INTRODUCTION

The Little Saint Germain Lake Protection and Rehabilitation District (LSGLPRD) successfully applied for a Wisconsin Department of Natural Resources (WDNR) Aquatic Invasive Species (AIS) Control Grant in 2009 to continue herbicide treatments and monitoring of both Eurasian water milfoil (EWM) and curly-leaf pondweed (CLP). This report discusses the second year of EWM and CLP treatment under this grant-funded project. Additional information regarding treatments completed prior to 2011 can be found in their respective reports.

Following the summer 2010 EWM peak-biomass survey, a conditional treatment permit map was created proposing 40.1 acres of treatment (Map 1). On May 19, 2011, Onterra staff visited Little Saint Germain Lake to survey the proposed EWM treatment areas and refine their boundaries as appropriate. As a result of the spring pretreatment survey, the treatment sites were slightly refined to 29.3 acres (Map 1, Table 1). During this survey, temperature and dissolved oxygen profiles were taken in West Bay, East Bay, and No Fish Bay (Figure 1). In West Bay, surface water temperature was around 54°F and approximately 50°F at seven feet, the maximum depth of the 2011 treatment areas. Surface temperatures in East and No Fish Bays were slightly higher at 57°F and 58°F respectively.

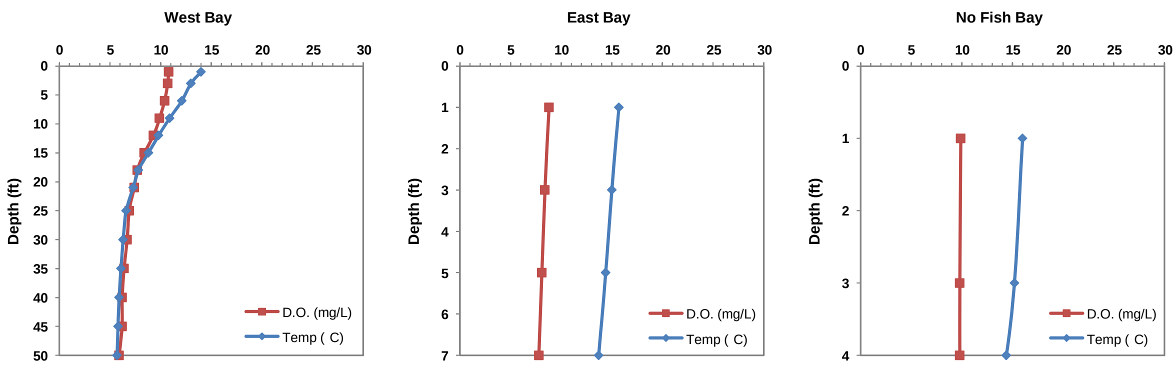


Figure 1. Temperature and dissolved oxygen profile for West, East, and No Fish Bays on Little Saint Germain Lake. May 19, 2011.

In 2010, due to financial strains and reservations as to whether the proposed 2010 treatment strategy would be effective, the LSGLPRD decided to only treat EWM in West Bay within areas of higher boat traffic and forego treating the remaining proposed 16 acres. The 2010 treatment within these areas was very effective, yet a significant amount of EWM remained in Little Saint Germain Lake within the areas that were left untreated.

In 2010, the WDNR and US Army Corps of Engineers (USACE) conducted numerous studies on 2,4-D applications in Wisconsin Lakes, including Little Saint Germain Lake. In regards to EWM management on Little Saint Germain Lake, one of the most pertinent points learned was that the desired 2,4-D concentration using Navigate could not be achieved within treatment sites with depths greater than six or seven feet, even at the product's maximum label rate of 200 pounder per acre. With this in mind, a more aggressive treatment strategy was developed for 2011 where treatments sites would be treated with a newer herbicide on the market called Sculpin G. Like Navigate, this is also a granular 2,4-D product, but it differs in that it has an EPA-approved product label that configures the range of acceptable application rates volumetrically (up to 4.0 ppm a.e.). It was recommended that the 2011 treatment sites be treated at a rate to achieve a 2,4-D concentration of approximately 2.25 ppm a.e for sites greater than one acre and 2.50 ppm a.e. for sites less than one acre. This resulted in application rates ranging from 160 to 260 pounds per acre.

On Little Saint Germain Lake, CLP pretreatment surveys have typically taken place in late-April or early May, and are conducted almost exclusively with underwater video technology because of the early growth stage of the plants. It was proposed in 2010 that the survey aimed at refining CLP colonies be conducted later in the growing season to more effectively determine the extent of the remaining CLP population in the lake. The 2010 final CLP treatment areas were used as conditional treatment acres for 2011, and were refined in the spring of 2011 to 35 acres (Map 3, Table 2). The 2011 CLP treatment areas were treated with liquid endothall (Aquathol K) at rates to achieve a concentration of 1.5 ppm a.i.

On May 26, 2011, the final treatment areas were treated by Bonestroo (now Stantec and previously Northern Environmental). They reported air temperatures of 60-65°F and 10-15 mph winds out of the northeast.

2011 TREATMENT MONITORING

The goal of herbicide treatments is to maximize target species (EWM) mortality while minimizing impacts to valuable native aquatic plant species. Monitoring herbicide treatments and defining their success incorporates both quantitative and qualitative methods. As the name suggests, quantitative monitoring involves comparing number data (or quantities) such as plant frequency of occurrence before and after the control strategy is implemented. Qualitative monitoring is completed by comparing visual data such as EWM or CLP colony density ratings before and after the treatments.

EWM treatment quantitative evaluation methodologies follow WDNR protocols in which point-intercept data are collected within treatment areas both the summer before and the summer immediately following the treatments take place. On Little Saint Germain Lake, quantitative evaluation was made through the collection of data at 44 point-intercept sub-sample locations all located within the areas where herbicide was directly applied. At these locations, EWM and native aquatic plant species presence and rake-fullness were documented along with water depth and substrate type. Specifically, these surveys aim to determine if significant differences in frequencies of occurrence of EWM and native species occur following the herbicide application.

Evaluation of treatment-wide effectiveness follows the same criteria based upon pooled sub-sample data from all of the treatment sites. Further, a noticeable decrease in rake-fullness ratings within the fullness categories of 2 and 3 should be observed and preferably, there would be no rake tows exhibiting a fullness of 2 or 3 during the post treatment surveys.

