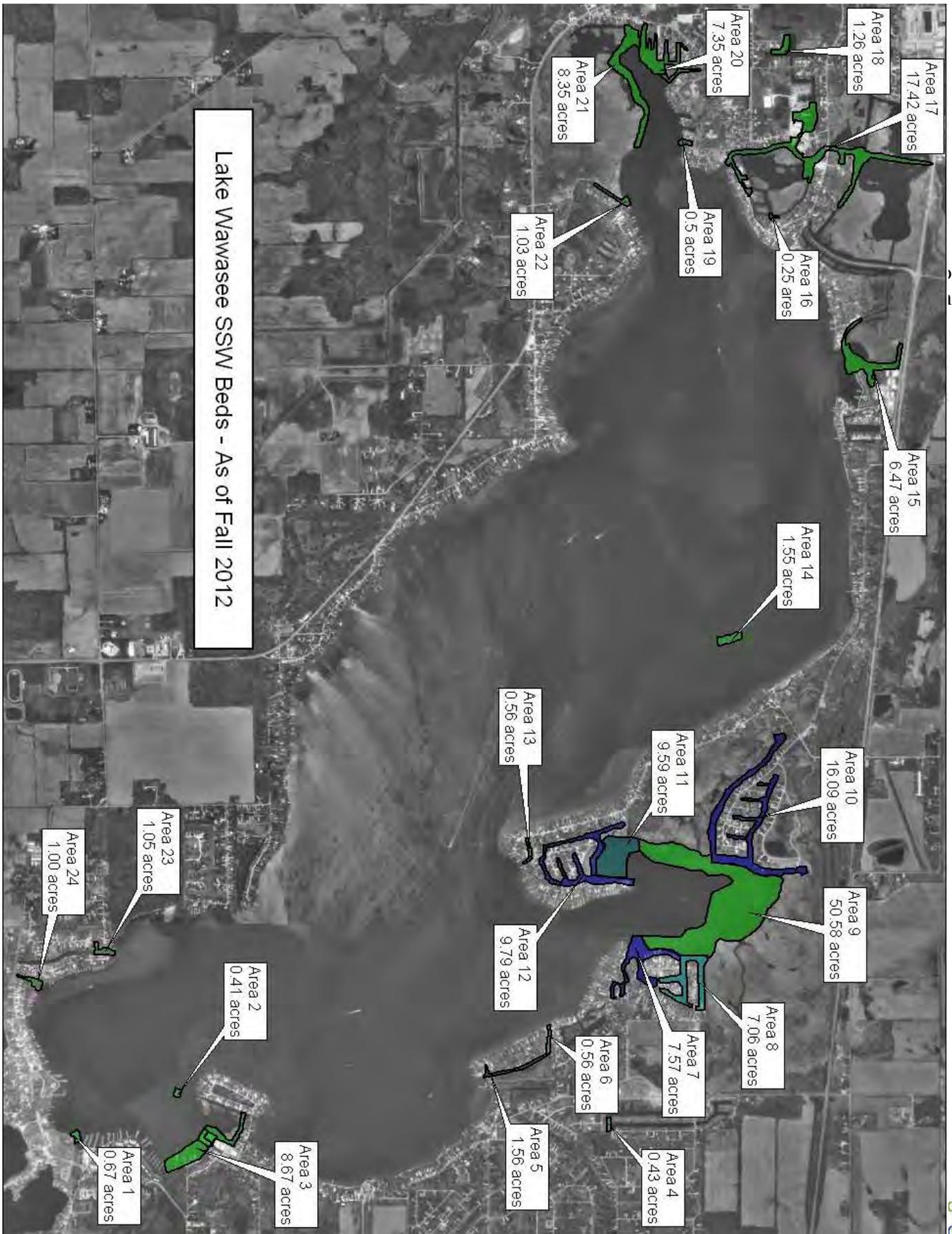
Developing SSW treatment priorities and tracking SSW treatments on these lakes is challenging due to the high number of SSW beds and their ever-changing acreages, as SSW continues to spread. Table 5 attempts to consolidate information from every SSW bed in Lake Wawasee and Syracuse Lake as of fall 2012. This table includes acreage, estimated average depth, acre-feet, rates, and amounts of herbicide needed for each area and a very brief description of each bed. Each area in

Table 5 corresponds to a labeled area in Figure 15. These items may provide a good baseline for the SSW treatments in 2013.

