

## INTRODUCTION

The Iron River Area Lakes Association, Inc. (IRALA) successfully applied for an Aquatic Invasive Species (AIS) Control Grant in February of 2009 to complete a five-year AIS control and prevention project on the Pike Chain of Lakes (Buskey Bay Lake, Lake Millicent, Hart Lake, Twin Bear Lake, Eagle Lake, and Flynn Lake). This report discusses the third year of Eurasian water milfoil (EWM) treatment under this grant-funded project. Additional information regarding treatments completed in 2009 and 2010 can be found in their respective reports.

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 is an important consideration 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 on this issue has been gathered in recent years, largely as a result of a joint research project between the WDNR and US Army Corps of Engineers (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 in which the herbicide will reach equilibrium with. The target herbicide concentration is typically between 0.225 and 0.325 ppm acid equivalent (a.e.) when exposed to the target plants for 7-14 days or longer. However, these same rates have been shown to impact some native plant species, particularly dicot species, some thin-leaved pondweeds, and naiad species. These strategies have not been implemented on the Pike Chain of Lakes.

Spot treatments are a type of control 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 on the Pike Chain of Lakes. 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 4.0 ppm a.e. in spot treatment scenarios. A newly adopted term, 'micro-treatments' is being used to describe very small spot treatments (working definition is less than 5 acres). Because of their small size, it is extremely difficult to predict treatment effectiveness due to rapid dilution of the herbicide. Larger treatment areas tend to be able to hold effective concentrations for a longer time.

Following the 2010 peak-biomass survey, a conditional permit map was created proposing approximately 11.9 acres of spot treatment (Map 1). On May 31 and June 1, 2011, Onterra staff visited the Pike Chain of Lakes to survey the proposed treatment areas and refine their boundaries as appropriate. As a result of the spring pretreatment survey, some of the proposed treatment areas were removed while new sites were added, resulting in final treatment acreage of 16.1 acres (Map 1). With the exception of K-11, all of the 2011 treatment areas fall into the

micro-treatment subcategory of spot treatments. While K-11 was just greater than 5 acres, its broad shape and slightly secluded nature are factors that likely combated rapid herbicide dilution.

The 2011 treatment areas were treated with Sculpin G by Northern Aquatic Services on June 10, and they reported surface water temperatures of approximately 63°F and winds light (3-4 mph) out 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 colony density ratings before and after the treatments.

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 the Pike Chain of Lakes, data of this type was collected at 24 point-intercept sub-sample locations. After refinements were made to the treatment strategy based upon the pretreatment survey, only eight of the sampled locations were located within areas that herbicide was directly applied – too small of a sample size to quantitatively evaluate using statistical analyses. Due to the small size of the individual treatment areas and extremely sparse nature of the current EWM infestation on the Pike Chain of Lakes, quantitative monitoring methodologies will continue to be difficult to implement. While they do not contain the same level of scientific rigor, qualitative evaluation techniques are better suited for monitoring treatments of this nature.

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 the survey results are used to qualitatively evaluate the 2011 herbicide treatment on the Pike Chain of Lakes. 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.

With the success of past herbicide treatments and hand-removal efforts on the Pike Chain, the EWM population is changing from a population comprised of larger, more contiguous colonies to a population consisting of single plants, clumps of plants, and small plant colonies. Techniques used to map EWM within the chain have shifted from polygon-based mapping of colonies to mostly point-based mapping of single plants and clumps of plants, making qualitative evaluation of treatment areas more difficult. Normally, only treatment areas with EWM mapped via polygons would be included in the qualitative assessment. However, the majority of the EWM mapped within the 2011 treatment areas was point-based. These 2011 treatment areas were qualitatively deemed successful if the number of EWM points decreased following the

treatment and/or the density label of the points declined by at least one rating (e.g. clumps of plants to single or few plants).