Spatial data reflecting EWM locations were collected using a sub-meter Global Positioning System (GPS) during the late summers of 2010 and 2011, when this plant is assumed to be at its peak biomass or growth stage. Comparisons of these surveys are used to qualitatively evaluate the 2011 herbicide treatment on Little Saint Germain Lake. Qualitatively, a successful treatment on a particular site would include a reduction of EWM density as demonstrated by a decrease in density rating (e.g. highly dominant to dominant). In terms of a treatment as a whole (lake-wide), at least 75% of the acreage treated that year would decrease by one level of density as described above for an individual site.

The monitoring of CLP treatments differs slightly, as quantitative sampling would be conducted in the spring pervious to the treatment (pretreatment) and the spring following the treatment (post treatment). Because of CLP's life cycle, a post treatment survey a few weeks following the treatment would not differentiate if a reduction in CLP occurrence could be attributed to the herbicide application or its natural die-off at that time of year. For this reason, the 2011 CLP treatment will not be discussed in terms of treatment effectiveness, as the post treatment data will not be collected until the spring of 2012. However, a pretreatment survey did occur in the spring of 2010, and a post treatment survey occurred in the spring of 2011, allowing for an analysis of the 2010 CLP herbicide treatment to be included within this report. Frequency of occurrence of CLP at point-intercept locations within 2010 application areas is analyzed in the next section.

Although it is never the intent of the treatments to impact native species, it is important to remember that in spot treatment scenarios, these non-target impacts can only be considered in the context of the areas treated and not on a lake-wide basis. In other words, the impact of the treatments on a non-target species in the treatment areas cannot be extrapolated to the entire population of that plant within the lake, unless the plant species is only found in locations where the herbicide applications took place. While 2,4-D is thought to be selective towards broad-leaf (dicot) species at the concentration and exposure times observed during the 2011 treatment on Long Lake, emerging data from the WDNR and US Army Corps of Engineers (USACE) suggests that some narrow-leaf (monocot) species may also be impacted by this herbicide. Data concerning natives is not collected within CLP treatment areas as they are not actively growing in the early spring when the data are collected.

2011 TREATMENT RESULTS

Eurasian Water Milfoil Results

EWM post treatment surveys were completed by Onterra on September 14, 2011. Map 2 shows that results of the mid-September EWM peak-biomass survey. One hundred percent of the 2011 treatment acreage was reduced by at least one density rating, exceeding the qualitative success criterion (75% of treatment acreage). In fact, only 0.2 acres of colonial EWM (polygons) were able to be mapped in 2011, the rest consisted of single plants, clumps, or small plant colonies. Figure 2 shows the acreage of mapped EWM colonies from 2008 to 2011. Following the 2011 treatment, a 99% reduction in EWM acreage was observed.

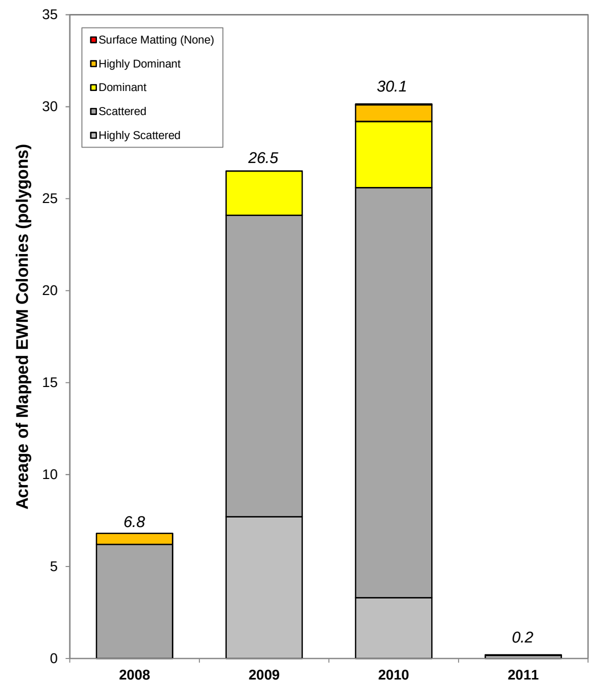


Figure 2. Acreage of mapped EWM colonies on Little Saint Germain Lake.

During the summer of 2010, 11.4% of the 44 point-intercept sampling locations contained EWM compared to 0% following the 2011 treatment, demonstrating a statistically valid 100% reduction in EWM occurrence within the 2011 treatment areas and exceeding the treatment-wide quantitative success criteria (50% reduction in occurrence) (Table 3). A rake-fullness rating of 1-3 was used to determine the abundance of EWM at each point-intercept location. Figure 3 displays the occurrence and densities of EWM as determined from the 2010 and 2011 point-intercept surveys.

Data concerning native aquatic plant species were also collected at the same 44 point-intercept locations within 2011 EWM treatment areas in the summers of 2010 and 2011. Table 3 shows that three native species, northern water milfoil, common waterweed, and white-stem pondweed saw statistically valid reductions following the 2011 treatment. Like EWM, northern water milfoil is a dicot and particularly sensitive to herbicide applications. Common waterweed and white-stem pondweed are non-dicots, and are not thought to be particularly sensitive to dicot-selective herbicides. However, recent data gathered on Little Saint Germain Lake and other lakes in the northern region in 2010 and 2011 suggests that some of these plants may be prone to decline following treatment.

