INTRODUCTION

Following the discovery of Eurasian water milfoil (EWM) within Bridge Lake and Lake Nokomis, Lincoln & Oneida Counties, in 2004, the Lake Nokomis Concerned Citizens, Inc. (LNCC) has successfully applied for several grants through the Wisconsin Department of Natural Resources (WDNR) to help fund a campaign to control this invasive plant. Along with reporting on the activities surrounding the 2010 herbicide treatment, this document will also serve as the final report for this most recent grant-funded time period. In February 2011, the LNCC applied for additional WDNR AIS grant funds to continue the project in 2011 and 2012.

EWM has been treated on this system for a number of years. Onterra was first contracted by the LNCC in 2006. That August, a survey was conducted on the lake to assess the density and the extent of EWM growth within the lake. An herbicide treatment followed in 2007, and subsequent treatments have occurred every spring since 2007 in an effort to control the aggressive plant. In 2007, 25.2 acres were treated within the system. Similar sized treatments occurred in 2008 and 2009 (28.1 and 25.4 acres, respectively).

A major challenge for EWM management on Bridge Lake has been the fluctuating water levels of this reservoir system. It is believed that significant control of EWM has not been achieved on this system due to the incredible water fluctuations the lake undergoes annually (Figure 1). Unintentionally, the summer surveys are conducted when the water is low, and in spring when the lake is treated, the water levels are higher diluting the concentration of the herbicide. It seems that the proposed treatment areas, which are created each year based upon the August EWM survey, do not accurately represent where the EWM exists during the May pretreatment survey. While some assumptions can be made, the area needing to be treated requires accurate refinement and verification each May. During this time period, the water is typically at its deepest and the plants are largely invisible from the surface, requiring the need for submersible cameras to view the plants. While refining the extents of a treatment area using a submersible camera is a commonly conducted practice, completely re-mapping an area using this methodology is almost impossible, highly impractical, and extremely time consuming.

It is also believed that these changing water levels are what gives EWM a competitive advantage over the other plants in Bridge Lake and sometimes allows the exotic plant to expand by tens of acres each year. Areas of the lake are constantly alternating between too shallow for plants to grow and too deep for plants to grow. These areas continually need to be recolonized as native (and non-native) plants die at the end of the growing season within this cyclic spectrum. EWM is certainly a very good at colonizing disturbed areas.

These issues were discussed with the WDNR over the winter in preparation for the 2010 treatment, and a plan was devised to complete the pre-treatment surveys a little later in the spring after peak flows resided. The herbicide application was proposed for early July when the water levels (and volumes) are typically lower.

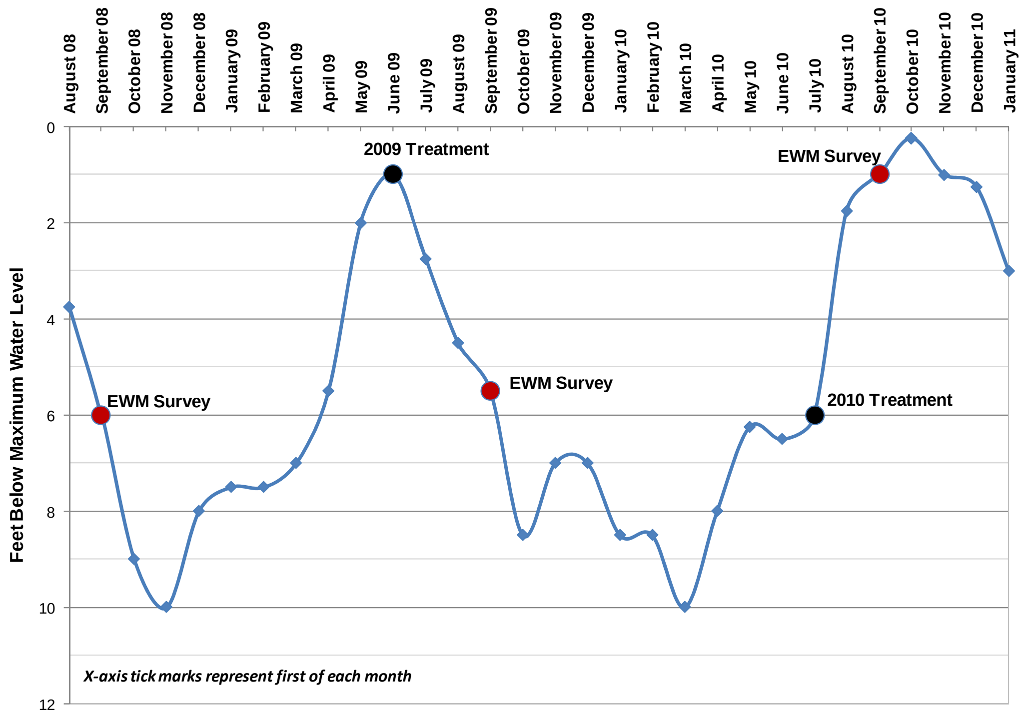


Figure 1. Water levels of Bridge Lake. This data is approximated from the WVIC website and displayed as feet below maximum water level (max level would be zero). Each data point is from the first of each month.

However, due to the lack of spring flows in 2010, Bridge Lake's water level remained lower than normal and the strategy was adjusted. The EWM in Bridge Lake was surveyed in early May of 2010 and treatment areas were refined to reflect the changes from the survey in August of 2009 (Map 1 and 2). As the maps indicate, the density of the EWM changed slightly from the summer 2009 to spring 2010 surveys. This is astounding as EWM growth at this time of year does not usually reach the densities observed during the May survey. Following this survey, a conditional treatment permit map was created proposing approximately 145 acres of treatment. Onterra proposed that these areas be treated using the lower-cost liquid formulation of 2,4-D due to the large scale of the proposed treatment. However, the large scale of the proposed treatment and because the treatment would occur later during the season, the WDNR requested that the treatment prioritize the densest areas in the western basin of the lake.

Concerns were also raised by the WDNR about the use of a liquid herbicide because it was thought that the flow of water through Bridge Lake would be too high which would cause the liquid herbicide to dissipate too rapidly, thus not exposing the EWM for a sufficient amount of time to cause mortality. The WDNR proposed that the granular formulation of 2,4-D should be used as an alternative. Map 2 displays the final 54.6 acres of EWM selected for treatment in 2010, all of which are located in the western basin.

