

**We Energies  
2012 Annual Report - Nuisance Plant Control Survey  
Brule Reservoir  
FERC Project #2431**

Background and Methods

We Energies' Environmental department staff, Mr. Mike Grisar and Mr. Bill Braunschweig, conducted a survey from a boat of the entire shoreline at the Brule Reservoir project on July 30, 2012. All waters and appropriate wetlands accessible from the boat were evaluated. Those species targeted for the survey included purple loosestrife (*Lythrum salicaria*) and Eurasian water milfoil (*Myriophyllum spicatum*). The visual meander survey included areas of shallow water adjacent to the shorelines. Shallow water was surveyed to a point where the water depth and clarity excluded visibility conducive to observing submerged vegetation. On average, this depth was at approximately 7-feet.

For each stand of Eurasian water milfoil encountered during the 2011 surveys, the stand location and perimeter were compared and verified with the 2010 monitoring data using a Trimble Geo XH GPS unit. Where the stand size was negligible, a single point in the center of the stand was located with the GPS. When significant changes in the stand perimeter were observed, these changes were marked with the GPS and reflected in the attached map. Changes in stand density were updated and are shown in Table 1BR. New stands not previously observed were mapped and recorded.

Various data were collected at each stand including stand/mat density and mat thickness (when present). The stand size was subsequently calculated from the collected GPS boundaries. A percent cover scale from 1-5 (sparse – dense) was used to accurately and consistently estimate stand densities:

<u>Estimated Density Rating</u>	<u>% Cover</u>
1 (sparse)	0 - 5%
2 (moderately sparse)	>5 - 25%
3 (moderate)	>25 - 75%
4 (moderately dense)	>75 - 95%
5 (dense)	>95%

Results & Discussion

No purple loosestrife plants were observed along the shores of the Brule Reservoir project area. The removal of the plant observed in 2009 was successful with no reoccurrence of this plant in 2012.

Fifty-eight stands of Eurasian water milfoil were observed at the Brule Reservoir project area in 2012 (attached map), a 132% increase from 2011 which was the exact opposite of what occurred between 2010 and 2011. 7 new stands were observed for the first time in 2012. The identified stands are distributed throughout the project area and range in size from <0.01-acre up to 25.59-acres.

Eurasian water milfoil is present in approximately 87.59-acres in the Brule Reservoir project area, an increase of about 80-acres from 2011. The total spatial distribution peaked at over 95-acres in 2010. Cumulatively, the average stand size is 1.51-acres with an average density rating of 2.10 per stand. In 2011, the average stand size was 1.00-acres with an average

density rating of 1.00 per stand. The increases in stand size and stand density is attributable to large increases in spatial distribution and densities observed between 2011 and 2012. Additionally, the density of 16 stands increased at an average increase of 2.31 in density, while no stands decreased in density.

Additionally, 54 stands changed in spatial coverage with a net change of 38.31-acres overall. The total gross change observed is 78.02-acres with an average gross change of 1.44-acres per stand. 10 stands accounted for about 61-acres that either increased or decreased in size.

The average stand density increased dramatically to 2.10 (the highest recorded density) in 2012 following the lowest average density recorded at Brule (1.00 per stand) in 2011. This followed the dramatic decrease observed between 2010 and 2011 when the average density dropped from 2.08 to 1.00. 16 stands decreased in density between 2011 and 2012, while none decreased. These 16 stands accounted for an average density increase of 2.31 per stand.

Out of the 58 observed, 11 stands have a high density rating (>75% cover) compared to none in 2011. They cover approximately 10.05-acres, which is far below the peak of 26.76-acres in 2010. This is a complete reversal in the trend of decreasing acres of high density stands between 2010 and 2011.