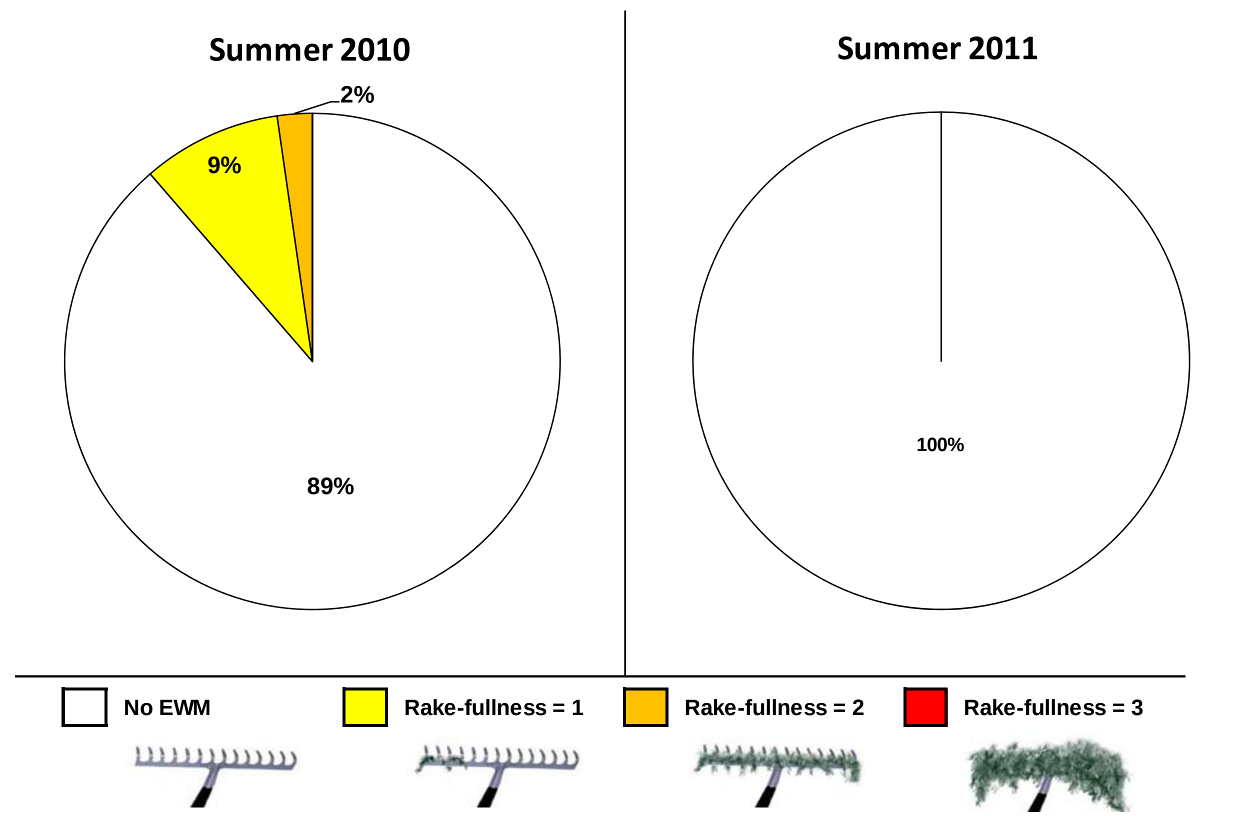


Figure 3. Lake-wide proportions of EWM rake-fullness ratings from 44 point-intercept sampling locations. Created using data from 2010 pre-treatment survey and 2011 post treatment survey.

Table 3. Statistical comparison of aquatic plant frequency data within 2011 EWM treatment areas from 2010 pre- and 2011 post treatment surveys. Only species with frequency of occurrence greater than 5.0% in at least one of the two surveys are applicable for analysis.

	Scientific Name	Common Name	2010 FOO	2011 FOO	% Change	Direction	Chi-square Analysis	
							Statistically Valid	p-value
Dicots	*Myriophyllum spicatum*	Eurasian water milfoil	11.4	0.0	-100.0	▼	Yes	0.021
	Myriophyllum sibiricum	Northern water milfoil	43.2	15.9	-63.2	▼	Yes	0.005
	Ceratophyllum demersum	Coontail	63.6	63.6	0.0	-	No	1.000
Non-dicots	*Elodea canadensis*	Common waterweed	70.5	38.6	-45.2	▼	Yes	0.003
	Potamogeton praelongus	White-stem pondweed	40.9	11.4	-72.2	▼	Yes	0.002
	Najas spp. (N. flexilis & guadalupensis)	Naiad spp.	31.8	61.4	92.9	▲	Yes	0.005
	Potamogeton robbinsii	Fern pondweed	2.3	27.3	1100.0	▲	Yes	0.001
	Potamogeton richardsonii	Clasping-leaf pondweed	36.4	36.4	0.0	-	No	1.000
	Potamogeton zosteriformis	Flat-stem pondweed	29.5	38.6	30.8	▲	No	0.368
	Potamogeton hybrid	Pondweed Hybrid	22.7	36.4	60.0	▲	No	0.161
	Vallisneria americana	Wild celery	20.5	13.6	-33.3	▼	No	0.395
	Nitella spp.	Stoneworts	15.9	13.6	-14.3	▼	No	0.764
	Potamogeton gramineus	Variable pondweed	13.6	6.8	-50.0	▼	No	0.291
	Potamogeton amplifolius	Large-leaf pondweed	9.1	15.9	75.0	▲	No	0.334
	Potamogeton pusillus	Small pondweed	9.1	4.5	-50.0	▼	No	0.398
	Chara spp.	Muskgrasses	4.5	11.4	150.0	▲	No	0.237

2010 & 2011 N = 44
FOO = Frequency of Occurrence
▲ or ▼ = Change Not Statistically Valid (Chi-square; α = 0.05)
▲ or ▼ = Change Not Statistically Valid (Chi-square; α = 0.05)

Fern pondweed, a native species, displayed a large statistically valid increase in occurrence in 2011 (Table 3). Of particular interest is the increase in naiad species from 2010 to 2011. During the 2011 survey, two species of naiad, slender naiad (*Najas flexilis*) and southern naiad (*Najas guadalupensis*) were located. Southern naiad was encountered at approximately 57% of the point-intercept locations in 2011, while it had not been documented in any previous survey on Little Saint Germain Lake. It is believed that this species was not recently introduced, but rather it was misidentified and grouped with slender naiad in the past as these two species are morphologically similar. For the 2011 survey, both the occurrences of slender naiad and southern naiad were grouped together to make it comparable to the 2010 survey. Increases in occurrence of southern naiad were observed on a number of lakes in 2011, and conditions may have been favorable for this species. Also, emerging research is indicating that hybrids between southern naiad subspecies exist and are often observed acting aggressively and growing to nuisance levels (Les et al. 2010).

Curly-leaf Pondweed Results

As discussed previously, the post treatment survey for the 2010 CLP treatment on Little Saint Germain Lake was conducted by Onterra on May 19, 2011. The data collected at 121 point-intercept locations within 2010 CLP treatment areas show that CLP occurrence increased from 2.5% in 2010 to 8.3% in 2011. The increase in CLP occurrence within these areas may be in part due to the survey taking place at a later date in 2011. When CLP is young, its small, limp leaves tend to slip off the rake easier and likely have a lower probability of being encountered than when it is larger later in the spring.

It is also important to note that as an annual plant, the observed CLP frequency of occurrence is a direct function of the number of turions sprouting each year and only indirectly measures CLP mortality. The length of time that a turion remains viable in the sediment is unknown, but it is thought to between 3-5 years, perhaps longer if anoxic (void of oxygen) conditions exist. The observed increase of CLP in 2011 may also be a result of more favorable conditions for the sprouting of previously dormant turions.