Two areas were treated with granular 2,4-D at 150 lbs/acre and three were treated with granular 2,4-D at 100 lbs/acre depending on the average depth and location of the treatment area in respect to high areas of flow. These application rates correspond to an herbicide concentration of

1.17 to 1.75 ppm a.e. Though the areas displayed on Map 2 were directly applied with herbicide, it was the intent to have the herbicide disperse throughout the entire western basin with a calculated concentration of approximately 1.0 ppm to attain basin-wide EWM control. No EWM within the eastern basin was targeted for treatment in 2010, and it is believed that with the primary east-to-west flow of the system that no detectable amount of herbicide would enter the eastern basin.

2010 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 observational data such as EWM colony density ratings before and after the treatments.

Quantitative evaluation methodologies follow WDNR protocols in which point-intercept data is collected within treatment areas both the summer before and the summer immediately following the treatments take place. In total, 397 point-intercept sub-sample locations were sampled during the summer of 2009 and 2010, of which 157 of these were located within areas directly applied with herbicide in 2010. At all 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.

Quantitatively, a specific treatment site is deemed to be successful if the EWM frequency following the treatments is statistically reduced by at least 50%. 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 preferable, 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 2009 (Map 1) and 2010 (Map 3), when this plant is assumed to be at its peak biomass or growth stage. As indicated above, an EWM mapping survey was also conducted during May 2010 (Map 2). Comparisons of these surveys are used to qualitatively evaluate the 2010 herbicide treatment on Bridge 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, at least 75% of the acreage treated that year would decrease by one level of density as described above for an individual site.

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 necessarily 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 2010 treatment on Bridge Lake, emerging data from the WDNR and US Army Corps of Engineers suggests that some narrow-leaf (monocot) species may also be impacted by this herbicide.

2010 TREATMENT RESULTS

The post treatment survey was conducted in mid September of 2010, and the water levels on Bridge Lake were near their maximum level due to high rainfall during the summer (Figure 1). Of the areas that were directly applied with herbicide in 2010, 100% were reduced by at least one density rating, exceeding the qualitative success criteria (75% reduction) for the 2010 treatment. Sites A-10 and D-10, both of which prior to treatment had EWM classified as ‘highly dominant’ and/or ‘surface matting’, were reduced to single, small damaged ‘sprigs’ of EWM (Map 2 and 3). No EWM was located following the treatment within the other treatment sites (C-10, E-10, and F-10) which contained ‘dominant’ and ‘highly scattered’ EWM prior to treatment. All of the EWM that was located outside of the 2010 treatment areas but still within the western basin was also reduced in density following the 2010 treatment.

The quantitative point-intercept survey revealed that EWM within the 2010 herbicide application areas decreased from an occurrence of 44% to 8% following the treatment (Table 1, Figure 2); a statistically valid reduction of 81% which greatly exceeds the quantitative success criteria (50% reduction in occurrence). As discussed previously, during the post treatment survey the majority of the EWM that was observed was comprised of dead stems and small sprigs. It was only recorded during the point-intercept survey if at least one, fully-developed green leaf was observed. The data also show that EWM occurrence was also reduced outside of the application areas within the western basin (Table 1), indicating the herbicide as anticipated had dispersed throughout the entire basin.

Knowing that the water levels were incredibly high for that time of year, it was initially thought that perhaps the EWM mortality observed in the western basin was due to the deeper water in this heavily stained system. Much of the treatment areas were around 4.5 feet deep in June and by mid-September were around 10 feet deep. However, after continuing the post treatment survey into the untreated eastern basin, the EWM was clearly visible growing near the water’s surface and in good health, suggesting that the mortality observed within the western basin could not solely be attributed to the higher water levels. In fact, the EWM within the eastern basin appeared to have expanded into new areas and increased in density in others (Map 3), indicating that the large fluctuations in water levels may have given EWM a competitive advantage over native aquatic plant species. In contrast to the western basin, the point-intercept monitoring shows that EWM within the eastern basin did see a statistically valid increase in occurrence from approximately 10% in 2009 to 33% in 2010 (Table 1). The substantial reduction of EWM within the western basin was likely due to the combination of the scale of the treatment, the low water volumes at the time of herbicide application, and possibly additional stress placed on the plants from higher water levels later in the summer.

A rake-fullness rating of 1-3 was used to determine the abundance of EWM at each point-intercept location. Figure 3 displays the proportions of EWM rake-fullness ratings from the preand post treatment surveys within the western basin. The figure indicates that not only did the occurrence of EWM decrease but that the density (rake-fullness) decreased as well.

Table 1. EWM percent occurrence in point-intercept locations within treated and untreated areas of Bridge Lake from summer 2009 to summer 2010. Created using data from 2009 and 2010 surveys.

		Symbol (Map 1)	Sample Size (N)	2009 EWM FOO	2010 EWM FOO	% Change	Direction	Chi-square Analysis	
								Statistically Different	P-value
Western Basin (Treated)	Within 2010 Application Areas		157	43.9	8.3	-81.2	▼	Yes	0.000
	Area 1		56	30.4	1.8	-94.1	▼	Yes	0.000
	Area 2		22	18.2	13.6	-25.0	▼	No	0.680
	Eastern Basin (Untreated)		156	9.6	33.3	246.7	▲	Yes	0.000

FOO = Frequency of Occurrence
▲ or ▼ = Statistically Different (Chi-square; α = 0.05)
▲ or ▼ = Not Statistically Different (Chi-square; α = 0.05)