Table 5: Lake Wawasee SSW Bed and Treatment Details - As of fall 2012

Description (Lake Wawasee)	Area	Acres	Avg Depth	Total Acre-feet	Amount of 25 ac-ft Pricing units	Recommended Hydrothol Rate	Open water or confined	Quarts of Hydrothol	Gallons Cutrine @ 2.4 gal/ac-ft
IDNR access site	Area 1	0.67	3	2.01	0.0804	1 qt per acre-foot	Open water	2.01	4.824
open water near IDNR access	Area 2	0.41	4	1.64	0.0656	1 qt per acre-foot	Open Water	1.64	3.936
Griffith's marina and bay area	Area 3	8.67	3	26.01	1.0404	1 qt per acre	Confined	8.67	62.424
channel area-enchanted hills	Area 4	0.43	3	1.29	0.0516	1 qt per acre	Confined	0.43	3.096
channel by cedar point	Area 5	1.56	3	4.68	0.1872	1 qt per acre	Confined	1.56	11.232
channel by strawberry island	Area 6	0.56	3	1.68	0.0672	1 qt per acre	Confined	0.56	4.032
black point channels and frontage	Area 7	7.57	5	37.85	1.514	1 qt per acre	Confined	7.57	90.84
NE Johnson bay channels/frontage	Area 8	7.06	4	28.24	1.1296	1 qt per acre	Confined	7.06	67.776
large Johnson bay open water area	Area 9	50.58	7	354.06	14.1624	1 qt per acre-foot	Open Water	354.06	849.744
Kenata Manayunk channels/frontage	Area 10	16.09	4	64.36	2.5744	1 qt per acre	Confined	16.09	154.464
Bay outside venetian isles- open water	Area 11	9.59	7	67.13	2.6852	1 qt per acre-foot	Confined	9.59	161.112
Venetian isles channel system/frontage	Area 12	9.79	4	39.16	1.5664	1 qt per acre	Confined	9.79	93.984
channel-ogden island	Area 13	0.56	3	1.68	0.0672	1 qt per acre	Confined	0.56	4.032
open water - near Spinks	Area 14	1.55	19	29.45	1.178	1 qt per acre-foot	Open Water	29.45	70.68
channels by wawasee boat company	Area 15	6.47	4	25.88	1.0352	1 qt per acre	Confined	6.47	62.112
small channel area in mud lake	Area 16	0.25	3	0.75	0.03	1 qt per acre	Confined	0.25	1.8
Channel between syr/waw and marina	Area 17	17.42	4	69.68	2.7872	1 qt per acre	Confined	17.42	167.232
in channel west of main channel marina	Area 18	1.26	4	5.04	0.2016	1 qt per acre	Confined	1.26	12.096
small channel near oakwood hotel	Area 19	0.25	3	0.75	0.03	1 qt per acre	Confined	0.25	1.8
wawasee slip and conlkin channels	Area 20	7.35	4	29.4	1.176	1 qt per acre	Confined	7.35	70.56
south side of conklin bay	Area 21	8.35	3	25.05	1.002	1 qt per acre-foot	Open Water	25.05	60.12
small channel on south shore - conlkin	Area 22	1.03	2	2.06	0.0824	1 qt per acre	Confined	1.03	4.944
mouth of Marineland gardens	Area 23	1.05	4	4.2	0.168	1 qt per acre	Confined	1.05	10.08
channel off of hatchery road	Area 24	1	3	3	0.12	1 qt per acre	Confined	1	7.2
Wawasee Totals		159.5		825.05	33.002			510.17	1980.12
Description (Syracuse Lake)	Area	Acres	Avg Depth	Total Acre-feet	Amount of 25 ac-ft Pricing units	Recommended Hydrothol Rate	Open water or confined	Quarts of Hydrothol	Gallons Cutrine @ 2.4 gal/ac-ft
Access channel	Area 1	4.5	3.5	15.75	0.63	1 qt per acre	Confined	4.5	37.8
channel- SE corner	Area 2	1	3	3	0.12	1 qt per acre	Confined	1	7.2
open water - point 49	Area 3	1	14	14	0.56	1 qt per acre-foot	Open Water	14	33.6
open water- point 54	Area 4	1	3	3	0.12	1 qt per acre-foot	Open Water	3	7.2
Syracuse Totals		7.5		35.75	1.43			22.5	85.8

Figure 15: Lake Wawasee Total SSW Beds - As of Fall 2012



2013 EWM treatments

It is recommended that funding be set aside to treat 50 acres of EWM infestation in Syracuse Lake and 75 acres of EWM infestation in Lake Wawasee. These acreages do not represent total EWM abundance in these lakes. The goal of any EWM treatments in 2013 would primarily be to improve lake use and access in areas of dense EWM growth. Any EWM treatment recommendations must be balanced with the fact that many EWM treatment areas are also likely to be suitable habitats for SSW infestation.

Treatment areas for 2013 will be dependent on data, GPS coordinates, and observations from the spring 2013 vegetation survey. The summer of 2012 was abnormally hot and dry. This likely resulted in above average EWM abundance and density in 2012. It is difficult to predict EWM density in 2013 based on what was observed this year.

In Lake Wawasee, portions of areas 5, 6, 7, and 11 in Figure 5 have been treated in the past and would be candidates for EWM treatment pending map submission in 2013 and IDNR approval. High priority EWM treatment areas for Syracuse Lake are shaded red in Figure 16 and would be good candidates for EWM treatment in 2013.

Figure 16: Syracuse Lake 2013 Potential EWM Treatment Areas



EWM Treatment Specifications

In the past, all areas of EWM infestation in Syracuse Lake and Lake Wawasee have been treated with DMA-4 herbicide. Treatments have been successful in the past at reducing EWM on a yearly basis in treatment areas, and this strategy is recommended for 2013. All areas of EWM infestation should be treated with DMA-4 herbicide at a rate of 2 parts per million. Granular Navigate could also be used but at increased cost per acre (approximately \$600 per acre). Average depth of treatment areas is undetermined, but for budgeting purposes, a 4 foot average depth is used.

Project Budget

<u>Eurasian Watermilfoil</u>	<u>Cost Estimates</u>
Treat 50 high priority acres of EWM on Syracuse Lake (DMA-4 herbicide at 2ppm, 4 foot avg. depth)	\$ 17,500
Treat 75 acres of EWM on Lake Wawasee (DMA-4 herbicide at 2ppm, 4 foot avg. depth)	\$ 26,250
Spring and Summer Tier II surveys, AVMP update	\$ 11,000
Total Cost Estimate and Grant Request	\$ 54,750
LARE grant request (80% - subject to availability)	\$ 43,800
Association's cost-share (20%)	\$ 10,950

Starry Stonewort Budget

At this time, it is unclear if funding from the Great Lakes Restoration Initiative will be available to treat SSW as it has in the past. Cutrine Ultra was used in combination with Hydrothol 191 to control SSW in 2012. Cost for SSW treatments at Lake Wawasee and Syracuse Lake in 2012 was \$1998.11 per 25 acre-feet treated with Cutrine Ultra. The additional cost for Hydrothol was \$25.41 per quart used. At this time, it is estimated that there are 825 acre-feet of water in current SSW beds in Lake Wawasee and 35 acre feet in Syracuse Lake. Total SSW acreage could change significantly in 2013 as the plant appears to continue spreading in these lakes.