It is never the intent of the treatments to impact valuable native aquatic plant species. 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 the Pike Chain of Lakes, emerging data from the WDNR and USACE suggests that some narrow-leaf (monocot) species may also be impacted by this herbicide. However, since no quantitative evaluation of the 2011 treatment areas could be conducted, the potential impact to native species within these areas cannot be evaluated. It is important to remember that in spot treatment scenarios, any 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.

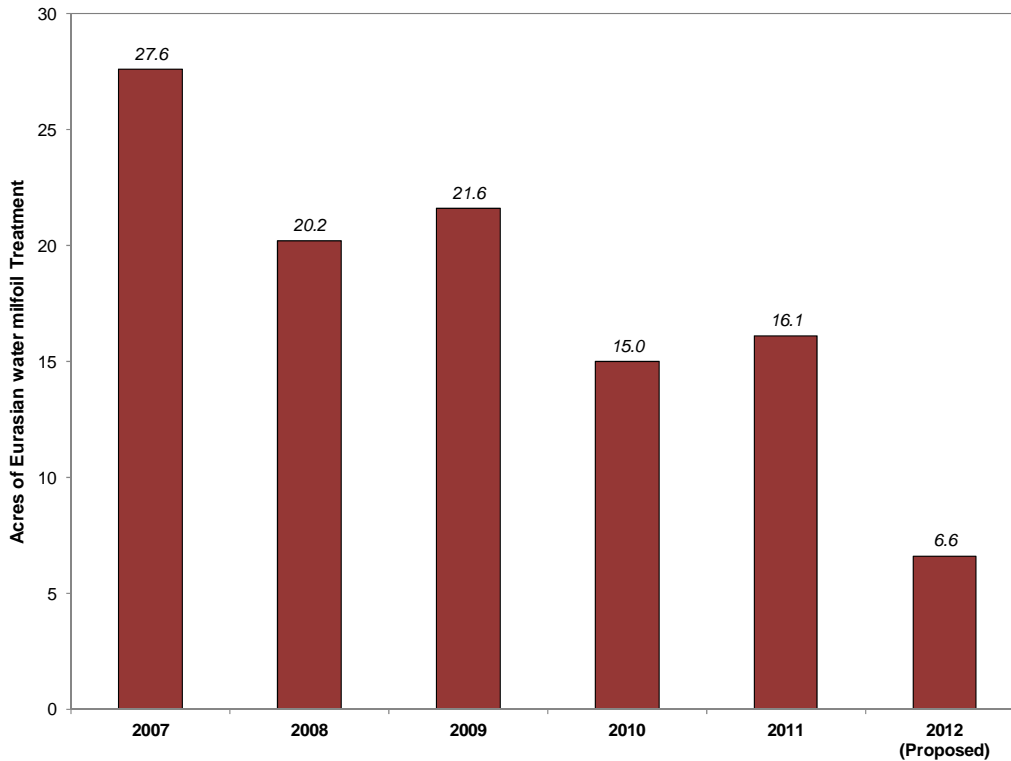
## **2011 TREATMENT RESULTS**

Post-treatment surveys were completed by Onterra on September 22, 2011. Map 2 shows the results of the mid-September 2011 peak-biomass survey, and that 14 of the 15 treatment sites were observed to have reductions in the number EWM points and/or a reduction in density. Site H-11 was the only area believed not to be successful, as clumps of plants and a small plant colony were observed here following the treatment (Map 2). Anecdotal reports from the IRLA indicate that sites H-11 and J-11 are situated over springs, or areas where groundwater may be erupting from the lakebed. While not verified, the presence of springs in these areas would increase water flow and hasten the dissipation of the herbicide. The lack of success on site H-11 may also be due to a combination of the site's deeper depth and its location within the chain in an area of naturally higher flow.