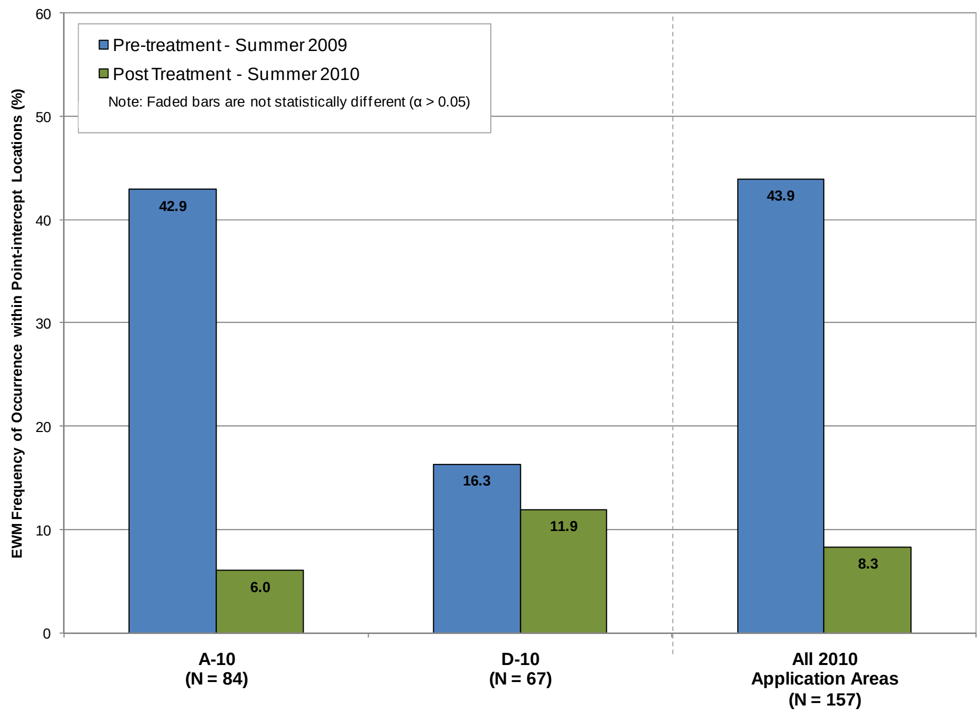


Figure 2. EWM percent occurrence in point-intercept locations displayed by treatment site comparing summer 2009 to summer 2010. Please note only those treatment sites with more than eight point-intercept locations are displayed on the graph. Three treatment sites have less than eight point-intercept locations, and therefore not graphed.

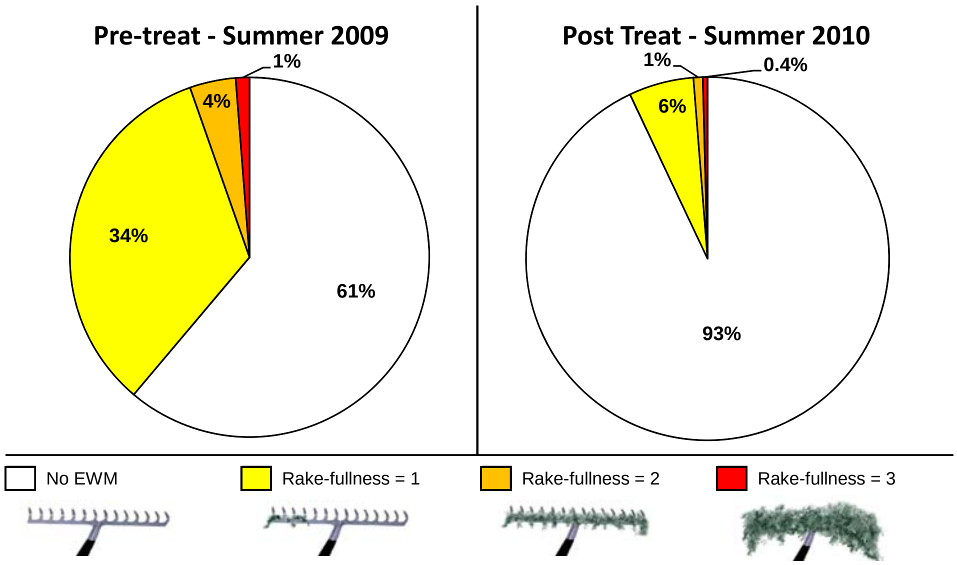


Figure 3. Proportions of EWM rake fullness ratings from 157 point-intercept sampling locations within 2010 treatment areas. Created using data from 2009 pre-treatment survey and 2010 post treatment survey.

Within the western basin, four native aquatic plant species and one group of macro-algae were found to have statistically declined in 2010 following the treatment (Table 2). Coontail, like EWM, is a broad-leaved species and is particularly susceptible to the herbicide applied. A 63% decline in occurrence of this species was observed within the western basin. Common waterweed, small pondweed, slender naiad, and stoneworts are not thought to be particularly sensitive to dicot-selective herbicides. However, emerging data gathered this year from lakes with similar large-scale treatments in the northern region suggests that this group of plants may be vulnerable to decline as a result of the treatment after all.

Table 2. Statistical comparison of native aquatic plant frequency data from 2009 pre- and 2010 post treatment surveys within the treated western basin of Bridge Lake. Created using data from 2009 and 2010 surveys.

Western Basin - Treated

							Chi-square Analysis	
	Scientific Name	Common Name	2009 FOO	2010 FOO	% Change	Direction	Statistically Different	P-value
Dicots	*Ceratophyllum demersum*	Coontail	74.4	27.7	-62.8	▼	Yes	0.000
	Myriophyllum sibiricum	Northern water milfoil	0.8	0.0	-100.0	▼	No	0.156
	Nuphar variegata	Spatterdock	0.0	0.8	100.0	▲	No	0.156
Non-dicots	*Elodea canadensis*	Common waterweed	87.2	11.6	-86.7	▼	Yes	0.000
	Potamogeton pusillus	Small pondweed	36.0	0.4	-98.9	▼	Yes	0.000
	Najas flexilis	Slender naiad	7.4	0.0	-100.0	▼	Yes	0.000
	Nitella sp.	Stoneworts	1.7	0.0	-100.0	▼	Yes	0.045
	P. praelongus & P. richardsonii	White-stem & Clasping-leaf pondweed	14.0	17.4	23.5	▲	No	0.318
	Potamogeton zosteriformis	Flat-stem pondweed	10.3	10.7	4.0	▲	No	0.882
	Potamogeton amplifolius	Large-leaf pondweed	2.9	1.7	-42.9	▼	No	0.360
	Potamogeton vaseyi	Vasey's pondweed	1.2	0.0	-100.0	▼	No	0.082
	Chara sp.	Muskgrasses	0.4	0.0	-100.0	▼	No	0.317
	Potamogeton strictifolius	Stiff pondweed	0.4	0.0	-100.0	▼	No	0.317
	Vallisneria americana	Wild celery	0.0	0.8	100.0	▲	No	0.156

2009 & 2010 N = 242
FOO = Frequency of Occurrence
▲ or ▼ = Statistically Different (Chi-square; α = 0.05)
▲ or ▼ = Not Statistically Different (Chi-square; α = 0.05)

Because the EWM within the eastern basin was not treated, the data gathered can be used as a control to compare against the treated western basin. Interestingly, similar to the western basin, statistical declines in coontail, common waterweed, and slender naiad were observed, along with muskgrasses, a group of macro-algae (Table 3). Flat-stem pondweed, a common native species, saw a statistical increase in occurrence from 2009 to 2010 within this basin. The decline of these native species within the untreated eastern basin seems to indicate that their decline within the western basin cannot be solely attributed to the treatment, and is likely due to natural phenomena such climatic variations.