Priority Starry Stonewort Areas

Should the decision be made not to treat all areas of SSW infestation in Lake Wawasee in 2013, the highest priority SSW treatment areas are listed below. All of these areas correspond to Figure 15 which is recommended as the basis for future SSW Treatments on Lake Wawasee.

1. Area 1 - 1 acre
2. Area 17- 17.42 acres
3. Area 3- 8.67 acres
4. Area 20- 7.35 acres
5. Area 10- 16.09 acres

Public Involvement

Parties interested in the improvement of Lake Wawasee and Syracuse Lake include members of the WACF and the Syracuse Lake Association as well as others who access the lake at the IDNR public access sites. The most common and most effective methods for keeping the public informed about aquatic vegetation management practices are lake association meetings as well as periodical newsletters sent out by the associations. It is recommended that association members encourage neighbors and other lake users to attend lake association meetings so that interested parties are well informed about the LARE program. Making sure that meetings are well advertised and planned well in advance of the meeting dates are ways to help ensure good attendance. Carry-in dinners, door prizes, contests, guest speakers, and discussion panels are all excellent ways to boost attendance, encourage involvement, and keep association members informed about lake management activities.

The WACF held a public meeting on August 4, 2012 to discuss issues related to the LARE program. Jim Donahoe of Aquatic Weed Control attended this meeting to summarize LARE activities on the lake. The lake residents were especially concerned about starry stonewort expansion in Lake Wawasee and Syracuse Lake and were in favor of continuing invasive species control. Attendance was low with only 7 people present. An effort is being made for 2013 to make more people aware of LARE activities. Because LARE management timelines and association meeting dates are not always cohesive, the possibility of Aquatic Weed Control conducting two meetings is being considered.

Figure 17 summarizes responses to the 2012 public questionnaire.

15.0 References Cited

Aquatic Weed Control. 2006. Lake Wawasee Aquatic Vegetation Management Plan. P.O. Box 325 Syracuse, IN 46567.

Aquatic Weed Control. 2005. Syracuse Lake Aquatic Vegetation Management Plan P.O. Box 325 Syracuse, IN 46567.

IDNR. 2006. Procedure Manual for Surveying Aquatic Vegetation: Tier II Reconnaissance Surveys. IN Department of Natural Resources. Indianapolis, Indiana.

IDNR. 2010. Procedure Manual for Surveying Aquatic Vegetation: Tier II Reconnaissance Surveys. IN Department of Natural Resources. Indianapolis, Indiana.

IDNR 2013. LARE AVMP Revision Comments. Indiana Department of Natural Resources. Division of Fish and Wildlife. Indianapolis, Indiana.

V3 Companies. 2010. Lake Wawasee Aquatic Vegetation Management Plan Update – 2009 and Vegetation Surveys in Eco-zone Areas of Conklin. 7325 Janes Avenue Woodbridge, Illinois 60517

Appendix

Common and Scientific Plant Names

Common Name	Scientific Name
American Pondweed	<i>Potamogeton nodosus</i>
Bladderwort	<i>Utricularia sp.</i>
Brittle Naiad	<i>Najas minor</i>
Cabomba	<i>Cabomba sp.</i>
Chara	<i>Chara sp.</i>
Coontail	<i>Ceratophyllum demersum</i>
Curly leaf Pondweed	<i>Potamogeton crispus</i>
Eelgrass	<i>Vallisneria americana</i>
Elodea	<i>Elodea canadensis</i>
Eurasian Watermilfoil	<i>Myriophyllum spicatum</i>
Flat Stem Pondweed	<i>Potamogeton zosteriformis</i>
Floating-leaf Pondweed	<i>Potamogeton natans</i>
Forked or Star Duckweed	<i>Lemna trisulca</i>
Illinois Pondweed	<i>Potamogeton illinoensis</i>
Lake Cress	<i>Armoracia lacustris</i>
Largeleaf Pondweed	<i>Potamogeton amplifolius</i>
Leafy Pondweed	<i>Potamogeton foliosus</i>
Nitella	<i>Nitella sp.</i>
Northern Watermilfoil	<i>Myriophyllum sibiricum</i>
Richardson's Pondweed	<i>Potamogeton richardsonii</i>
Sago Pondweed	<i>Potamogeton pectinatus</i>
Slender Arrowhead	<i>Sagittaria teres</i>
Slender Naiad	<i>Najas flexilis</i>
Small Pondweed	<i>Potamogeton pusillus</i>
Variable Pondweed	<i>Potamogeton diversifolius</i>
Warer Stargrass	<i>Heteranthera dubia</i>
Water Buttercup sp.	<i>Ranunculus sp.</i>
Whitestem Pondweed	<i>Potamogeton praelongus</i>
Whorled Milfoil	<i>Myriophyllum verticillatum</i>