The hand-removal effort of EWM on the Pike Chain of Lakes led by Al Bochler has been instrumental in maintaining a low population of EWM within the chain. In 2011, a total of 165 hours were spent removing EWM from the chain lakes. This does not include time spent monitoring the lakes, or searching for and identifying EWM plants and colonies. During the 2011 peak-biomass survey, Al joined Onterra ecologists and took them to areas where hand-removal had taken place. Any EWM that remained in these areas was recorded. Al also took Onterra staff to several suspect areas on Eagle Lake where a few single EWM plants were located (Map 2). These areas will be closely monitored by the IRLA volunteers and Onterra staff in 2012.

## **2012 TREATMENT STRATEGY**

Overall, the 2011 EWM treatment on the Pike Chain of Lakes was met with success. While quantitative evaluation of the 2011 treatment was not possible, qualitatively 14 of the 15 treatment sites appeared to have seen a reduction in EWM following the treatment. A total of 6.0 acres of EWM are proposed for treatment on the Pike Chain of Lakes in 2012 (Map 2). Figure 1 shows that the recurring annual treatments on the Pike Chain have reduced the amount of treatable EWM acreage by 78% since 2007.



**Figure 1. The Pike Chain of Lakes annual Eurasian water milfoil treatment acreage from 2007-2011 and proposed 2012 treatment acreage.**

The proposed 2012 treatment areas include: 1.1 acres on Buskey Bay, 2.6 acres on Lake Millicent, and 2.8 acres on Hart Lake – no treatment areas are proposed for Twin Bear Lake. The re-treatment of previously treated areas is not uncommon in EWM management as dense areas often require multiple years of treatment to significantly reduce a site’s density and/or size. As discussed in past treatment reports, in order to reduce the treatable acreage of EWM on the Pike Chain of Lakes, it is believed that multiple years of treatment is the key to success. Great strides in EWM control have been made in recent years on the chain, but it must be noted that many of the remaining areas of EWM on the Pike Chain (B-12, C-12, E-12, H-12, J-12) have been treated for multiple years.

On the Pike Chain of Lakes, the EWM population is approaching a point at which the herbicide application areas are too small to consistently predict if they will cause EWM mortality. As indicated within the Introduction Section, it is extremely difficult in micro-treatment scenarios to keep a sufficient herbicide concentration exposed to the target plants long enough to be effective. Therefore, potential treatment sites less than 0.3 acres were not proposed for treatment due to their extremely small size and unlikely nature of being successful. Also, all proposed treatment areas include an expanded buffer (40 feet) as well as a higher granular 2,4-D application rate of 3.00 ppm a.e.

Two granular 2,4-D products are widely used in Wisconsin: Navigate and Sculpin G. Sculpin G has an EPA-approved product label that sets the herbicide’s maximum application rates volumetrically (up to 4.0 ppm a.e.). Up until recently, Navigate’s EPA-approved label stated that it could only be applied at rates up to 200 lbs/acre. In deeper water treatments, this did not