Table 3. Statistical comparison of native aquatic plant frequency data from 2009 pre- and 2010 post treatment surveys within the untreated eastern basin of Bridge Lake. Created using data from 2009 and 2010 surveys.

Eastern Basin - Untreated

	Scientific Name	Common Name	2009 FOO	2010 FOO	% Change	Direction	Chi-square Analysis: Statistically Different	Chi-square Analysis: P-value
D	*Ceratophyllum demersum*	Coontail	57.7	45.5	-21.1	▼	Yes	0.031
D	*Myriophyllum sibiricum*	Northern w ater milfoil	0.6	0.6	0.0	-	No	1.000
Non-dicots	*Elodea canadensis*	Common w aterw eed	55.1	40.4	-26.7	▼	Yes	0.009
Non-dicots	*Potamogeton zosteriformis*	Flat-stem pondw eed	8.3	21.8	161.5	▲	Yes	0.001
Non-dicots	*Najas flexilis*	Slender naiad	4.5	0.0	-100.0	▼	Yes	0.007
Non-dicots	*Chara sp.*	Muskgrasses	4.5	0.6	-85.7	▼	Yes	0.032
Non-dicots	*Potamogeton pusillus*	Small pondw eed	7.7	4.5	-41.7	▼	No	0.237
Non-dicots	*P. praelongus & P. richardsonii*	White-stem & Clasping-leaf pondw eed	6.4	10.9	70.0	▲	No	0.159
Non-dicots	*Potamogeton amplifolius*	Large-leaf pondw eed	5.1	1.9	-62.5	▼	No	0.125
Non-dicots	*Nitella sp.*	Stonew orts	1.3	0.0	-100.0	▼	No	0.156
Non-dicots	*Potamogeton vaseyi*	Vasey's pondw eed	0.6	0.0	-100.0	▼	No	0.317
Non-dicots	*Lemna trisulca*	Forked duckw eed	0.0	0.6	100.0	▲	No	0.317
Non-dicots	*Vallisneria americana*	Wild celery	0.0	0.6	100.0	▲	No	0.317

2009 & 2010 N = 156
FOO = Frequency of Occurrence, D = Dictos
▲ or ▼ = Statistically Different (Chi-square; α = 0.05)
▲ or ▼ = Not Statistically Different (Chi-square; α = 0.05)

Because granular 2,4-D was used for such a large-scale treatment, Bridge Lake was one of a number of lakes selected for herbicide residual monitoring to determine how the herbicide disperses and how long it remains in the system after its application. Water sampling was conducted by the Engineer Research and Development Center (ERDC), a division of the USACE (Map 2). The data reveal that the herbicide was quickly and widely dissipated throughout the entire western basin, though the average herbicide concentration was higher in the application areas.

The herbicide concentration dropped to undetectable levels by 11 to 12 days after application, which was more rapid than other research lakes which were treated earlier in the spring when water temperatures were lower. 2,4-D degradation is through biological processes which are more active in the warmer water temperatures. Appendix A contains the USACE report with more detail regarding the residual sampling study on Bridge Lake.

Dissolved oxygen, a measure of the amount of oxygen dissolved in the water, was also recorded at the residual monitoring sampling sites. After the application of the herbicide, the dying EWM is decomposed by bacteria which actively consume dissolved oxygen. This can be a potential problem with large-scale EWM treatments, especially those that occur later in the season when plant biomass and water temperatures are high. The results of the dissolved oxygen sampling show that all of the sampling sites that were located within the herbicide application areas dropped below 1 mg/L at some point between 20 and 45 days after treatment. This drop in oxygen was to be expected in these areas with the incredible amount of decaying plant biomass. Fortunately, the dissolved oxygen at monitoring sites located outside of the application areas did not drop below 2 mg/L, and the loss of oxygen appeared to be isolated to the application areas.

2011 TREATMENT STRATEGY

Overall, the 2010 treatment on the western basin of Bridge Lake was extremely successful with both qualitative and quantitative success criteria being exceeded. Approximately 55 acres of EWM were treated in the western basin in 2010 (Map 2) and none of these areas are proposed for re-treatment again in 2011 (Map 3 and 4). However, the great decline of EWM within the western basin was contrasted by its expansion within the eastern basin. While declines were observed in certain native aquatic plant species within the treated areas, data gathered in the untreated eastern basin suggest that their decline cannot solely be attributed to the treatment.

As illustrated on Map 4, the 2011 treatment proposes approximately 74 acres of EWM to be treated on Bridge Lake using the liquid formulation of 2,4-D for site B-11, and Sculpin G for the other sites. Sculpin G is a new product on the market, and is a granular formulation of 2,4-D. However, unlike other granular forms of 2,4-D whose application rates are determined in pounds per surface-acre, Sculpin G has an EPA-approved product label that sets the herbicide's maximum application rates volumetrically (up to 4.0 ppm a.e.). The proposed 2011 treatment strategy includes using this herbicide from a concentration of 2.22 ppm to 2.25 ppm 2,4-D (acid equivalent).

As would be the case for any new herbicide, the use of Sculpin G within Wisconsin lakes is currently under review by the WDNR and until that review is completed, the use of Sculpin G may not be permitted by the WDNR. If their review determines that this herbicide is not appropriate for use on Bridge Lake in 2011, an alternate control strategy would need to be developed.

BRIDGE LAKE 2007 – 2010 TREATMENT REVIEW

With recurring annual herbicide treatments on Bridge Lake, it is important to take a broader perspective and ascertain whether these treatments are being effective in the long-term at controlling EWM, while at the same time minimizing impacts to valuable native aquatic plant species. Figure 4 displays the acreage and density of mapped EWM from 2007 to 2010 in Bridge Lake. As illustrated, the overall acreage of EWM lake-wide has increased every year since 2007. As discussed previously, the annual water level fluctuations experienced on Bridge Lake have made EWM management particularly difficult. Although EWM acreage has been increasing, the 2010 treatment was extremely successful in reducing the proportions of the densest EWM (Figure 4). Following the 2010 treatment, the majority of the EWM within Bridge Lake was classified as 'scattered'. The increase in acreage from 2009 to 2010 was all within the eastern basin, which went untreated in 2010.