2011 RESIDUAL MONITORING

Little Saint Germain Lake was again selected to participate in a residual herbicide monitoring research project being conducted by the WDNR and USACE. Water samples were collected by the USACE and by Little Saint Germain Lake volunteers from sites located both within and outside of EWM and CLP herbicide application areas. The water samples were properly fixed and sent to the USACE laboratory for analysis. The preliminary data show that at two of the three sites collected within EWM treatment site N-11, herbicide concentrations were slightly higher near the bottom than at the surface through four hours following the treatment. All residual samples within this EWM treatment area were well below the target concentration throughout monitoring demonstrating rapid dilution of the herbicide. The residual 2,4-D concentrations were below the irrigation restriction limit by six hours after treatment.

Endothall concentrations monitored within three 2011 CLP treatment areas B-11, C-11, and E-11, dissipated by four hours after treatment and were below the detection limit by 18, 14, and 120 hours after treatment, respectively. Treatment sites B-11 and C-11 were smaller, and the herbicide dissipated more rapidly in these areas. No herbicide was detected at the sampling locations outside of the treatment areas demonstrating that while the herbicide was rapidly diluting from the treatment sites, the levels outside the treatment sites were not sufficient to cause significant impacts. Appendix A contains the USACE draft report with more detail regarding the residual sampling study on Little Saint Germain Lake.

During 2011, the WDNR also monitored herbicide concentrations within the lake's sediments before, during, and after the treatments. These results are currently being evaluated at will be made available at a later date.

NATIVE PLANT COMMUNITY

There have been concerns and reliable anecdotal reports that the native aquatic plant communities within No Fish Bay, East Bay, and Lower East Bay have been declining during the past two decades. These statements are also supported by the lack of mechanical harvesting activities being warranted during this time period. Many stakeholders believe that the reduced native plant populations are directly connected with the initiation of the CLP control program in these areas. Certain native aquatic plant species have been shown to respond negatively to early-season endothall treatments, while others have demonstrated positive or no responses. Tables 1-3 display the littoral frequency of occurrences of aquatic plant species within No Fish, East, and Lower East Bays from whole-lake point-intercept surveys conducted by Onterra in 2004 and 2008. While the point-intercept spacing resolution was different between these years yielding more sampling locations in 2008, the data are still comparable.

Table 1. Statistical comparison of aquatic plant frequency data within No Fish Bay from 2004 and 2008 whole-lake point-intercept surveys.

	Scientific Name	Common Name	2004 LFOO	2008 LFOO	Percent Change	Direction	Chi-square Analysis: Statistically Valid	Chi-square Analysis: p-value
D	*Ceratophyllum demersum*	Coontail	90.9	75.5	-16.9	▼	No	0.263
	Nymphaea odorata	White water lily	9.1	4.1	-55.1	▼	No	0.491
Non-dicots	*Potamogeton robbinsii*	Fern pondweed	36.4	0.0	-100.0	▼	Yes	0.000
	Elodea canadensis	Common waterweed	81.8	63.3	-22.7	▼	No	0.238
	Najas flexilis	Slender naiad	36.4	38.8	6.6	▲	No	0.882
	Lemna turionifera	Turion duckweed	9.1	2.0	-77.6	▼	No	0.239
	Potamogeton praelongus	White-stem pondweed	9.1	12.2	34.7	▲	No	0.768
	Vallisneria americana	Wild celery	9.1	10.2	12.2	▲	No	0.911
	Nitella sp.	Stoneworts	0.0	4.1	100.0	▲	No	0.496
	Eleocharis acicularis	Needle spikerush	0.0	2.0	100.0	▲	No	0.633
	Heteranthera dubia	Water stargrass	0.0	22.4	100.0	▲	No	0.082
	Lemna trisulca	Forked duckweed	0.0	10.2	100.0	▲	No	0.268
	Potamogeton pusillus	Small pondweed	0.0	6.1	100.0	▲	No	0.400
	Potamogeton richardsonii	Clasping-leaf pondweed	0.0	10.2	100.0	▲	No	0.268
	Potamogeton strictifolius	Stiff pondweed	0.0	2.0	100.0	▲	No	0.633
	Potamogeton vaseyi	Vasey's pondweed	0.0	2.0	100.0	▲	No	0.633
	Potamogeton zosteriformis	Flat-stem pondweed	0.0	2.0	100.0	▲	No	0.633
	Sagitaria sp. (rosette)	Arrowhead rosette	0.0	2.0	100.0	▲	No	0.633
	Spirodela polyrhiza	Greater duckweed	0.0	2.0	100.0	▲	No	0.633

2004 N = 11, 2008 N = 49
D = Dicots; LFOO = Littoral Frequency of Occurrence
▲ or ▼ = Change Statistically Valid (Chi-square; α = 0.05)
▲ or ▼ = Change Not Statistically Valid (Chi-square; α = 0.05)

From 2004 to 2008, fern pondweed was the only native aquatic plant species to display a statistically valid reduction within No Fish Bay (Table 1). Fern pondweed has been shown to be sensitive to early-season endothall treatments (Skogerboe and Getsinger 2002). No other species displayed statistically valid reductions or increases in occurrence within this area. In East Bay, no native aquatic plants exhibited a statistically valid reduction, and one species, water stargrass, exhibited a statistically valid increase in occurrence in 2008 (Table 2). Like common waterweed, this species has been known to respond positively to early-season endothall treatments (Skogerboe and Getsinger 2002). None of the aquatic plants in Lower East Bay displayed statistically valid reductions or increases in occurrence from 2004 to 2008 (Table 6).

Table 2. Statistical comparison of aquatic plant frequency data within East Bay from 2004 and 2008 whole-lake point-intercept surveys.