35 of the 58 stands have very low densities (<25% cover) of Eurasian water milfoil with single stems growing sporadically among a lot of native species. The most common native species included northern water milfoil (*Myriophyllum sibiricum*), two-leaf water milfoil (*Myriophyllum heterophyllum*), a variety of pondweeds (*Potamogetan* sp.), common waterweed (*Elodea canadensis*), bladderwort (*Utricularia* sp.), coon's tail (*Ceratophyllum demersum*), water celery (*Vallisneria americana*), yellow pond lilies (*Nuphar* sp.), and white pond lily (*Nymphaea odorata*). The 35 low densities stands account for approximately 60% (24.37-acres) of the total area observed to have Eurasian water milfoil present.

### Conclusions

Generally, a decrease in observed purple loosestrife presence was documented at the We Energies reservoirs monitored in 2012. It was discouraging that a new location of purple loosestrife was observed in the Brule Reservoir for the first time in 2010. The entire plant was removed including the flowering heads, stems, and root mass. No purple loosestrife was found at Brule in 2012.

Substantial increases in the number Eurasian water milfoil stands (+132%), total acres (+80-acres), average stand size (+400%), and average density rating per stand (+110%) were observed in the Brule project area from 2011 to 2012. 11 dense stands (>75% cover) were observed and only 60% were documented as sparse stands (<25% cover). Sixteen stands increased in density, while none decreased. These are all negative trends from the perspective that the Eurasian water milfoil became dramatically worse between 2011 and 2012. The only apparent positive trends observed were increases in the number and acreage of low density stands; although, in this case it is a negative trend in that it corresponds directly to a dramatic increase in the number and distribution of stands observed between 2011 and 2012.

These dramatic increases followed peak lows observed in 2011. The two years previous (2009 & 2010) were also years where peak highs were observed. In other words, steady increases in Eurasian water milfoil distribution and densities were generally observed leading up to the peak in 2010, the milfoil population crashed in 2011, and then peaked again in 2012. Consistently, changes in the number of stands, overall coverage, spatial distribution of individual stands, and stand densities continue to be observed on an annual basis in Brule and all of the We Energies

reservoirs where Eurasian water milfoil is present throughout the Menominee River system. Conditions exhibit a majority of positive trends some years, remain relatively constant in others, and also dramatically become much worse as observed at Brule in 2012. Refer to the attached annual Eurasian water milfoil monitoring summary tables for a complete summary of data results since detailed observations were first recorded in 2006.

These trends indicate the Eurasian water milfoil population is in flux from year to year. Contributing factors include influences of local and annual climate variances (i.e. precipitation and temperature), the presence of the indigenous milfoil weevil population, extent of milfoil hybridization, and others.

Annual fluctuations in the extent and density of Eurasian water milfoil appear to be due, in large part, to the presence of an indigenous weevil population occurring in the system. After four years of monitoring the weevil population, positive trends are being observed between weevil population and Eurasian water milfoil population fluctuations. These trends indicate the indigenous weevil population tends to increase as the Eurasian water milfoil population increases. Evidence shows the milfoil populations ultimately spike before declining. The weevil populations tend to lag behind the milfoil population spike, and it spikes as the milfoil population begins declining and crashes as observed in some reservoirs. The weevil population spikes are followed by substantial decreases in the respective populations. It appears a cycle occurs between these two populations. See the attached results and discussion regarding the Eurasian water milfoil summary report prepared by EnviroScience for further information about milfoil management activities that occurred in 2012.