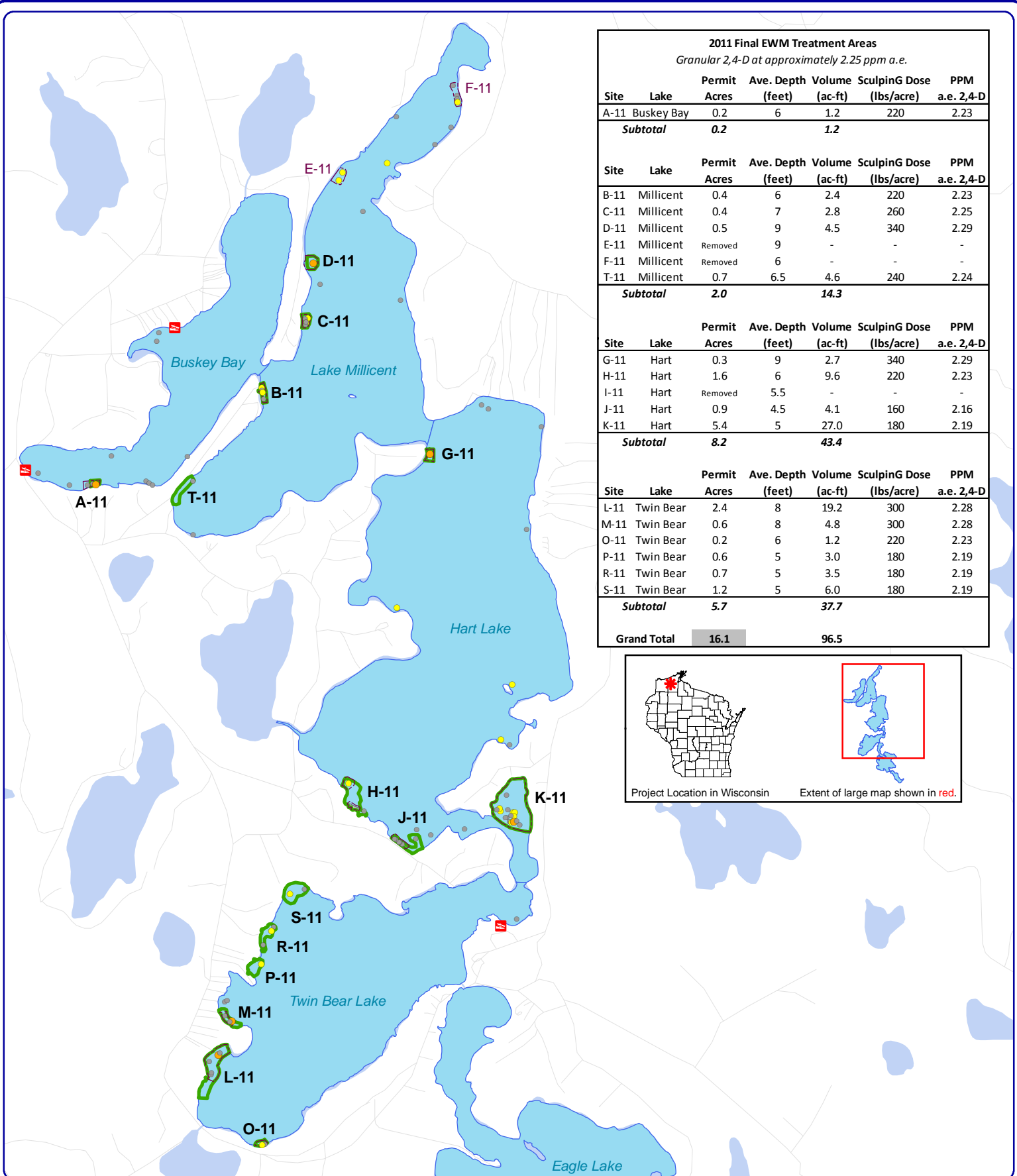
provide sufficient active ingredient to reach desired herbicide concentrations and therefore Sculpin G was often used in these situations. For this reason, the 2011 treatments on the Pike Chain of Lakes were completed with Sculpin G. An updated EPA approved label now allows Navigate to be dosed volumetrically up to 4.0 ppm a.e. However, because of Navigate's ester formulation, the updated label also includes a 24-hour swimming restriction, which is not included as a part of the amine-formulated Sculpin G label.

Because the percent composition of active ingredients differs between the two herbicides, Table 1 shows the application rates needed to achieve the target concentration. Due to the logistical needs of the applicator (i.e. product container size), the application rate will likely need to be rounded to a specific increment. It is proposed that, within reason, these rates are rounded up to achieve a slightly higher concentration. After discussions between the IRLA, herbicide applicator, WDNR, and Onterra determine the most appropriate herbicide product, a revised conditional treatment map (Map 2) will be created.