Data Sheets and GPS Coordinates

Latitude	Longitude	Depth	Site	EWM	CLP	Starry	Chara	Saggs	Richardson's	Najad	Bladderwort	Small	Illinois	Eel grass	Coastal	Whorled	Flatstem	American	Nuttall's
41.424312	-85.749894	5	1																
41.423983	-85.749814	5	2																
41.424055	-85.749567	5	3																
41.424136	-85.749270	3	4																
41.424041	-85.748623	3	5																
41.423561	-85.747522	3	6																
41.423871	-85.746280	2	7																
41.423453	-85.745186	2	8																
41.422700	-85.744881	4	9																
41.422098	-85.743490	5	10																
41.422679	-85.743364	3	11																
41.422531	-85.742336	3	12																
41.423581	-85.741657	6	13																
41.424191	-85.741880	6	14																
41.424870	-85.740935	18	15																
41.425221	-85.739882	14	16																
41.426022	-85.738747	13	17																
41.425643	-85.737497	12	18																
41.424400	-85.740133	14	19																
41.423672	-85.740768	5	20																
41.422841	-85.740373	3	21																
41.422957	-85.738561	3	22																
41.422969	-85.737112	6	23																
41.421829	-85.735051	3	24																
41.422250	-85.735642	11	25																
41.424518	-85.734990	8	26																
41.422785	-85.734484	16	27																
41.421867	-85.733981	6	28																
41.421334	-85.734269	3	29																
41.420849	-85.734031	2	30																
41.421208	-85.732989	2	31																
41.421789	-85.731209	3	32																
41.422322	-85.731507	3	33																
41.422656	-85.732557	8	34																
41.424448	-85.732452	9	35																
41.424283	-85.731297	11	36																
41.423350	-85.730825	2	37																
41.422081	-85.729424	3	38																
41.422489	-85.727798	2	39																
41.421986	-85.727694	3	40																
41.423689	-85.728488	4	41																
41.424564	-85.729873	8	42																
41.425248	-85.726876	3	43																
41.426169	-85.727198	11	44																
41.425740	-85.729138	6	45																
41.426125	-85.730501	11	46																
41.426208	-85.723509	19	47																
41.427232	-85.731884	16	48																
41.427004	-85.730169	14	49																
41.427124	-85.728756	17	50																

Latitude	Longitude	Depth	Site	EWM	CLP	Starry	Chara	Sago	Richardson's	Naiad	Bladderwort	small	Illinois	Eel grass	Coontail	Whorled	Flatstem	American	Nitella
41.428135	-85.729073	11	51																
41.426583	-85.726397	5	52																
41.427992	-85.727427	11	53																
41.428326	-85.726260	2	54																
41.429079	-85.726910	3	55																
41.428815	-85.728316	9	56																
41.429664	-85.728899	6	57																
41.428832	-85.730474	12	58																
41.428267	-85.73135	14	59																
41.428687	-85.734089	18	60																
41.429375	-85.733202	8	61																
41.429089	-85.732100	9	62																
41.429562	-85.731234	8	63																
41.430207	-85.729913	3	64																
41.430450	-85.731786	3	65																
41.430639	-85.73168	6	66																
41.429662	-85.733941	11	67																
41.430197	-85.735139	6	68																
41.430026	-85.736043	17	69																
41.430698	-85.736633	2	70																
41.430447	-85.737930	11	71																
41.430966	-85.738797	2	72																
41.430317	-85.739433	20	73																
41.430631	-85.740412	6	74																
41.430729	-85.741506	12	75																
41.431645	-85.741790	1	76																
41.431306	-85.742828	9	77																
41.431946	-85.742978	2	78																
41.432827	-85.743068	5	79																
41.433501	-85.742999	3	80																
41.431188	-85.743824	2	81																
41.430293	-85.743964	12	82																
41.429715	-85.745008	17	83																
41.430591	-85.745194	1	84																
41.430060	-85.746096	2	85																
41.429449	-85.746682	15	86																
41.429878	-85.747684	6	87																
41.430028	-85.749299	3	88																
41.429399	-85.748397	10	89																
41.428927	-85.747459	8	90																
41.428623	-85.748328	11	91																
41.428955	-85.748533	6	92																
41.427750	-85.747697	13	93																
41.426880	-85.747227	3	94																
41.427020	-85.746157	13	95																
41.426367	-85.745817	7	96																
41.426102	-85.744781	8	97																
41.425570	-85.744096	18	98																
41.424753	-85.743881	6	99																
41.423957	-85.743585	2	100																

Syracuse Lake	Latitude	Longitude	Depth	Site	FWM	CLP	Starry	Chair	Sago	Richardsons	Nasad	Biddervort	small	Illinois	Eel grass	Coontail	whorled	Flatstem	American	Nitella	
	41.424312	-85.749884	5	1																	
	41.423983	-85.749814	5	2																	
	41.424055	-85.749567	5	3																	
	41.424136	-85.749270	3	4																	
	41.424041	-85.748523	3	5																	
	41.423503	-85.747522	3	6																	
	41.422871	-85.746280	2	7																	
	41.423453	-85.745186	2	8																	
	41.422700	-85.744884	4	9																	
	41.422098	-85.744490	5	10																	
	41.422679	-85.743364	3	11																	
	41.422531	-85.742336	3	12																	
	41.423581	-85.741657	6	13																	
	41.424191	-85.741880	6	14																	
	41.424870	-85.740935	18	15																	
	41.425221	-85.739882	14	16																	
	41.426022	-85.738747	13	17																	
	41.425643	-85.737497	12	18																	
	41.424400	-85.740133	14	19																	
	41.423672	-85.740768	5	20																	
	41.422841	-85.740373	3	21																	
	41.422957	-85.738561	3	22																	
	41.422959	-85.737112	6	23																	
	41.421829	-85.736451	3	24																	
	41.423250	-85.735642	11	25																	
	41.424518	-85.734990	8	26																	
	41.422785	-85.734484	16	27																	
	41.421867	-85.733861	6	28																	
	41.421334	-85.734269	3	29																	
	41.420849	-85.734051	2	30																	
	41.421208	-85.732989	2	31																	
	41.421388	-85.731705	3	32																	
	41.422322	-85.731502	3	33																	
	41.422858	-85.732557	8	34																	
	41.424445	-85.732452	9	35																	
	41.424283	-85.731297	11	36																	
	41.423350	-85.728825	2	37																	
	41.422081	-85.728424	3	38																	
	41.422489	-85.727796	2	39																	
	41.421686	-85.727684	3	40																	
	41.423689	-85.728488	4	41																	
	41.424564	-85.729873	8	42																	
	41.425248	-85.726876	3	43																	
	41.426169	-85.727798	11	44																	
	41.425740	-85.729138	6	45																	
	41.426125	-85.730607	11	46																	
	41.426268	-85.733609	17	47																	
	41.427232	-85.731884	16	48																	
	41.427004	-85.730369	14	49																	
	41.427124	-85.728758	17	50																	