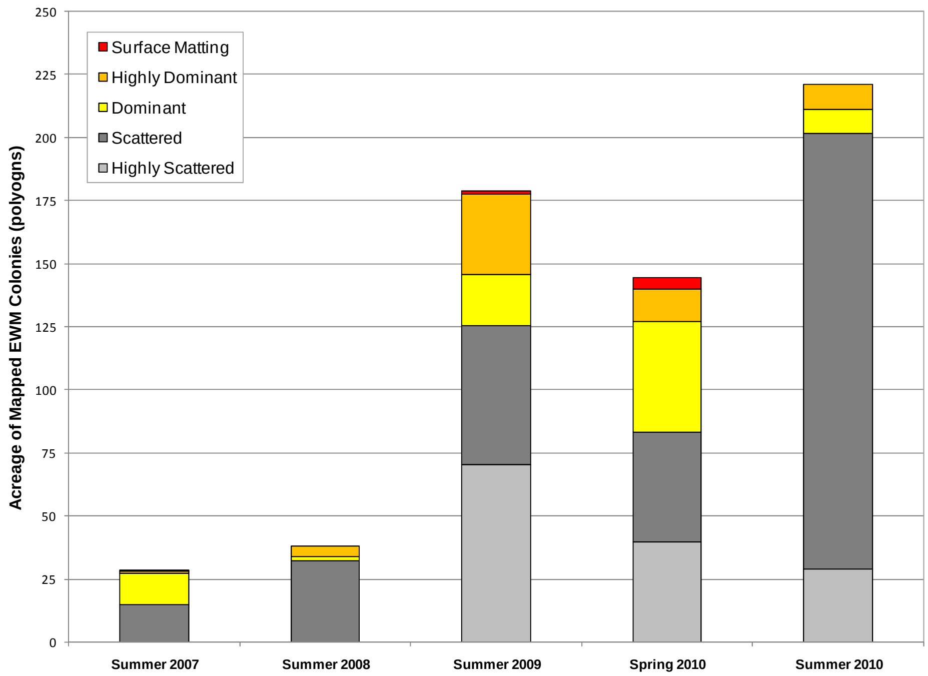


Figure 4. Bridge Lake EWM colonial acreage and density from 2007 to 2010. Created using data from 2007, 2008, 2009, and 2010 peak-biomass surveys.

As discussed earlier, for any particular treatment quantitative evaluation using point-intercept data is collected within treatment areas both the summer prior and the summer immediately following the treatment. In addition, point-intercept data is also collected during the summer one year following the treatment to determine the long-term success of the treatment in terms of EWM control and native aquatic plant species recovery. For example, for the 2009 treatment on Bridge Lake, pre-treatment data was collected in the summer of 2008, while post treatment data was collected in the summer of 2009 immediately following the treatment and one year later in the summer of 2010. This makes it possible to conduct a two-year evaluation of the 2009 treatment. Unfortunately, due to the start date of this project, no comparative data from 2007 exists making a two-year evaluation of the 2008 treatment impossible.

This type of data can be split into two categories: 1) areas that were only treated in 2009 (e.g. not retreated in 2010); and 2) areas that were treated in both 2009 and 2010. Figure 5 displays the frequency of occurrence of EWM within areas that were only treated in 2009. Areas that were treated in 2009 and 2010 are not displayed as only five point-intercept sampling sites were located in these areas; too small of sample size for statistical analysis. In 2009, the majority of the treatment areas were located in the eastern basin and were successful at reducing the occurrence of EWM. Because of this, these areas were not re-treated in 2010, and unfortunately, the occurrence of EWM rebounded (Figure 5). This dramatic rebound is thought to be the competitive advantage EWM gains with the profound water level fluctuations in the system. With the success observed this year within the western basin, it is the hope that this same success will be achieved within the eastern basin in 2011.

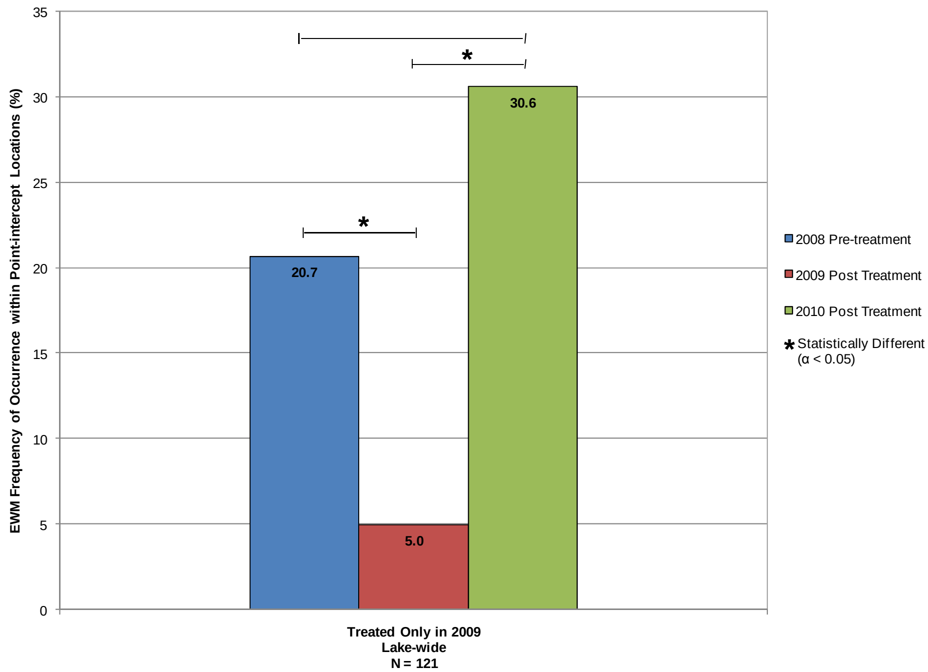


Figure 5. Bridge Lake EWM 2008 pre-treatment and 2009/2010 post treatment occurrence within areas treated only in 2009. Created using data from 2008 pre-treatment survey and 2009 and 2010 post treatment surveys.

One native broad-leaved species, coontail, was found to have statistically valid reductions since 2008 in areas that were only treated in 2009 (Table 4). The reduction in 2010 may be due to competition with expanding EWM or factors other than the control action such as the plant's response to environmental or climactic differences. Common waterweed and leafy pondweed, two non-dicot species were also observed to have declined since 2008 (Table 4). Leafy pondweed had a low frequency of occurrence in 2008 and has not been detected since. It is more likely that this species may have been misidentified for another similar narrow-leaf pondweed species. No reduction in common waterweed was observed following the 2009 treatment, and the reduction in 2010 in areas where no herbicide was applied suggests that like coontail, the common waterweed population is responding to natural environmental factors (Table 4). One non-dicot species, flat-stem pondweed, has increased in occurrence from 2008 to 2010 in these areas (Table 4).