**Table 1. Granular 2,4-D application rates (dose) based upon proposed 2012 treatment strategy.**

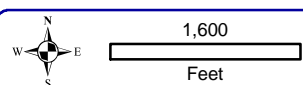
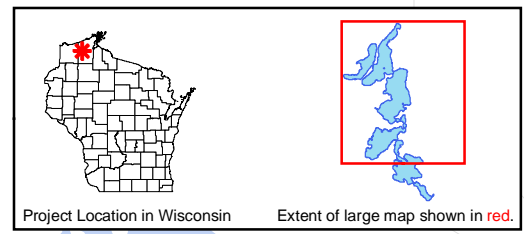
Site	Lake	Proposed Acres	Ave. Depth (feet)	Volume (ac-ft)	PPM a.e. 2,4-D	Navigate Dose (lbs/acre)	SculpInG Dose (lbs/acre)
A-12	Buskey Bay	0.3	4	1.3	3.00	172	198
C-12	Buskey Bay	0.8	5	4.1	3.00	215	247
E-12	Millicent	1.0	5	5.1	3.00	215	247
D-12	Millicent	0.5	6	2.9	3.00	257	297
B-12	Millicent	0.3	5	1.5	3.00	215	247
F-12	Millicent	0.5	8	4.2	3.00	343	395
L-12	Millicent	0.3	9	2.7	3.00	386	445
G-12	Hart	0.4	9	3.4	3.00	386	445
H-12	Hart	1.6	6	9.6	3.00	257	297
I-12	Hart	0.3	8	2.4	3.00	343	395
J-12	Hart	0.3	6	1.6	3.00	257	297
K-12	Hart	0.3	9	2.3	3.00	386	445
<b>Total</b>		<b>6.6</b>		<b>41.0</b>			

With a threshold of 0.3 acres for treatment sites in 2012, this means that some areas with numerous single or clumps of EWM are not proposed to be treated. These areas should be high priority for aggressive hand-removal by IRLA volunteers to prevent expansion and spreading EWM to other parts of the lake. The EWM in many areas has been reduced to a point where hand-removal is the only option for control, and is highly recommended so these areas do not expand and have to be retreated chemically in the future. The proposed 2012 treatment sites as well as the 2011 treatment sites will be assessed during the spring 2012 pretreatment survey. It is in the IRLA's best interest to be financially and mentally prepared for a slightly larger treatment if the pretreatment surveys locate additional areas of EWM or areas where it has rebounded that warrant treatment. It is also proposed that the IRLA apply for a large-scale herbicide application permit (Form 3200-4A) in the event that the revised treatment strategy exceeds the 10-acre threshold for treatments that do not require this component.



**2011 Final EWM Treatment Areas**  
Granular 2,4-D at approximately 2.25 ppm a.e.

Site	Lake	Permit Acres	Ave. Depth (feet)	Volume (ac-ft)	SculpinG Dose (lbs/acre)	PPM a.e. 2,4-D
A-11	Buskey Bay	0.2	6	1.2	220	2.23
<b>Subtotal</b>		<b>0.2</b>		<b>1.2</b>		
Site	Lake	Permit Acres	Ave. Depth (feet)	Volume (ac-ft)	SculpinG Dose (lbs/acre)	PPM a.e. 2,4-D
B-11	Millicent	0.4	6	2.4	220	2.23
C-11	Millicent	0.4	7	2.8	260	2.25
D-11	Millicent	0.5	9	4.5	340	2.29
E-11	Millicent	Removed	9	-	-	-
F-11	Millicent	Removed	6	-	-	-
T-11	Millicent	0.7	6.5	4.6	240	2.24
<b>Subtotal</b>		<b>2.0</b>		<b>14.3</b>		
Site	Lake	Permit Acres	Ave. Depth (feet)	Volume (ac-ft)	SculpinG Dose (lbs/acre)	PPM a.e. 2,4-D
G-11	Hart	0.3	9	2.7	340	2.29
H-11	Hart	1.6	6	9.6	220	2.23
I-11	Hart	Removed	5.5	-	-	-
J-11	Hart	0.9	4.5	4.1	160	2.16
K-11	Hart	5.4	5	27.0	180	2.19
<b>Subtotal</b>		<b>8.2</b>		<b>43.4</b>		
Site	Lake	Permit Acres	Ave. Depth (feet)	Volume (ac-ft)	SculpinG Dose (lbs/acre)	PPM a.e. 2,4-D
L-11	Twin Bear	2.4	8	19.2	300	2.28
M-11	Twin Bear	0.6	8	4.8	300	2.28
O-11	Twin Bear	0.2	6	1.2	220	2.23
P-11	Twin Bear	0.6	5	3.0	180	2.19
R-11	Twin Bear	0.7	5	3.5	180	2.19
S-11	Twin Bear	1.2	5	6.0	180	2.19
<b>Subtotal</b>		<b>5.7</b>		<b>37.7</b>		
<b>Grand Total</b>		<b>16.1</b>		<b>96.5</b>		