	Scientific Name	Common Name	2004 LFOO	2008 LFOO	Percent Change	Direction	Chi-square Analysis	
							Statistically Valid	p-value
Dicots	*Ceratophyllum demersum*	Coontail	30.4	30.7	0.8	▲	No	0.975
	Nuphar variegata	Spatterdock	2.2	3.1	41.1	▲	No	0.749
	Nymphaea odorata	White w ater lily	2.2	2.5	12.9	▲	No	0.913
Non-dicots	*Heteranthera dubia*	Water stargrass	0.0	8.0	100.0	▲	Yes	0.048
	Elodea canadensis	Common w aterw eed	34.8	28.8	-17.1	▼	No	0.438
	Najas flexilis	Slender naiad	15.2	12.3	-19.4	▼	No	0.599
	Nitella sp.	Stonew orts	8.7	14.7	69.3	▲	No	0.289
	Vallisneria americana	Wild celery	6.5	1.8	-71.8	▼	No	0.093
	Lemna trisulca	Forked duckw eed	2.2	0.0	-100.0	▼	No	0.059
	Potamogeton crispus	Curly-leaf pondw eed	0.0	1.2	100.0	▲	No	0.450
	Eleocharis palustris	Creeping spikerush	0.0	0.6	100.0	▲	No	0.594
	Lemna turionifera	Turion duckw eed	0.0	0.6	100.0	▲	No	0.594
	Potamogeton pusillus	Small pondw eed	0.0	0.6	100.0	▲	No	0.594
	Potamogeton richardsonii	Clasping-leaf pondw eed	0.0	1.8	100.0	▲	No	0.354
	Schoenoplectus acutus	Hardstem bulrush	0.0	1.2	100.0	▲	No	0.450

2004 N = 46, 2008 N = 163
LFOO = Littoral Frequency of Occurrence
▲ or ▼ = Change Statistically Valid (Chi-square; α = 0.05)
▲ or ▼ = Change Not Statistically Valid (Chi-square; α = 0.05)

Table 3. Statistical comparison of aquatic plant frequency data within Lower East Bay from 2004 and 2008 whole-lake point-intercept surveys.

	Scientific Name	Common Name	2004 LFOO	2008 LFOO	Percent Change	Direction	Chi-square Analysis	
							Statistically Valid	p-value
Dicots	*Myriophyllum spicatum*	Eurasian w ater milfoil	0.0	1.4	100.0	▲	No	0.630
	Ceratophyllum demersum	Coontail	35.3	48.6	37.8	▲	No	0.319
	Nymphaea odorata	White w ater lily	11.8	12.2	3.4	▲	No	0.964
	Nuphar variegata	Spatterdock	0.0	2.7	100.0	▲	No	0.493
	Utricularia vulgaris	Common bladderw ort	0.0	2.7	100.0	▲	No	0.493
	Elodea canadensis	Common w aterw eed	23.5	27.0	14.9	▲	No	0.768
	Najas flexilis	Slender naiad	23.5	12.2	-48.3	▼	No	0.227
	Spirodela polyrhiza	Greater duckw eed	11.8	5.4	-54.1	▼	No	0.341
	Lemna turionifera	Turion duckw eed	11.8	5.4	-54.1	▼	No	0.341
	Nitella sp.	Stonew orts	5.9	23.0	290.5	▲	No	0.111
	Heteranthera dubia	Water stargrass	0.0	1.4	100.0	▲	No	0.630
	Potamogeton foliosus	Leafy pondw eed	0.0	2.7	100.0	▲	No	0.493
	Potamogeton crispus	Curly-leaf pondw eed	0.0	1.4	100.0	▲	No	0.630
	Eleocharis palustris	Creeping spikerush	0.0	2.7	100.0	▲	No	0.493
	Lemna trisulca	Forked duckw eed	0.0	1.4	100.0	▲	No	0.630
	Potamogeton epihydrus	Ribbon-leaf pondw eed	0.0	1.4	100.0	▲	No	0.630
	Potamogeton strictifolius	Stiff pondw eed	0.0	1.4	100.0	▲	No	0.630
	Schoenoplectus acutus	Hardstem bulrush	0.0	1.4	100.0	▲	No	0.630
	Sparganium emersum	Short-stemmed bur-reed	0.0	1.4	100.0	▲	No	0.630
	Vallisneria americana	Wild celery	0.0	8.1	100.0	▲	No	0.224

2004 N = 17, 2008 N = 74
LFOO = Littoral Frequency of Occurrence
▲ or ▼ = Change Statistically Valid (Chi-square; α = 0.05)
▲ or ▼ = Change Not Statistically Valid (Chi-square; α = 0.05)

While these surveys do not measure biomass, it shows that the occurrences of the majority of native aquatic plant species within these areas have not displayed statistically valid changes from 2004 to 2008. Another whole-lake point-intercept survey will be conducted in either the summer of 2012 or 2013 to continue to monitor the valuable native aquatic plant community.

2012 TREATMENT STRATEGY

Herbicides that target submersed plant species are directly applied to the water, either as a liquid or an encapsulated granular formulation. Factors such as water depth, water flow, treatment area size, and plant density work to dilute herbicide concentration within aquatic systems. Understanding concentration-exposure times are important considerations for aquatic herbicides. Successful control of the target plant is achieved when it is exposed to a lethal concentration of the herbicide for a specific duration of time. Much information has been gathered in recent years, largely as a result of a joint research project between the WDNR and the USACE. Based on their preliminary findings, lake managers have adopted two main treatment strategies; 1) whole-lake treatments, and 2). spot treatments.

Whole-lake treatments are those where the herbicide is applied to specific sites, but when the herbicide reaches equilibrium within the entire volume of water (of the lake, lake basin, or within the epilimnion of the lake or lake basin); it is at a concentration that is sufficient to cause mortality to the target plant within that entire lake or basin. The application rate of whole-lake treatments is dictated by the volume of water which the herbicide will reach equilibrium within.

Spot treatments are a type of treatment strategy where the herbicide is applied to a specific area (treatment site) such that when it dilutes from that area, its concentrations are insufficient to cause significant affects outside of that area. This is the strategy implemented historically on Little Saint Germain Lake. Spot treatments typically rely on a short exposure time (often hours) to cause mortality and therefore are applied at a much higher herbicide concentration than whole-lake treatments. For Eurasian water milfoil, 2,4-D is typically applied between 2.25 and 3.5 ppm acid equivalent (a.e.) in spot treatment scenarios. A newly adopted term, micro-treatments are small spot treatments (working definition is less than 5 acres) and because of their small size, are extremely difficult to predict if they will be effective because of the rapid dilution of the herbicide. Larger treatment areas tend to be able to hold effective concentrations for a longer time.

The 2011 EWM treatment on Little Saint Germain Lake was very successful, exceeding both the quantitative and qualitative success criteria. At the start of this control project, only EWM colonies that were dominant or greater were targeted for treatment. After numerous successful treatments, the threshold (trigger) for determining which areas warranted treatment was relaxed to include any colonized (polygon-based mapping techniques) area of EWM. The majority of the EWM that was observed in 2011 following the treatment was comprised of single plants and small clumps. Map 2 displays the proposed 9.8 acres of EWM treatment for 2012, almost entirely consisting of treatments targeting EWM mapped using point-based mapping techniques.