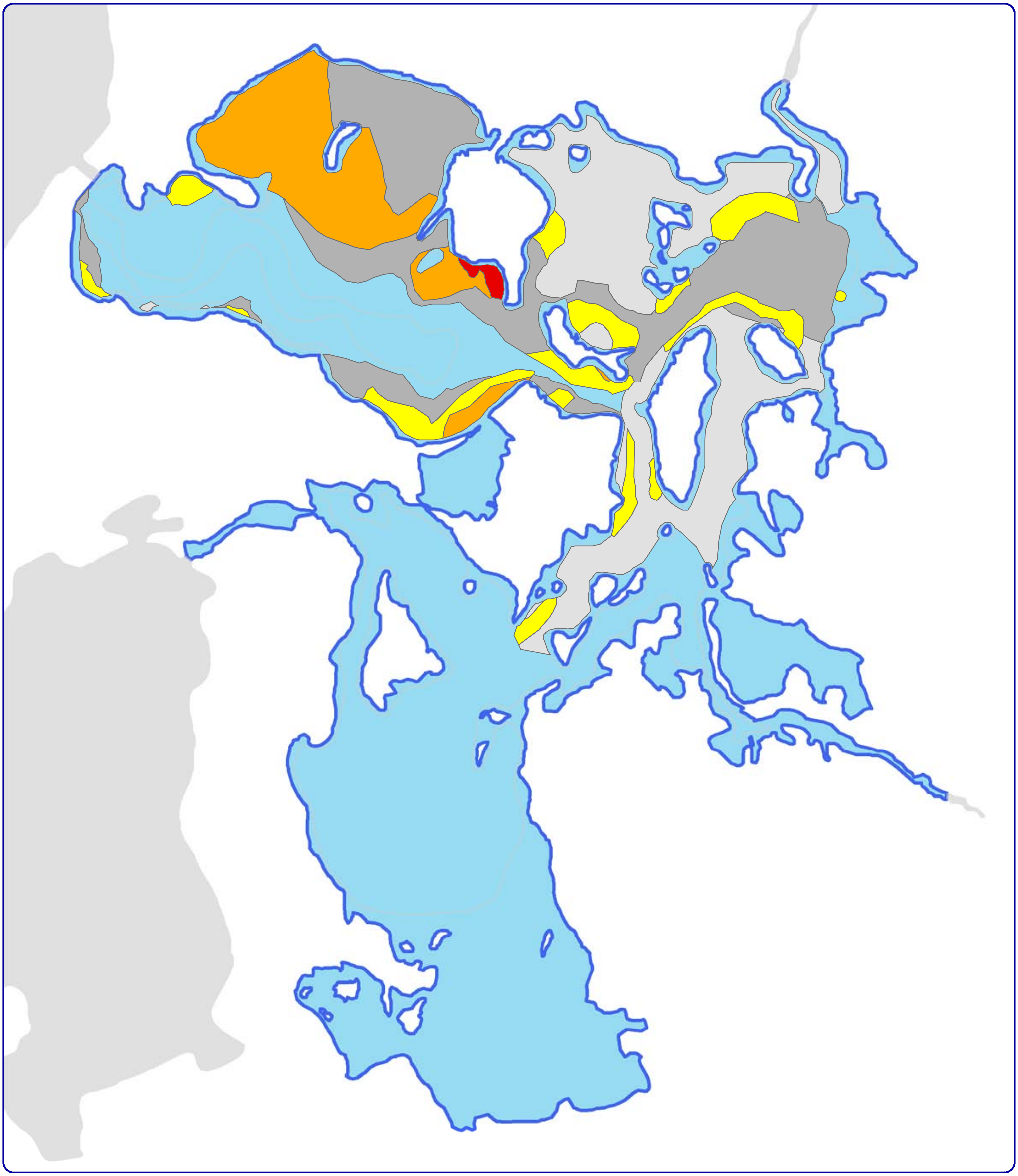
Overall, the treatments on Bridge Lake have been met with difficulty due to the fluctuating water levels, and as a result, EWM acreage has increased annually within this system. However, the incredible success observed from the 2010 treatment within the western basin shows that EWM control within Bridge Lake may finally be gaining some ground. Though the large expansion of EWM within the eastern basin is discouraging, it is the hope that the treatment with the use of liquid 2,4-D and the new Sculpin G will be just as successful in controlling EWM as was observed in 2010. Only a few select native species have seen statistical impacts from the treatments. It is important to reiterate the fact that the decline of native species within the treatment areas does not represent what occurred on a lake-wide basis. A whole-lake point-intercept survey is scheduled to be completed in the near future and comparisons of this study with the 2007 dataset will allow an understanding of changes within the plant community over time.

Table 4. Statistical analysis of Eurasian water milfoil and native aquatic plant species occurrence in areas treated only in 2009. Created using data from 2008 pre-treatment and 2009/2010 post treatment surveys.

2009 Treatment - Point-intercept Locations within Areas Treated Only in 2009

						2008-2009		2009-2010		2008-2010	
	Scientific Name	**Common Name**	**2008 FOO**	**2009 FOO**	**2010 FOO**	**% Change**	**Direction**	**% Change**	**Direction**	**% Change**	**Direction**
Dicots	*Myriophyllum spicatum*	Eurasian water milfoil	20.7	5.0	30.6	-76.0	▼	516.7	▲	48.0	▲
	Ceratophyllum demersum	Coontail	57.9	58.7	39.7	1.4	▲	-32.4	▼	-31.4	▼
	Myriophyllum sibiricum	Northern water milfoil	0.0	0.8	0.0	100.0	▲	-100.0	▼	0.0	-
Non-dicots	*Elodea canadensis*	Common waterweed	50.4	52.9	30.6	4.9	▲	-42.2	▼	-39.3	▼
	Potamogeton zosteriformis	Flat-stem pondweed	3.3	3.3	10.7	0.0	-	100.0	▲	225.0	▲
	Potamogeton foliosus	Leafy pondweed	5.0	0.0	0.0	-100.0	▼	0.0	-	-100.0	▼
	Potamogeton praelongus	White-stem pondweed	12.4	5.8	9.1	-53.3	▼	100.0	▲	-26.7	▼
	Potamogeton pusillus	Small pondweed	5.0	2.5	2.5	-50.0	▼	100.0	-	-50.0	▼
	Potamogeton richardsonii	Clasping-leaf pondweed	3.3	0.8	0.8	-75.0	▼	100.0	-	-75.0	▼
	Potamogeton amplifolius	Large-leaf pondweed	3.3	4.1	0.8	25.0	▲	-80.0	▼	-75.0	▼
	Nitella sp.	Stoneworts	0.8	0.8	0.0	0.0	-	-100.0	▼	-100.0	▼
	Lemna trisulca	Forked duckweed	0.8	0.0	0.0	-100.0	▼	0.0	-	-100.0	▼
	Potamogeton robbinsii	Fern pondweed	0.8	0.0	0.0	-100.0	▼	0.0	-	-100.0	▼
	Potamogeton spirillus	Spiral-fruited pondweed	0.8	0.0	0.0	-100.0	▼	0.0	-	-100.0	▼