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Sources:  
Roads and Hydro: WDNR  
Aquatic Plants: Onterra, 2010-2011  
Map Date: January 23, 2012  
Filename: Map1\_PkChn\_EWM\_2010PB\_T2011.mxd

- Legend**
- Highly Scattered
  - Scattered (None)
  - Dominant (None)
  - Highly Dominant (None)
  - Surface Matting (None)
  - Single or Few Plants
  - Clumps of Plants
  - Small Plant Colony
  - 2011 Conditional Treatment Area
  - 2011 Final Treatment Area

Map 1  
**Pike Chain of Lakes**  
Bayfield County, Wisconsin  
**2010 EWM Locations**  
**& 2011 Treatment Areas**

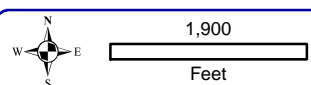
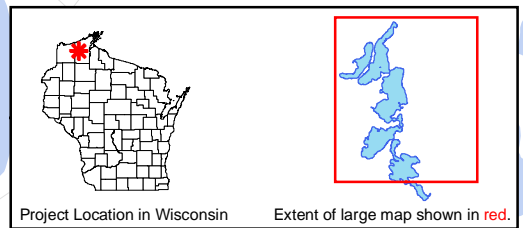
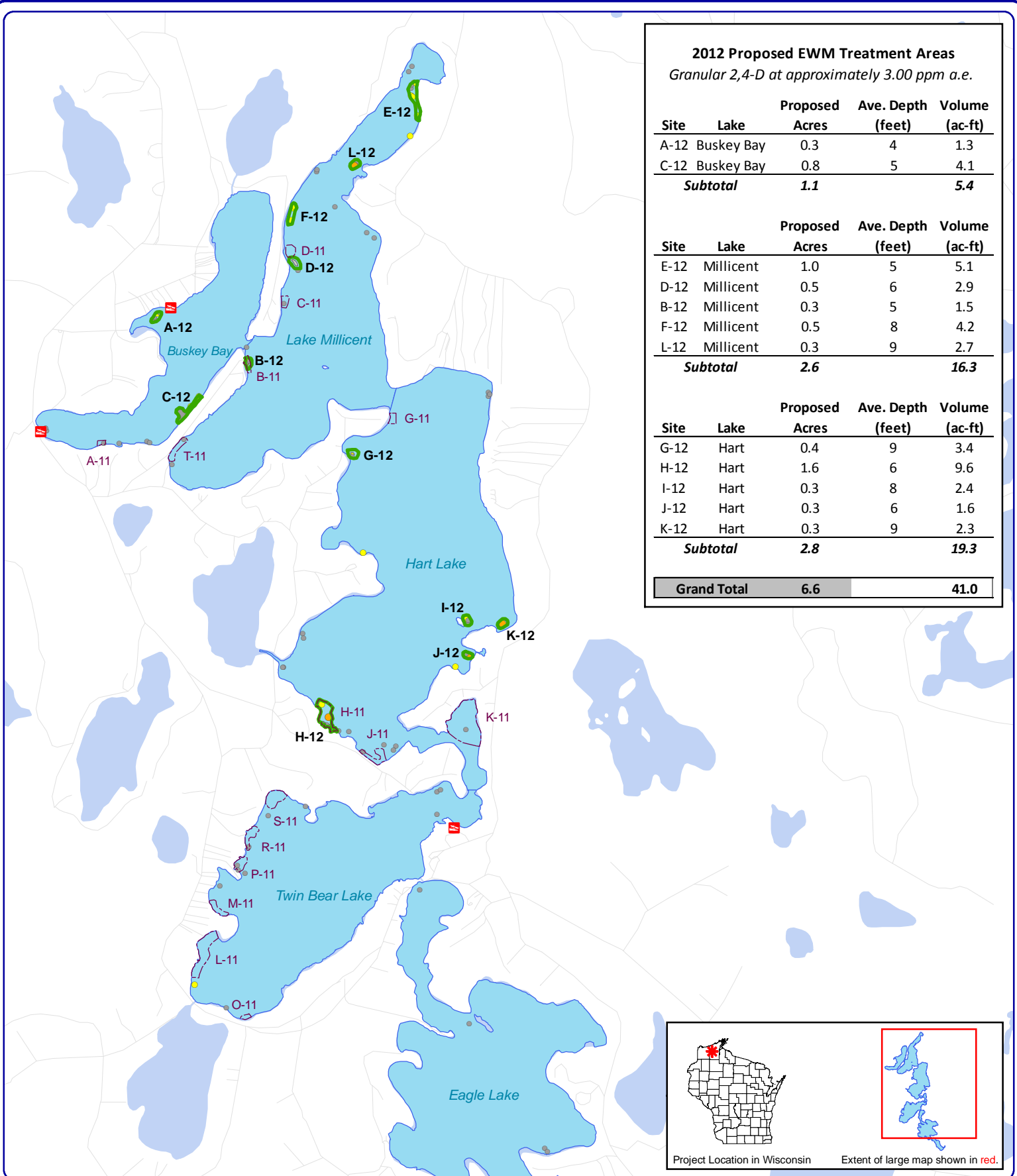
**2012 Proposed EWM Treatment Areas**  
Granular 2,4-D at approximately 3.00 ppm a.e.