8-16-2012

15.7 SWL

Small
Illinois
Eel grass
Coontail
whorled
Flatstem
American
Nitella

Stems
13.7 Seds. 8-16-2012

Latitude	Longitude	Depth	Site	EWM	GLP	Starry	Chara	Sago	Richardson	Najas	Bladderwort	Small	Illinois	Fel grass	Cornfall	Whorled	Flatstem	American	Nitella
41.428135	-85.729113	11	51																
41.428583	-85.726387	5	52																
41.427992	-85.727427	11	53																
41.428326	-85.726260	7	54																
41.429079	-85.726910	3	55																
41.428815	-85.728316	9	56																
41.429654	-85.728999	6	57																
41.428832	-85.730474	12	58																
41.428267	-85.732135	14	59																
41.428687	-85.734089	18	60																
41.429375	-85.733202	8	61																
41.429088	-85.732100	9	62																
41.429562	-85.731234	8	63																
41.430207	-85.729913	3	64																
41.430450	-85.731786	3	65																
41.430639	-85.733160	5	66																
41.429962	-85.733941	14	67																
41.430197	-85.735199	6	68																
41.430076	-85.736043	17	69																
41.430698	-85.736633	2	70																
41.430447	-85.737930	11	71																
41.430966	-85.738797	2	72																
41.430317	-85.739493	20	73																
41.430631	-85.740412	6	74																
41.430729	-85.741506	12	75																
41.431645	-85.741790	1	76																
41.431306	-85.742828	9	77																
41.431946	-85.742978	7	78																
41.432827	-85.743068	5	79																
41.432501	-85.742999	3	80																
41.431188	-85.743824	2	81																
41.430293	-85.743964	12	82																
41.429715	-85.745008	17	83																
41.430581	-85.745194	1	84																
41.430060	-85.746096	2	85																
41.429449	-85.746682	15	86																
41.429878	-85.747684	6	87																
41.430038	-85.749299	3	88																
41.429399	-85.748397	10	89																
41.428227	-85.747459	8	90																
41.428623	-85.748328	11	91																
41.428055	-85.748533	6	92																
41.427750	-85.747697	13	93																
41.428880	-85.747227	3	94																
41.427030	-85.746357	13	95																
41.426367	-85.745817	7	96																
41.426102	-85.744781	8	97																
41.425570	-85.744006	18	98																
41.424753	-85.743881	5	99																
41.423917	-85.743385	9	100																

Maunder Forest - 11/20/2012

Depth	Site	Starry	EWM	CP	Chara	Conostyl	Sago	Illinois	Slender	Eel	Bladder	Whorled	Richardson's	Flat-stem	Sagittaria sp.	Elodea	Small	Nitella	American P. Vegetable	Largelent	
3	1	3																			
5.5	2																				
4.5	3	-																			
4.5	4																				
4	5																				
5	6																				
13	7																				
5	8																				
21	9																				
3	10																				
2	11																				
5	12																				
5	13																				
20	14																				
5	15																				
4.5	16																				
5	17																				
5	18																				
4	19																				
4	20																				
4.5	21																				
3	22																				
3	23																				
5	24																				
4	25																				
11	26																				
5	27																				
7	28																				
21	29																				
5	30																				
5	31																				
11	32																				
10	33																				
17	34																				
11	35																				
21	36																				
6	37																				
6	38																				
3	39																				
4	40																				
2	41																				
4	42																				
2	43																				
4	44																				
5	45																				
6	46																				
5	47																				
3	48																				
4	49																				
4	50																				

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Depth	Site	Starry	EWM	CLR	Chara	Cornell	Sage	Illinois	Slender	Fel	Bladder	Whorled	Richardson's	Flat-stem	Sagittaria sp.	Elodea	Small	Nitella	American P.	Variable	Largical	
6	51																					
5	52	1																				
4	53																					
5	54	3																				
6	55																					
5	56																					
6	57																					
4	58																					
9	59																					
5	60																					
20	61																					
16.5	62																					
4	63																					
4.5	64																					
6.5	65																					
5.5	66																					
10	67																					
7	68																					
5.5	69																					
6.5	70																					
8	71																					
5	72																					
7	73																					
5	74																					
4	75																					
12	76																					
20	77																					
18.5	78																					
8	79																					
16	80																					
10.5	81																					
4.5	82																					
5.5	83																					
4.5	84																					
8	85																					
5.5	86																					
5	87																					
3.5	88																					
5.5	89																					
11.5	90																					
5	91																					
5	92																					
7	93																					
4	94																					
4	95																					
5	96																					
6	97																					
6	98																					
6.5	99																					
6	100																					