2008, 2009, & 2010 N = 121
FOO = Frequency of Occurrence
▲ or ▼ = Statistically Different (Chi-square; α = 0.05)
▲ or ▼ = Not Statistically Different (Chi-square; α = 0.05)



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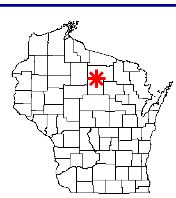
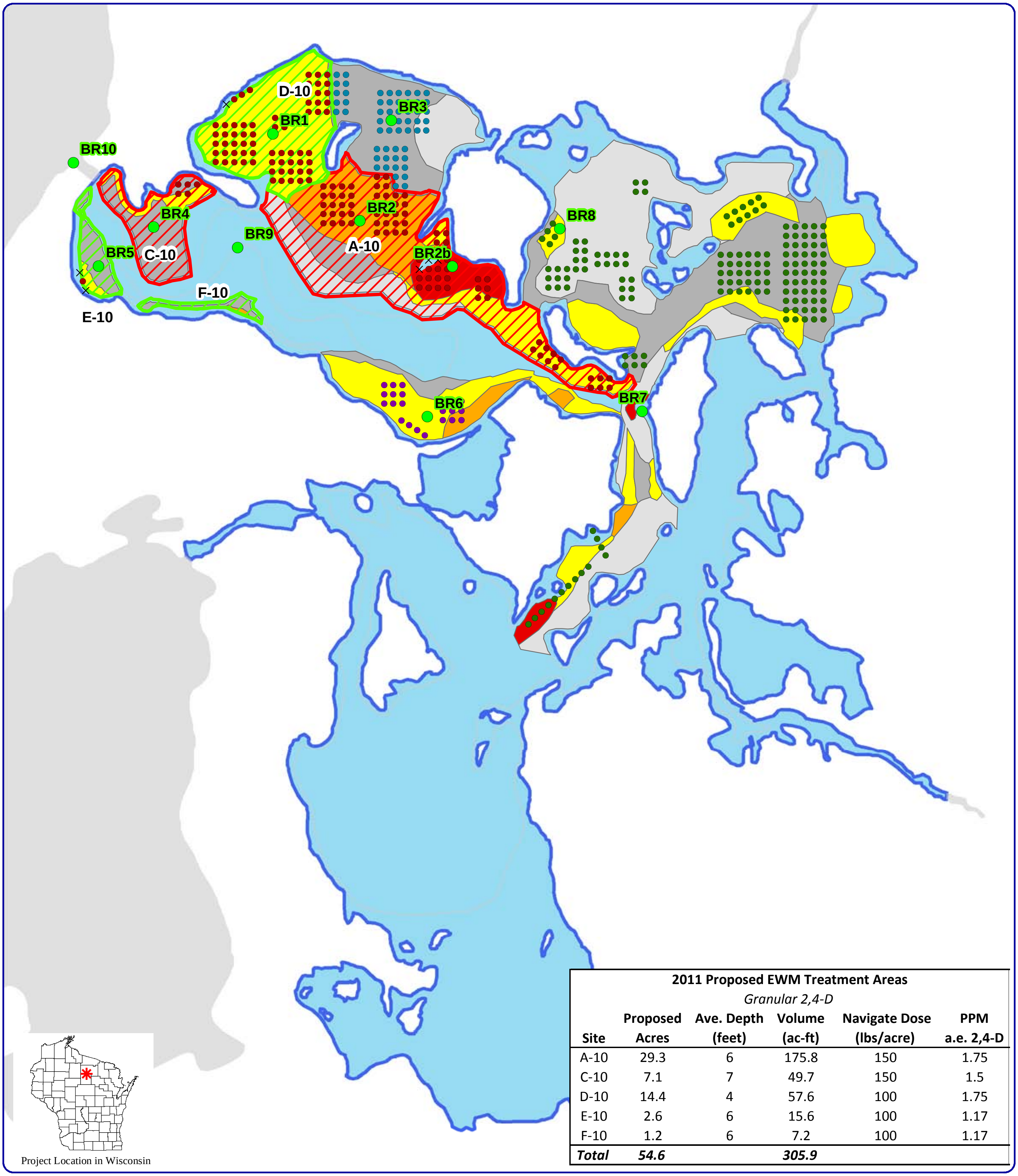
Sources:
Roads and Hydro: WDNR
Aquatic Plants: Onterra, 2009
Map Date: March 3, 2011
File Name: Map_1_Bridge_Aug09_PB


Project Location in Wisconsin

EWM Survey Results ***(August 2009)***

- Highly Scattered
- Scattered
- Dominant
- Highly Dominant
- Surface Matting

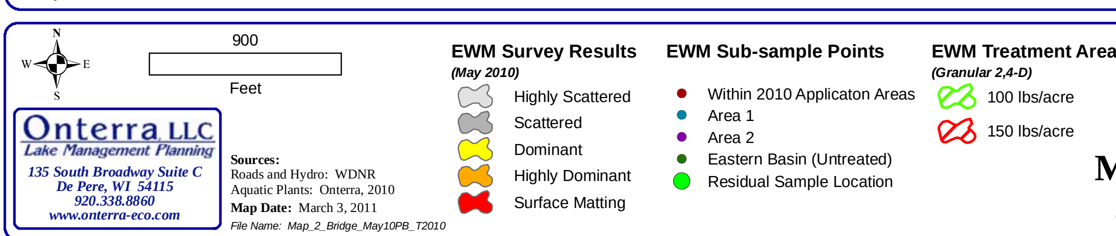
Map 1
Bridge Lake
Oneida-Lincoln Counties, Wisconsin
2009 EWM Locations