**Table 1BR. 2012 Brule Reservoir  
Eurasian Water Milfoil Stand Data**

<b>Stand Number</b>	<b>Density<sup>1</sup></b>	<b>Mat Thickness</b>	<b>Stand Size<sup>2</sup></b>
1	4 (+3)	None	0.3 (-0.08)
2	Not Present	NA	NA
3	4 (+3)	None	1.05 (+0.97)
4	3 (+2)	None	7.34 (+6.56)
5	3	None	0.85
6	1	None	4.91 (+1.89)
7	3 (+2)	None	6.5 (+6.49)
8	1	None	0.55
9	Not Present	NA	NA
10	4 (+3)	None	3.02 (+2.75)
11	3 (+2)	None	2.44 (+2.43)
12	Not Present	NA	NA
13	1	None	0.09
14	1	None	0.04
15	4	None	0.84
16	4 (+3)	None	0.13 (+0.12)
17	1	None	0.01
18	1	None	0.10
19	Not Present	NA	NA
20	3	None	2.32
21	1	None	5.69 (+5.66)
22	Not Present	NA	NA
23	1	None	0.15
24	1	None	3.61
25	1	None	1.56
26	Not Present	NA	NA
27	Number Skip	NA	NA
28	Not Present	NA	NA
29	1	None	0.01
30	1	None	2.25
31	4 (+3)	None	3.3 (+1.52)
32	1	None	0.09 (+0.08)
33	3	None	0.18
34	Not Present	NA	NA
35	Not Present	NA	NA
36	1	None	3.05 (+3.04)
37	Not Present	NA	NA
38	Not Present	NA	NA
39	Not Present	NA	NA
40	1	None	0.77
41	4 (+3)	None	0.3 (+0.29)
42	Not Present	NA	NA
43	Not Present	NA	NA
44	Not Present	NA	NA
45	Not Present	NA	NA
46	Not Present	NA	NA
47	Not Present	NA	NA



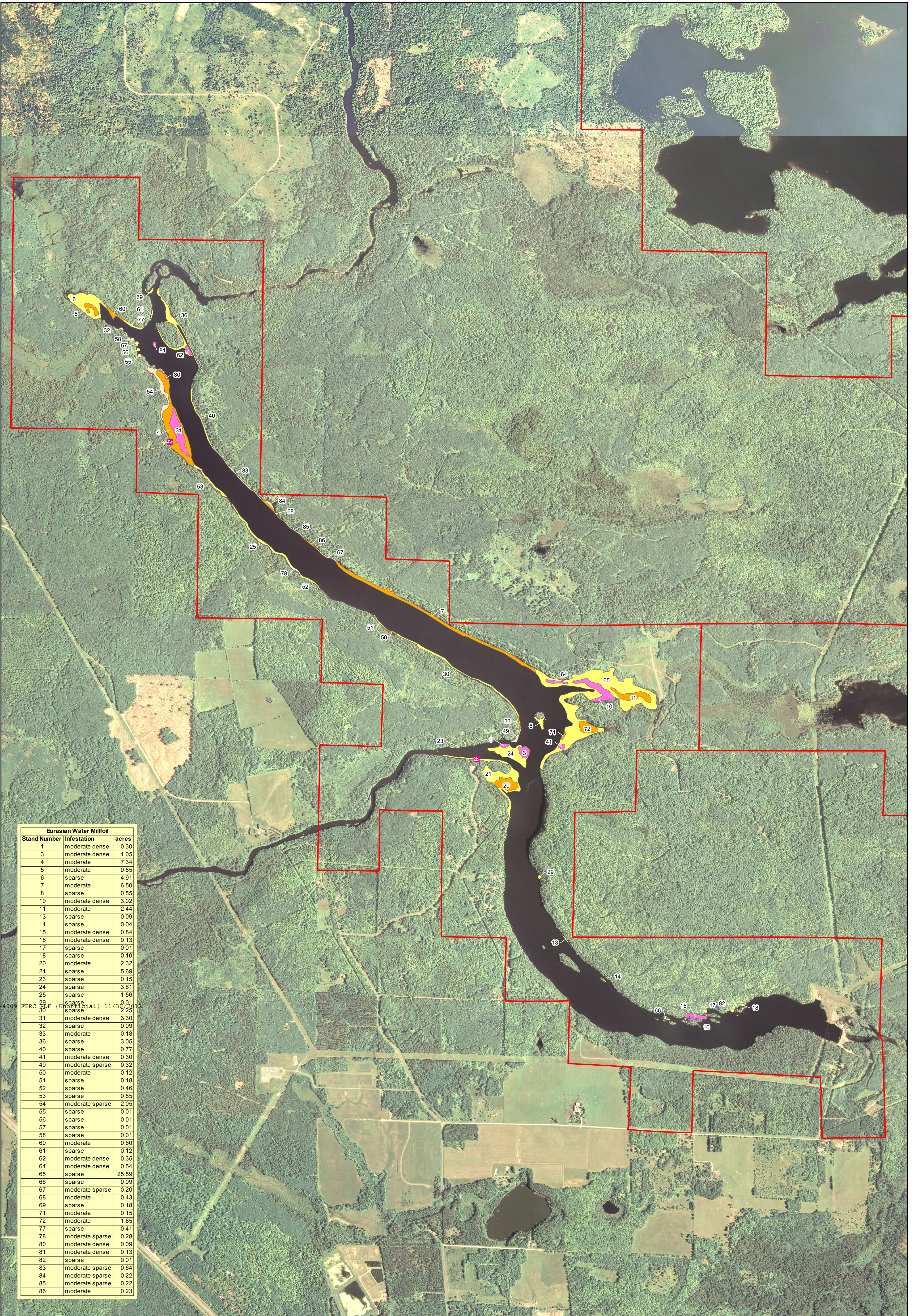
**Table 1BR. 2012 Brule Reservoir  
Eurasian Water Milfoil Stand Data**