While the 2011 treatment utilizing granular 2,4-D at 2.25-2.50 ppm a.e. was very successful, a slightly modified strategy is proposed for 2012 due to the small size of the proposed treatment sites. The 2012 proposed treatment strategy for Little Saint Germain Lake includes an expanded buffer (40-foot) around the EWM occurences as well as a higher proposed application rate of herbicide (Map 2).

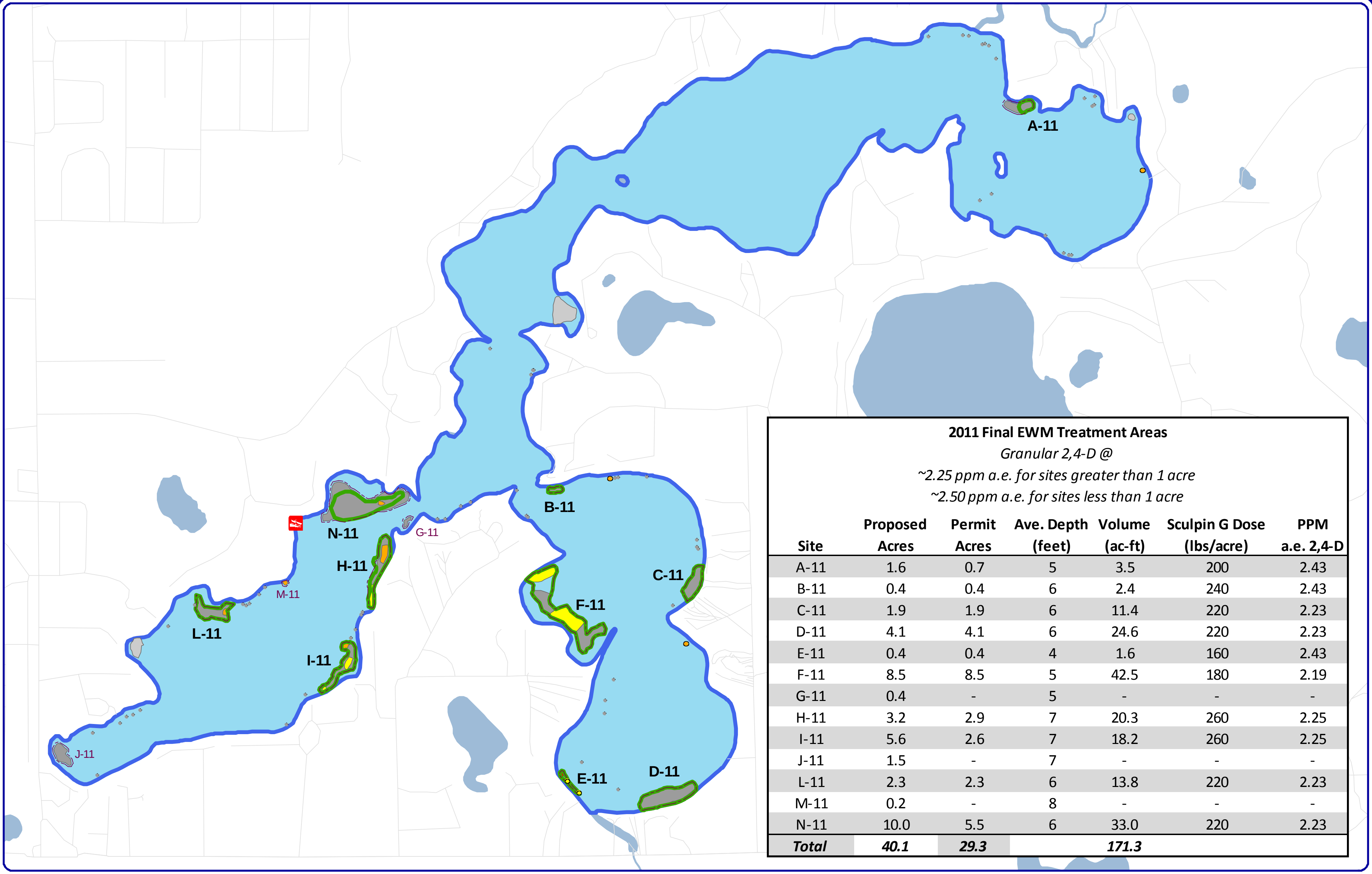
Since the start of LSGLPRD's CLP control program, CLP has not been allowed to grow to its full potential and be mapped when it is at its peak-biomass. For this reason, the LSGLPRD has traditionally submitted a conditional treatment permit using the previous year's treatment areas to serve as a proposed treatment strategy for the following year (Map 3). These areas would be refined during the pretreatment survey if applicable.

The absence of knowing what the CLP population of Little Saint Germain Lake is at its peak-biomass makes it difficult to understand the true effectiveness of the treatment program. However, the data that has been collected strongly indicate that incredible strides in CLP management have occurred. At some point in the management of any AIS, the population of the target species is reduced to a level that may not warrant further treatment. The population of CLP on Little Saint Germain Lake may currently be approaching or at this level. In order to fully understand this concept, the CLP in Little Saint Germain Lake needs to be mapped at its peak-biomass in the absence of a CLP treatment occurring during that year.

Next year (2012) is the last year covered by the grant for this project, and there are two proposed strategies for continued CLP management:

1. Treat the CLP in 2012 as planned, but likely at a higher herbicide dose in the smaller treatment sites where the USACE residual herbicide analysis found that the herbicide dissipates more rapidly. Then, CLP would not be treated in 2013 but would be allowed to grow to the surface so the population in its entirety could be mapped at its peak-biomass. It would also be suggested that the whole-lake point-intercept survey (and community mapping survey) be postponed until the summer of 2013 to coincide with a non-treatment of CLP. The LSGLPRD would need to pursue options with the WDNR of extending the timeframe of the project to accompany this change in project scope (which should not be an issue). The LSGLPRD may also want to discuss how extending the project would impact EWM management and its cost-coverage.

2. Although included within the current grant-funded project, do not treat CLP in 2012 and map it at its peak-biomass. The whole-lake point-intercept survey (and community mapping survey) would be conducted as planned during the summer of 2012. Due to the cost savings of not treating CLP in 2012, there would likely be some monies left in the grant that could be carried over to 2013 through extending the timeframe and scope of the project. This extended project would include at least partial cost-coverage for the 2013 EWM and CLP treatments and associated monitoring costs. If the LSGLPRD feels this approach is warranted, they may also want to discuss applying for an additional AIS EPC grant during the subsequent funding cycle (August 1, 2012 or February 1, 2013) to dovetail the current project and continue the control project past 2013.