Site	Lake	Proposed Acres	Ave. Depth (feet)	Volume (ac-ft)
A-12	Buskey Bay	0.3	4	1.3
C-12	Buskey Bay	0.8	5	4.1
<b>Subtotal</b>		<b>1.1</b>		<b>5.4</b>

Site	Lake	Proposed Acres	Ave. Depth (feet)	Volume (ac-ft)
E-12	Millicent	1.0	5	5.1
D-12	Millicent	0.5	6	2.9
B-12	Millicent	0.3	5	1.5
F-12	Millicent	0.5	8	4.2
L-12	Millicent	0.3	9	2.7
<b>Subtotal</b>		<b>2.6</b>		<b>16.3</b>

Site	Lake	Proposed Acres	Ave. Depth (feet)	Volume (ac-ft)
G-12	Hart	0.4	9	3.4
H-12	Hart	1.6	6	9.6
I-12	Hart	0.3	8	2.4
J-12	Hart	0.3	6	1.6
K-12	Hart	0.3	9	2.3
<b>Subtotal</b>		<b>2.8</b>		<b>19.3</b>

<b>Grand Total</b>	<b>6.6</b>	<b>41.0</b>
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Sources:  
Roads and Hydro: WDNR  
Aquatic Plants: Onterra, 2010-2011  
Map Date: January 23, 2012  
Filename: Map2\_PkChn\_EWM\_T2012\_Cond1.mxd

- Legend**
- Highly Scattered
  - Scattered
  - Dominant
  - Highly Dominant (None)
  - Surface Matting (None)
  - Single or Few Plants
  - Clumps of Plants
  - Small Plant Colony
  - 2011 Final Treatment Area
  - 2012 Proposed Treatment Area

**Map 2**  
**Pike Chain of Lakes**  
Bayfield County, Wisconsin  
**2011 EWM Locations**  
**& 2012 Proposed**  
**Treatment Areas v.1**