<b>Stand Number</b>	<b>Density<sup>1</sup></b>	<b>Mat Thickness</b>	<b>Stand Size<sup>2</sup></b>
48	Not Present	NA	NA
49	2 (+1)	None	0.32 (+0.31)
50	3	None	0.12
51	1	None	0.18
52	1	None	0.46 (+0.45)
53	1	None	0.85
54	2 (+1)	None	2.05 (+1.27)
55	1	None	0.01
56	1	None	0.01
57	1	None	0.01
58	1	None	0.01
59	Not Present	NA	NA
60	3	None	0.60
61	1	None	0.12
62	4 (+3)	None	0.35 (+0.34)
63	Not Present	NA	NA
64	4 (+3)	None	0.54 (+0.53)
65	1	None	25.59
66	1	None	0.09
67	2	None	0.20
68	3 (+2)	None	0.43 (+0.28)
69	1	None	0.18
70	Not Present	NA	NA
71	3	None	0.15
72	3 (+2)	None	1.65 (+1.64)
73	Combined with 65	NA	NA
74	Combined with 65	NA	NA
75	Combined with 65	NA	NA
76	Combined with 65	NA	NA
77	1	None	0.41
78	2 (+1)	None	0.28 (+0.27)
79	Not Present	NA	NA
80	4	None	0.09
81	4	None	0.13
83	2	None	0.64
82	1	None	0.01
84	2	None	0.22
85	2	None	0.22
86	3	None	0.23