2011 Final EWM Treatment Areas

Granular 2,4-D @

~2.25 ppm a.e. for sites greater than 1 acre

~2.50 ppm a.e. for sites less than 1 acre

Site	Proposed Acres	Permit Acres	Ave. Depth (feet)	Volume (ac-ft)	Sculpin G Dose (lbs/acre)	PPM a.e. 2,4-D
A-11	1.6	0.7	5	3.5	200	2.43
B-11	0.4	0.4	6	2.4	240	2.43
C-11	1.9	1.9	6	11.4	220	2.23
D-11	4.1	4.1	6	24.6	220	2.23
E-11	0.4	0.4	4	1.6	160	2.43
F-11	8.5	8.5	5	42.5	180	2.19
G-11	0.4	-	5	-	-	-
H-11	3.2	2.9	7	20.3	260	2.25
I-11	5.6	2.6	7	18.2	260	2.25
J-11	1.5	-	7	-	-	-
L-11	2.3	2.3	6	13.8	220	2.23
M-11	0.2	-	8	-	-	-
N-11	10.0	5.5	6	33.0	220	2.23
Total	***40.1***	***29.3***		***171.3***		

1,900

Feet

Onterra LLC
Lake Management Planning
135 South Broadway Suite C
De Pere, WI 54115
920.338.8860
www.onterra-eco.com

Sources:
Roads and Hydro: WDNR
Aquatic Plant Survey: Onterra, 2010
Map Date: December 1, 2011
Filename: Map1_LSG_EWM_2010PB_T2011.mxd

Project Location in Wisconsin

Summer 2010 EWM Survey ***(September 2010)***

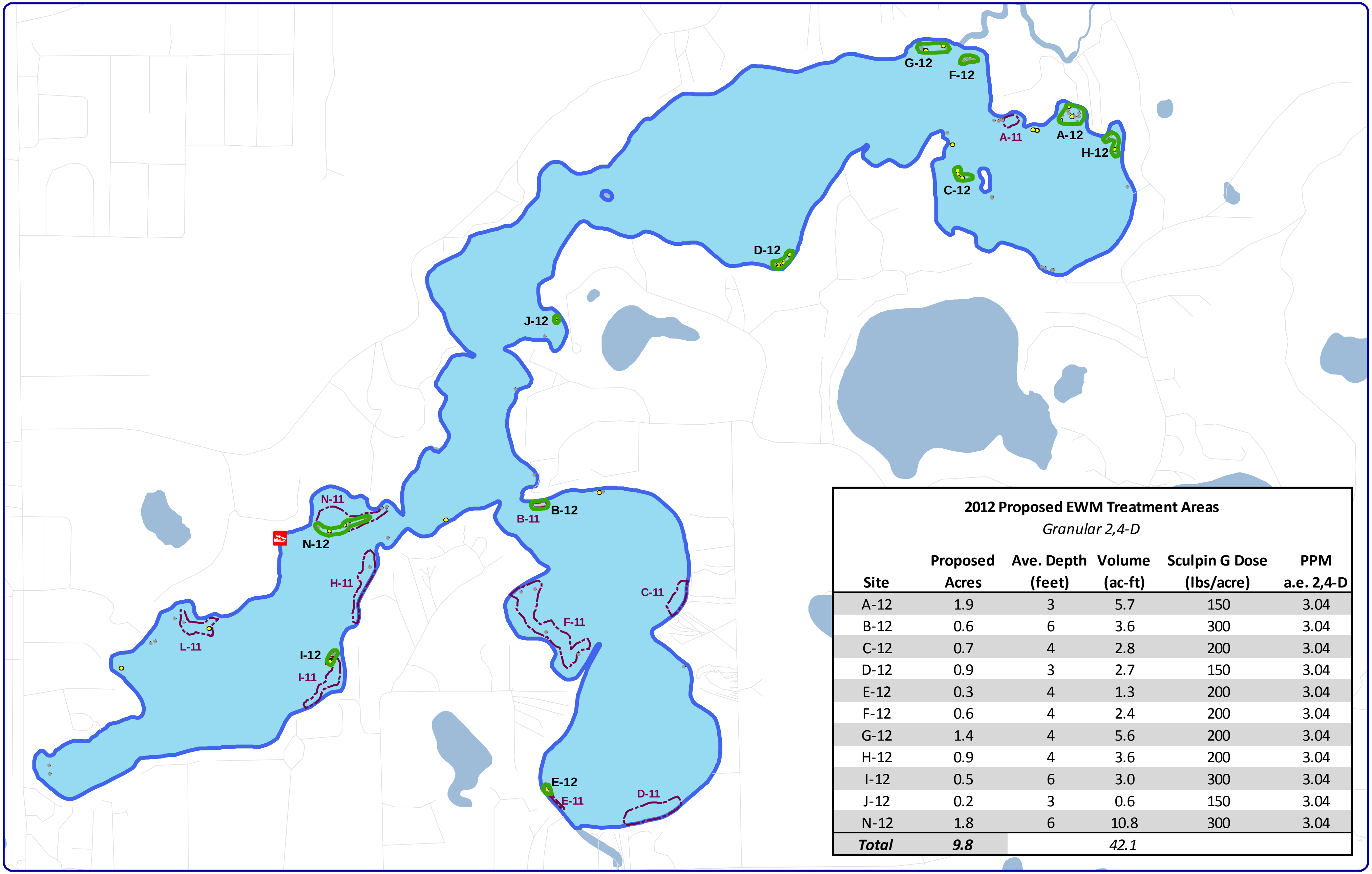
- Highly Scattered
- Scattered
- Dominant
- Highly Dominant
- Surface Matting
- Single or Few Plants
- Clumps of Plants
- Small Plant Colony

2011 EWM Treatment Areas

- 2011 Conditional Treatment Area
- 2011 Final Treatment Area

Map 1
Little Saint Germain Lake
Vilas County, Wisconsin

2010 EWM Locations & 2011 Treatment Areas



2012 Proposed EWM Treatment Areas

Granular 2,4-D

Site	Proposed Acres	Ave. Depth (feet)	Volume (ac-ft)	Sculpin G Dose (lbs/acre)	PPM a.e. 2,4-D
A-12	1.9	3	5.7	150	3.04
B-12	0.6	6	3.6	300	3.04
C-12	0.7	4	2.8	200	3.04
D-12	0.9	3	2.7	150	3.04
E-12	0.3	4	1.3	200	3.04
F-12	0.6	4	2.4	200	3.04
G-12	1.4	4	5.6	200	3.04
H-12	0.9	4	3.6	200	3.04
I-12	0.5	6	3.0	300	3.04
J-12	0.2	3	0.6	150	3.04
N-12	1.8	6	10.8	300	3.04
Total	***9.8***		*42.1*		