5-30-2012

Depth	Site	Starry	EWM/CP	Chara	Coontail	Sago	Illinois	Slender	Fel	Bladder	Whorled	Richardson's	Flax stem	Sagittaria sp.	Elodea	Small	Nitella	American Variable	Largeleaf	
17	101																			
4	102		1																	
15.5	103	1.5																		
8	104	3	1																	
10	105	3	1																	
3.5	106	3																		
1.5	107	3	1																	
3.5	108	3	1																	
4.5	109	3	1																	
5.5	110	3																		
6.5	111	3																		
8.5	112	3																		
3	113	1																		
3.5	114	1																		
5	115	1																		
5	116	1																		
21	117	1																		
6	118	1																		
15	119	1																		
5	120	1																		
19	121	1																		
10	122	1																		
21	123	1																		
17	124	1																		
11	125	1																		
5	126	1																		
12	127	3																		
12	128	3																		
10	129	3																		
11	130	1																		
11	131	1																		
5	132	1																		
15	133	3	1																	
21	134	7																		
8	135	1																		
4	136	1																		
12	137	1																		
8	138	1																		
13	139	1	3																	
6	140	1																		
8	141	1																		
19	142	1																		
11	143	1																		
18	144	1																		
6	145	1																		
7	146	1																		
7	147	1																		
14	148	1																		
14	149	1																		
8	150	1																		

Depth	Site	Starry	EWM/CLP	Chara	Counsell	Sago	litoreis	Slender	Fel	Bladder	Whorled	Richardson's	Flat-stem	Sagittaria sp.	Eloidea	Small	Nitella	American P Variable	Largenleaf	
16	151																			
16	152		1	3	17	2														
23	153																			
11	154			1																
11	155			2																
18	156					1														
23	157																			
4	158																			
6	159		1																	
4	160			3				1												
4	161							1												
8	162																			
3	163				3															
3	164																			
10	165				5															
5	166																			
5	167																			
4	168																			
3	169																			
3	170																			
14	171																			
7	172																			
5	173																			
4	174																			
6	175																			
5	176																			
7	177																			
6	178																			
5	179																			
5	180																			
5	181																			
6	182																			
5	183																			
7	184																			
6	185																			
4	186																			
4	187																			
3	188																			
3	189																			
3	190																			
3	191																			
4	192																			
3	193																			
4	194																			
4	195																			
0	196																			
0	197																			
4	198																			
5	199																			
4	200																			

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Depth	Site	Sperry	EWMI	CLP	Chara	Ceratophyllum	Sagittaria	Illinois	Slender	Eel	Bladder	Whorled	Richardson's	Flat-stem	Sagittaria sp.	Erioda	Small	Najas	American P Variable	Largemouth
6	201		1																	
6	202		1																	
2	203	LN																		
4.5	204																			
5.5	205																			
5.5	206																			
4.5	207																			
6	208																			
6	209																			
6	210																			
5	211																			
7	212																			
8	213																			
5	214																			
6	215																			
4	216																			
10	217																			
5	218																			
5	219																			
4.5	220																			
5.5	221																			
4	222																			
4	223																			
5	224																			
5	225																			
4	226																			
4	227																			
4	228																			
5	229																			
4.5	230																			
7	231																			
9	232																			
9.5	233																			
9	234																			
8.5	235																			
6	236																			
5.5	237																			
4.5	238																			
11	239																			
12	240																			
8	241																			
3.5	242																			
7.5	243																			
4	244																			
5	245																			
5	246																			
7	247																			
8	248																			
4	249																			
2	250																			

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Wawakee
5-30-2012

Depth	Site	Starry	EWM	CLP	Chara	Coontail	Sage	Illinois	Slender	Eel	Bladder	Whorled	Richardson's	Flat-stem	Sagittaria sp.	Elodea	Small	Nitella	American P-Variable	Largelael	
5	251																				
4	252																				
3	253				1	1															
7	254																				
14	255																				
10	256																				
22	257																				
20	258																				
4	259																				
7	260																				
5	261																				
6	262																				
4	263																				
12	264																				
5	265																				
5	266																				
9	267																				
5	268																				
15	269																				
5	270																				
23	271																				
16	272																				
17	273																				
19	274																				
12	275																				
5	276																				
18	277																				
4	278																				
5	279																				
5	280																				
3	281																				
5	282																				
5	283																				
4	284																				
13	285																				
15	286																				
4	287																				
5	288																				
5	289																				
13	290																				
11	291																				
4	292																				
11	293																				
3	294																				
10	295																				
19	296																				
5	297																				
11	298																				
5	299																				
4	300																				

Wauwau
 2-22-2012
 Section - 11-1-01

Depth	Site	Stary	Chara	EWM	Coontail	Sago	Illinois	Spencer	El	Bladder	Whorled	Richardson's	Fat-stem	Sagittaria sp.	Elodea	Small	Nitella	American P Variable	CLP	Largestleaf
3	1	3																		
5.5	2	1																		
4.5	3																			
4.5	4																			
4	5																			
5	6																			
13	7																			
5	8																			
21	9																			
3	10																			
2	11																			
5	12																			
5	13																			
20	14																			
5	15																			
4.5	16																			
5	17																			
5	18																			
4	19																			
4	20																			
4.5	21																			
3	22																			
3	23																			
5	24																			
4	25																			
11	26																			
5	27																			
7	28																			
21	29																			
5	30																			
5	31																			
11	32																			
10	33																			
17	34																			
11	35																			
21	36																			
6	37																			
6	38																			
3	39																			
4	40																			
2	41																			
4	42																			
2	43																			
4	44																			
5	45																			
6	46																			
5	47																			
3	48																			
4	49																			
4	50																			