2011 Proposed EWM Treatment Areas

Granular 2,4-D

Site	Proposed Acres	Ave. Depth (feet)	Volume (ac-ft)	Navigate Dose (lbs/acre)	PPM a.e. 2,4-D
A-10	29.3	6	175.8	150	1.75
C-10	7.1	7	49.7	150	1.5
D-10	14.4	4	57.6	100	1.75
E-10	2.6	6	15.6	100	1.17
F-10	1.2	6	7.2	100	1.17
Total	***54.6***		***305.9***		



Onterra LLC
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www.onterra-eco.com

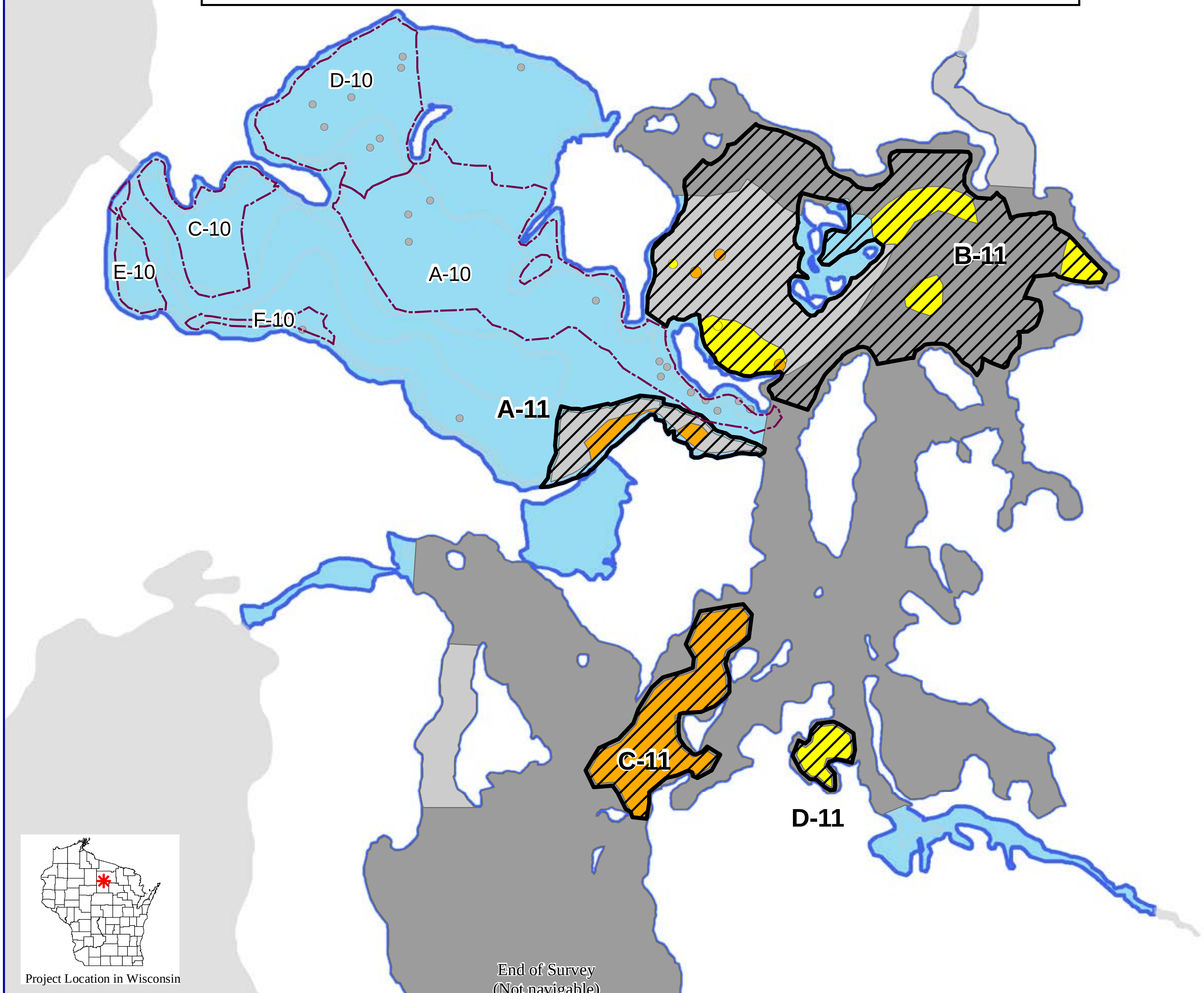
Sources:
Roads and Hydro: WDNR
Aquatic Plants: Onterra, 2010
Map Date: March 3, 2011
File Name: Map_2_Bridge_May10PB_T2010

Map 2
Bridge Lake
Oneida-Lincoln Counties, Wisconsin

May 2010 EWM Locations & 2010 Treatment Areas

	Treatment Area			Lake Basin		Proposed Liquid 2,4-D Dose	
Site	Proposed Acres	Average Depth (ft)	Volume (Acre-feet)	Volume (Acre-feet)	Average Depth (ft)	Treatment Area Concentration (2,4-D a.e. ppm)	Calculated Basin Concentration (2,4-D a.e. ppm)
B-11	55.5	8.4	468.4	561.0	7.2	0.225	0.188

Site	Proposed Acres	Average Depth (ft)	Volume (Acre-feet)	SculpinG Dose (lbs/acre)	Treatment Area Concentration (2,4-D a.e. ppm)
A-11	6.3	8.2	51.6	300	2.22
C-11	10.3	4.7	48.6	175	2.25
D-11	2.0	3.1	6.3	115	2.22
Total	***18.6***				
Grand Total	**74.1**				



Please Note:
1. Entire area of lake used for fishing.
2. Proposed Treatment areas are used for all boating activities.

N W E S

900

Feet

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Sources:
Roads and Hydro: WDNR
Aquatic Plants: Onterra, 2010

Map Date: February 21, 2011

File Name: Map_3_Bridge_2010PB_T2011.mxd

EWM Survey Results (Mapped September 2010)

- Highly Scattered
- Scattered
- Dominant
- Highly Dominant
- Surface Matting
- Single or Few Plants
- Clump of Plants
- Small Plant Colony
- Proposed 2011 Treatment Areas
- Proposed 2011 Treatment Areas

Map 3
Bridge Lake
Oneida-Lincoln Counties, Wisconsin

2010 EWM Locations & 2011 Proposed Treatment Areas v.1