1 – (+/-) change in density rating from 2011 to 2012

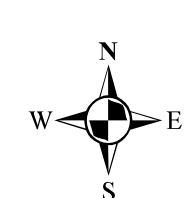
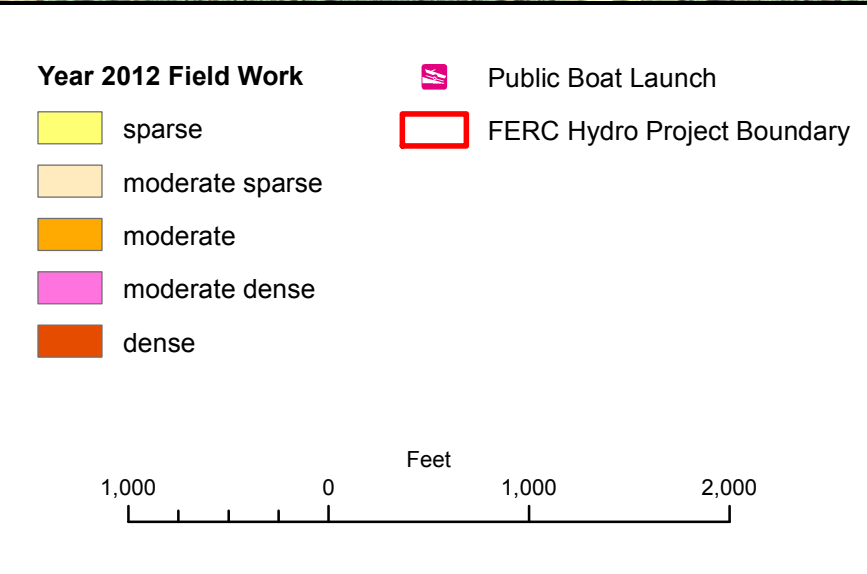
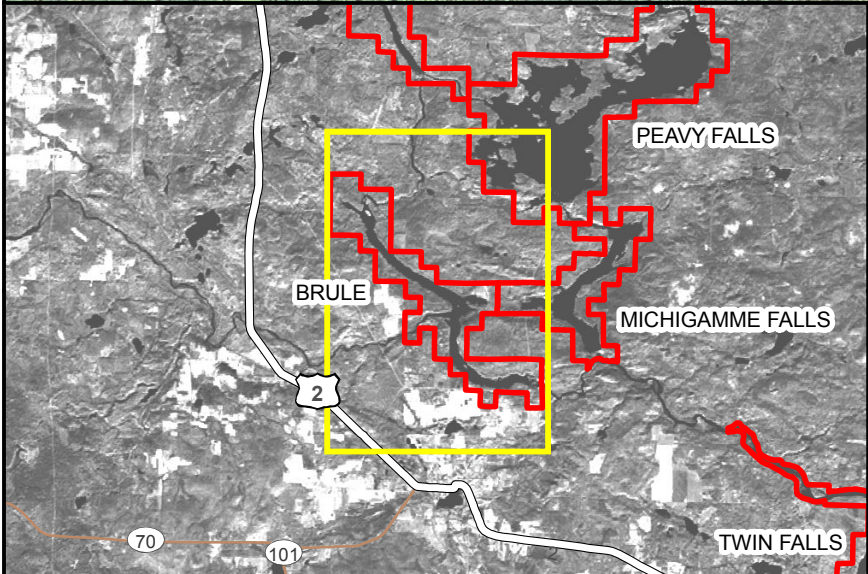
2 – (+/-) change in stand size in acres from 2011 to 2012





Stand Number	Infestation	acres
1	moderate dense	0.30
3	moderate dense	1.05
4	moderate	7.34
5	moderate	0.85
6	sparse	4.91
7	moderate	6.50
8	sparse	0.55
10	moderate dense	3.02
11	moderate	2.44
13	sparse	0.09
14	sparse	0.04
15	moderate dense	0.84
16	moderate dense	0.13
17	sparse	0.01
18	sparse	0.10
20	moderate	2.32
21	sparse	5.69
23	sparse	0.15
24	sparse	3.61
25	sparse	1.56
29	sparse	0.01
30	sparse	2.25
31	moderate dense	3.30
32	sparse	0.09
33	moderate	0.18
36	sparse	3.05
40	sparse	0.77
41	moderate dense	0.30
49	moderate sparse	0.32
50	moderate	0.12
51	sparse	0.18
52	sparse	0.46
53	sparse	0.85
54	moderate sparse	2.05
55	sparse	0.01
56	sparse	0.01
57	sparse	0.01
58	sparse	0.01
60	moderate	0.60
61	sparse	0.12
62	moderate dense	0.35
64	moderate dense	0.54
65	sparse	25.59
66	sparse	0.09
67	moderate sparse	0.20
68	moderate	0.43
69	sparse	0.18
71	moderate	0.15
72	moderate	1.65
77	sparse	0.41
78	moderate sparse	0.28
80	moderate dense	0.09
81	moderate dense	0.13
82	sparse	0.01
83	moderate sparse	0.64
84	moderate sparse	0.22
85	moderate sparse	0.22
86	moderate	0.23

20121130 4009 FERC Form (Initial) 11-30-12



**Brule Hydro Project - Year 2012  
Eurasian Water Milfoil and Purple Loosestrife Survey**

Source: USDA - NAIP Imagery, 2010  
GPS field data collected 7/30/2012