Wauwasee August 23, 2012

Depth	Site	Starr	Chara	EVM	Countail	Sago	Illinoe	Sender	Eel	Bladder	Whorled	Richardson's	Flat-stem	Sagittaria sp.	Elodea	Small	Nitella	American P	Variable	CLP	Largeleaf	
6	51	1																				
5	52	1																				
4	53	1																				
5	54	1																				
6	55	1																				
5	56	1																				
6	57	1																				
4	58	1																				
9	59	1																				
5	60	1																				
20	61	1																				
16.5	62	1																				
4	63	1																				
4.5	64	1																				
6.5	65	1																				
5.5	66	1																				
10	67	1																				
7	68	1																				
5.5	69	1																				
6.5	70	1																				
8	71	1																				
5	72	1																				
7	73	1																				
5	74	1																				
4	75	1																				
17	76	1																				
20	77	1																				
18.5	78	1																				
8	79	1																				
16	80	1																				
10.5	81	1																				
4.5	82	1																				
5.5	83	1																				
4.5	84	1																				
8	85	1																				
5.5	86	1																				
5	87	1																				
3.5	88	1																				
5.5	89	1																				
11.5	90	1																				
5	91	1																				
5	92	1																				
7	93	1																				
4	94	1																				
4	95	1																				
5	96	1																				
6	97	1																				
6	98	1																				
6.5	99	1																				
6	100	1																				

9969
Mojave August 23 2012

Depth	Site	Starry	Chara	EWM	Coontail	Sago	Illinoia	Spencer	Fel	Bladder	Whorled	Richardson's	Flar-stem	Sagittaria sp	Eriosa	Small	Rutella	American PVariable	CLP	Targetleaf	
17	101																				
4	102																				
15.5	103																				
8	104																				
10	105																				
2.5	106																				
1.5	107																				
3.5	108																				
4.5	109																				
5.5	110																				
6.5	111																				
8.5	112																				
3	113																				
3.5	114																				
5	115																				
5	116																				
21	117																				
6	118																				
15	119																				
5	120																				
19	121																				
10	122																				
21	123																				
17	124																				
11	125																				
5	126																				
12	127																				
12	128																				
10	129																				
11	130																				
11	131																				
5	132																				
15	133																				
21	134																				
8	135																				
4	136																				
12	137																				
8	138																				
13	139																				
6	140																				
8	141																				
19	142																				
11	143																				
18	144																				
6	145																				
7	146																				
7	147																				
14	148																				
3.7	149																				
8	150																				

Whinnere August 20, 2010

Depth	Site	Starry	Chara	EWI	Coontail	Sage	Illinois	Slender	Fel	Bladder	Whorled	Richardson's	Flat-stem	Sagittaria sp.	Elodea	Small	Nympha	American P	Variable	Clp	Largeleaf	
16	151																					
23	152																					
11	154																					
11	155																					
18	156																					
23	157																					
4	158																					
6	159																					
4	160																					
4	161																					
8	162																					
3	163																					
3	164																					
10	165																					
5	166																					
5	167																					
4	168																					
3	169																					
3	170																					
14	171																					
7	172																					
5	173																					
4	174																					
6	175																					
5	176																					
7	177																					
6	178																					
5	179																					
5	180																					
5	181																					
6	182																					
5	183																					
7	184																					
6	185																					
4	186																					
4	187																					
3	188																					
3	189																					
3	190																					
3	191																					
4	192																					
3	193																					
4	194																					
4	195																					
4	196																					
0	197																					
4	198																					
5	199																					
6	200																					

Waters: Run 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Depth	Site	Starry	Chara	EWMI	Coontail	Sago	Illinois	Slender	Eel	Bladder	Whorled	Richardson's	Flr-stem	Sagittaria sp.	Erodia	Small	Nitella	American Variable	Clp	Largeleaf	
6	201																				
6	202	3					4			1	3			1							
2	203																				
4.5	204			1			3														
5.5	205										3										
5.5	206										3										
4.5	207			1							1										
6	208			3																	
6	209				1																
6	210			5																	
5	211			8																	
7	212			1																	
8	213			3																	
5	214			3																	
6	215			3																	
4	216			5			1														
10	217			3		3															
5	218																				
5	219																				
4.5	220																				
5.5	221													3							
4	222																				
4	223	3																			
5	224																				
5	225																				
4	226			3																	
4	227																				
4	228																				
5	229																				
4.5	230																				
7	231	3																			
9	232																				
9.5	233																				
9	234																				
8.5	235																				
6	236																				
5.5	237																				
4.5	238																				
11	239																				
12	240																				
8	241																				
3.5	242																				
7.5	243																				
4	244																				
5	245																				
5	246																				
7	247																				
8	248																				
4	249																				
1	250																				

Mussel
August 29, 2017

Depth	Site	Starry	Chara	EWM	Coontail	Sago	Illinois	Slender	Fel	Bladder	Worled	Richardson's	Flat-stem	Sagittaria sp.	Elodea	Small	Nitella	American	Variable	CP	Largemouth	
5	251																					
4	252			1																		
3	253	3		1					1													
7	254			1					1													
14	255		3																			
10	256																					
22	257																					
20	258																					
4	259																					
7	260																					
5	261																					
6	262																					
4	263																					
12	264																					
5	265																					
5	266																					
9	267																					
5	268																					
15	269																					
5	270																					
23	271																					
16	272																					
17	273																					
19	274																					
12	275																					
5	276																					
18	277																					
4	278																					
5	279																					
5	280																					
3	281																					
5	282																					
5	283																					
4	284																					
13	285																					
16	286																					
4	287																					
5	288																					
5	289																					
13	290																					
11	291																					
4	292																					
11	293																					
3	294																					
10	295																					
19	296																					
5	297																					
11	298																					
5	299																					
4	300																					

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*****Wawasee Permit map- pending spring 2013 survey. Per Fisheries Biologist Jed Pearson's comments, 2012 was an exceptional year for weed growth and may not be indicative of what we will see in 2013. The amount of offshore treatment necessary will depend upon the abundance and density of EWM in 2013.