N W E S

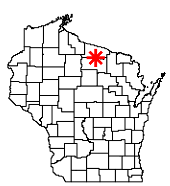
2,000

Feet

Onterra LLC
Lake Management Planning

135 South Broadway Suite C
De Pere, WI 54115
920.338.8860
www.onterra-eco.com

Sources:
Roads and Hydro: WDNR
Aquatic Plant Survey: Onterra, 2010
Map Date: December 1, 2011
Filename: Map2_LSG_EWM_T2012_Cond1



Project Location in Wisconsin

Summer 2011 EWM Survey ***(September 2011)***

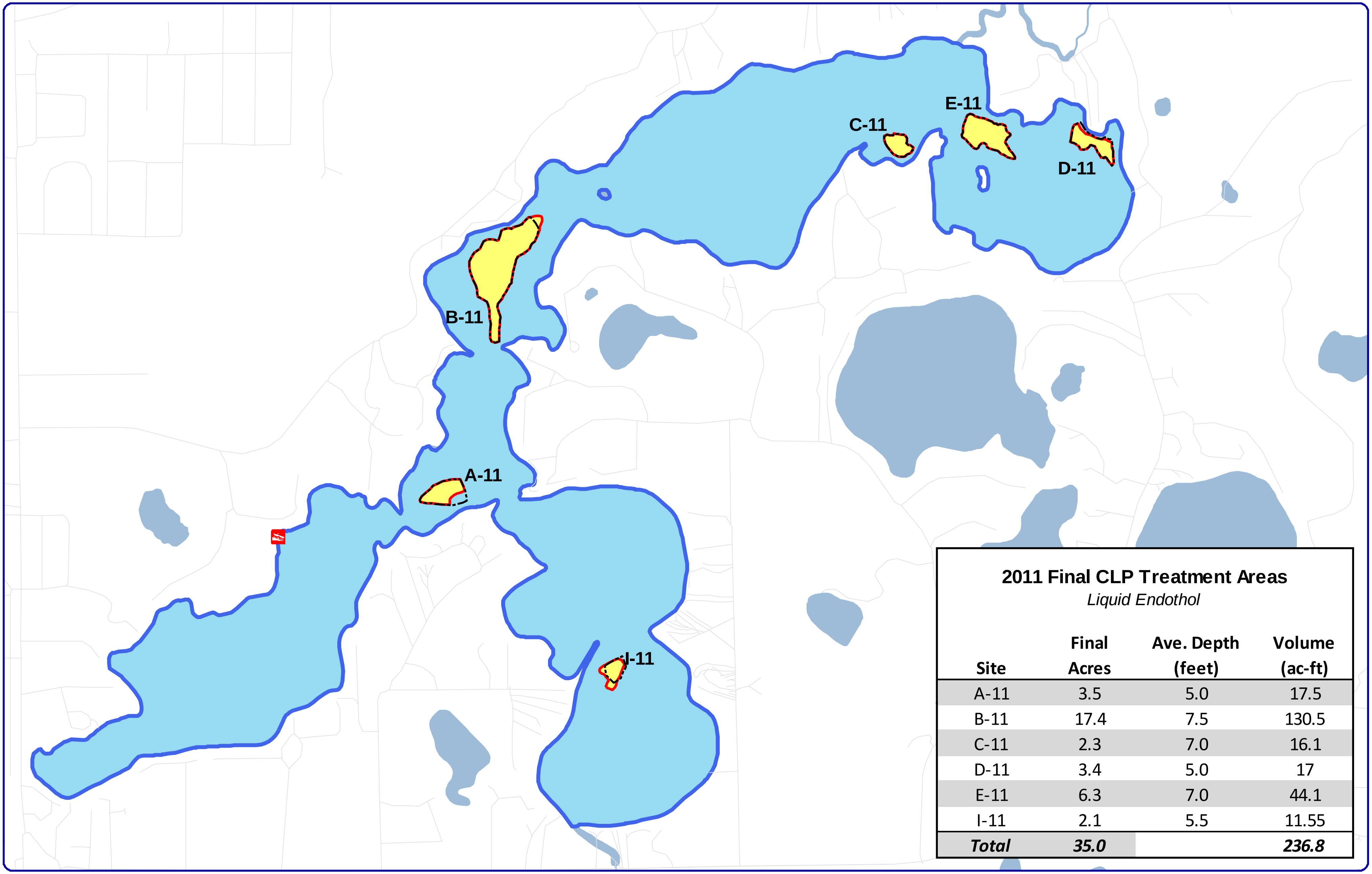
- Highly Scattered
- Scattered *(None)*
- Dominant
- Highly Dominant *(None)*
- Surface Matting *(None)*
- Single or Few Plants
- Clumps of Plants
- Small Plant Colony

EWM Treatment Areas

- 2011 Final Treatment Area
- 2012 Proposed Treatment Area

Map 2
Little Saint Germain Lake
Vilas County, Wisconsin

2011 EWM Locations & 2012 Proposed Treatment Areas v.1



2011 Final CLP Treatment Areas

Liquid Endothol

Site	Final Acres	Ave. Depth (feet)	Volume (ac-ft)
A-11	3.5	5.0	17.5
B-11	17.4	7.5	130.5
C-11	2.3	7.0	16.1
D-11	3.4	5.0	17
E-11	6.3	7.0	44.1
I-11	2.1	5.5	11.55
Total	***35.0***		***236.8***

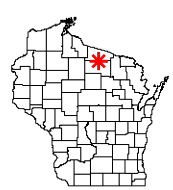
N W E S

2,000

Feet

Onterra LLC
Lake Management Planning
135 South Broadway Suite C
De Pere, WI 54115
920.338.8860
www.onterra-eco.com

Sources:
Roads and Hydro: WDNR
Aquatic Plant Survey: Onterra, 2011
Map Date: December 22, 2011
Filename: Map3_LSG_CLP_T2012_Cond1.mxd



Project Location in Wisconsin

Legend

2011 Conditional Treatment Areas
Also the 2010 Final Treatment Areas

2011 Final Treatment Areas
Also Serve as 2012 Proposed Treatment Areas

Map 3

Little Saint Germain Lake

Vilas County, Wisconsin

2011 Final & 2012 Proposed CLP Treatment Areas v.1