*****Starry Stonewort treatments have not needed a vegetation control permit in the past since they have been funded and controlled by the IDNR. It is likely that they will not need a permit in 2013.

Treatment Area	2	LAT/LONG or UTM's N41 25.462 W85 44.553			
Total acres to be controlled	10	Proposed shoreline treatment length (ft)	NA	Perpendicular distance from shoreline (ft)	684
Maximum Depth of Treatment	12	Expected date(s) of treatment (Mid June)			
Treatment method: <input checked="" type="checkbox"/> Chemical <input type="checkbox"/> Physical <input type="checkbox"/> Biological Control <input type="checkbox"/> Mechanical					
Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control: 2, 4-D (DMA-4 or Navigate)					

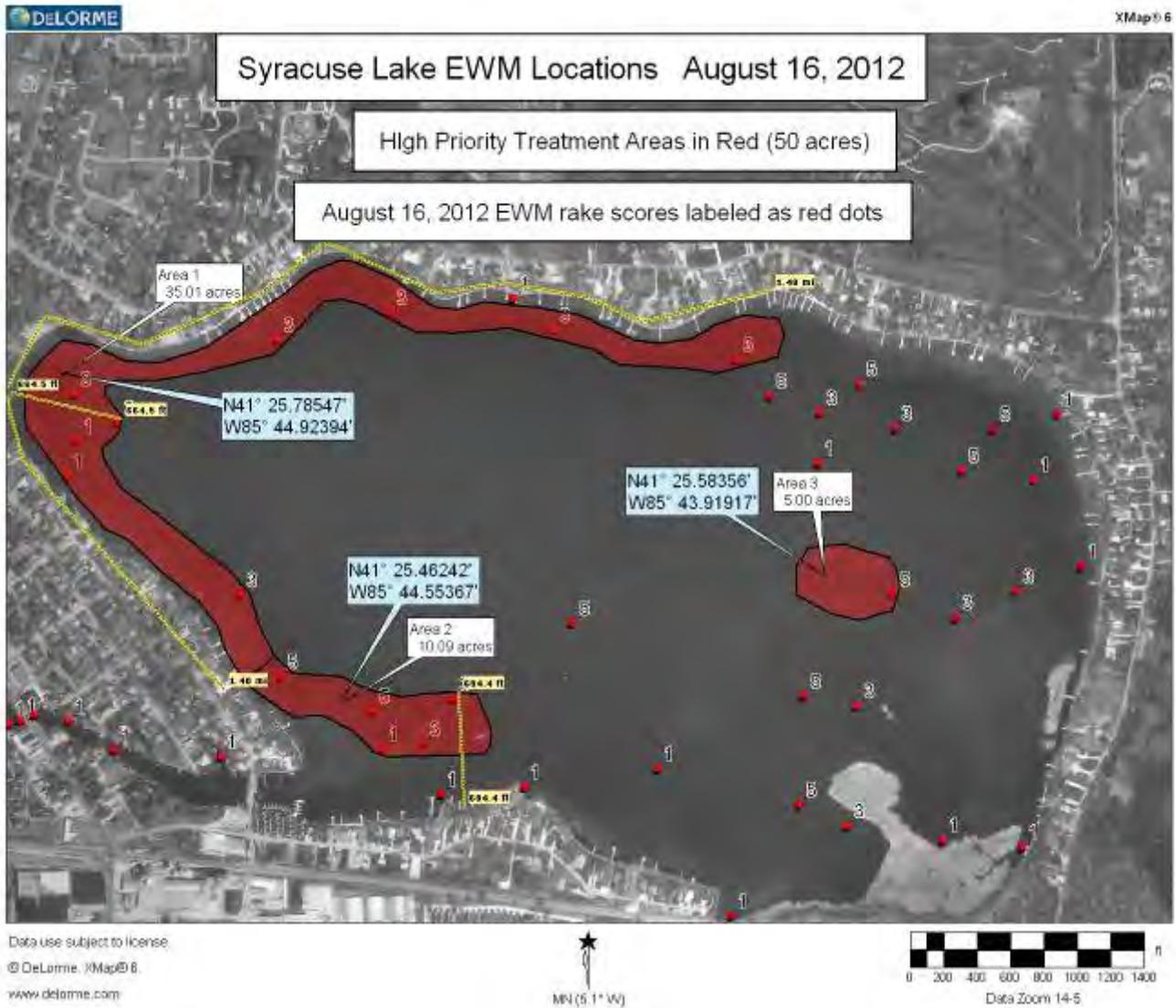
Plant survey method: Rake Visual Other (specify)

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian Milfoil	x	50
Curley Leaf		20
Sago		10
Coontail		20

Treatment Area	3	LAT/LONG or UTM's N41 25.583 W85 43.919			
Total acres to be controlled	5	Proposed shoreline treatment length (ft)	offshore	Perpendicular distance from shoreline (ft)	NA
Maximum Depth of Treatment	12	Expected date(s) of treatment (Mid June)			
Treatment method: <input checked="" type="checkbox"/> Chemical <input type="checkbox"/> Physical <input type="checkbox"/> Biological Control <input type="checkbox"/> Mechanical					
Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control: 2, 4-D (DMA-4 or Navigate)					

Plant survey method: Rake Visual Other (specify)

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian Milfoil	x	50
Curley Leaf		20
Sago		10
Coontail		20



*****Starry Stonewort treatments have not needed a vegetation control permit in the past since they have been funded and controlled by the IDNR. It is likely that they will not need a permit in 2013.