We Energies
2012 Annual Report - Nuisance Plant Control Survey
Twin Falls
Project #11831-000

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 Twin Falls Reservoir project on July 29 and August 2, 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 2012 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 1TF. 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:

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

Results and Discussion

No purple loosestrife plants were observed along the shores of the Twin Falls Reservoir project area.

One hundred and seven stands of Eurasian water milfoil were observed to occur in 2010 at Twin Falls (attached map), an increase of 17 stands from 2010. While there were 30 new stands recorded, 17 were observed to be absent in 2012, and 5 stands were merged with other stands. The identified stands are distributed throughout the project area and range in size from <0.01-acre up to 68.08-acres.

Eurasian water milfoil is present in approximately 245.98-acres in the Twin Falls Reservoir project area, an increase of only 0.13-acre from 2010, and about 30-acres since 2006. Cumulatively, the average stand size is 2.30-acres and has an average density rating of 1.96 per stand. In 2010, the average stand size was 2.73-acres and had an average density rating of 1.63 per stand. While the number of observed stands increased, the stand size decreased to the lowest recorded since detailed monitoring began in 2006. The decrease in stand size is largely attributable to the 19% increase in total stands observed from 2010 to 2012. The

average density rating per stand increased by over 20% during the two year period. This is attributable to having 15 stands increase at an average increase of 1.67 in density, while only 7 stands decreased in density at an average decrease of 1.43 per stand.

Additionally, 67 stands changed in spatial coverage with a net change of -0.01-acres overall, meaning there was no net change of acreage among those stands that changed in size. The total gross change observed is 122.59-acres with an average gross change of 1.83-acres per stand. 13 stands accounted for about 62-acres (25% of the total acreage) that either increased or decreased in size (approximate 4.8-acre average change).

Out of the 107 observed stands, 17 stands were observed with high densities (>75% cover). Of these, 4 of them increased by an average rating of 3; 7 of them were observed as new stands. Combined, the 17 stands account for about 20% (50.14-acres) of the total area observed to have Eurasian water milfoil present, which is up from only 2% in 2010.

69 of the 107 stands have very low densities (<25% cover) of Eurasian water milfoil with single stems growing sporadically among 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*). These low density stands account for 70% (144.79-acres) of the total area observed to have Eurasian water milfoil present, up from 59% in 2009.

Conclusions

In conclusion, many of the changes exhibited in Twin Falls are a continuation of the negative trends observed between 2006 and 2008. However, indications of a few positive or stabilizing trends appear to be occurring between 2010 and 2012. Negative trends observed in 2012 included the percent increase in number of stands (19%) and average stand density (+20%) as well as increases in the number of new stands (30), stands that increased in density (15) , and high density stands (17). Additionally, increases were observed in the acres of high density stands (+45.63), percent of high density stands (+15%), and percent acreage of high density stands (+18%). The most obvious changes occurred in the western portions of Badwater Lake where significant increases in densities continued to be observed in 2012.

There were positive trends observed including a decrease in average stand size (-16%) and increase in the percent of spatial coverage of low density stands (+19%). Similarly, the acres of low density stands increased by over 27-acres while the total acreage remained stable between 2010 and 2012. Finally, 7 stands decreased in density, although this was offset by the 15 stands that increased in density.

Of particular note with respect to observed changes, the spatial distribution of the stands changed dramatically. While there was almost no net change in the acreage among stands that changed in spatial distribution, over 122-acres of spatial distribution occurred in 67 stands at an average change of just under 2-acres per stand.

Overall, the Eurasian water milfoil infestation in Twin Falls displayed negative trends between 2010 and 2012; however, some positive trends were also observed. 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 Twin Falls 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 decrease as observed at Twin Falls 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 1TF. 2012 Twin Falls Reservoir
Eurasian Water Milfoil Stand Data

Stand Number	Density[1]	Mat Thickness	Stand Size[2]
1	1	None	0.01
2	1	None	0.33
3	1	None	0.14 (+0.05)
4	Not Present	NA	NA
5	1	None	0.24 (+0.2)
6	Not Present	NA	NA
7	1	None	0.76
8	1	None	0.48
9	Not Present	NA	NA
10	1	None	13.91 (-0.91)
11	1	None	0.84 (-0.7)
12	1	None	1.18
13	1	None	0.78
14	1	None	0.80
15	Not Present	NA	NA
16	Not Present	NA	NA
17	Combined with 18	NA	NA
18	1 (+1)	None	2.77 (+2.77)
19	1	None	5.42 (-3.67)
20	4 (+1)	None	5.83 (+1.19)
21	1	None	0.11 (-0.31)
22	1	None	0.94
23	1	None	7.31 (-0.54)
24	1	None	0.01
25	1	None	0.4 (-0.13)
26	1	None	0.49
27	1	None	0.49 (+0.38)
28	Combined with 27	NA	NA
29	Not Present	NA	NA
30	Not Present	NA	NA
31	1	None	0.43
32	1	None	0.42 (-0.64)
33	1	None	6.1 (-0.58)
34	1	None	10.07 (-2.5)
35	5 (+2)	None	0.32
36	(-1)	None	0 (-0.14)
37	1	None	0.38
38	3 (+1)	None	0.48
39	3 (+1)	None	1.37
40	1	None	4.3 (-2.72)
41	4 (+1)	None	3.68 (+2.17)
42	1 (-2)	None	4.42 (+0.15)
43	4 (+4)	None	0.07 (+0.07)
44	1	None	0.37
45	1	None	11.13 (+0.72)
46	Not Present	NA	NA
47	Not Present	NA	NA
48	Not Present	NA	NA

Table 1TF. 2012 Twin Falls Reservoir
Eurasian Water Milfoil Stand Data

Stand Number	Density[1]	Mat Thickness	Stand Size[2]
49	3	None	5.90 (-1.23)
50	Combined with 55	NA	NA
51	1	None	0.03
52	1 (-1)	None	1.15 (-0.36)
53	Not Present	NA	NA
54	Not Present	NA	NA
55	1 (-2)	None	68.08 (+23.18)
56	Combined with 70	NA	NA
57	Not Present	NA	NA
58	Not Present	NA	NA
59	Not Present	NA	NA
60	4	None	3.57 (-0.94)
61	Not Present	NA	NA
62	3	None	1.56 (-0.05)
63	1	None	6.06 (-2.85)
64	Not Present	NA	NA
65	3 (-1)	None	3.55 (+0.44)
66	Not Present	NA	NA
67	1	None	0.32 (-0.08)
68	Not Present	NA	NA
69	3 (-2)	None	0.19
70	4	None	27.65 (+12.73)
71	Combined with 50	NA	NA
72	2	None	1.35 (+0.54)
73	4	None	0.04
74	5 (+2)	None	0.98
75	3 (+2)	None	0.50
76	1	None	1.06
77	3 (+1)	None	0.45 (-3.12)
78	1	None	0.68 (+0.4)
79	Not Present	NA	NA
80	1	None	0.01
81	4 (+4)	None	0.06 (+0.06)
82	1	None	0.01
83	1 (+1)	None	0.34 (+0.34)
84	2 (+1)	None	0.72
85	1	None	0.47
86	1	None	1.99
87	1	None	0.03 (+0.02)
88	1	None	0.09
89	1	None	0.01 (-0.02)
90	1	None	1.10 (-0.29)
91	Not Present	NA	NA
92	3	None	1.38 (-0.40)
93	3	None	0.31
94	Not Present	NA	NA
95	1	None	0.38
96	Not Present	NA	NA

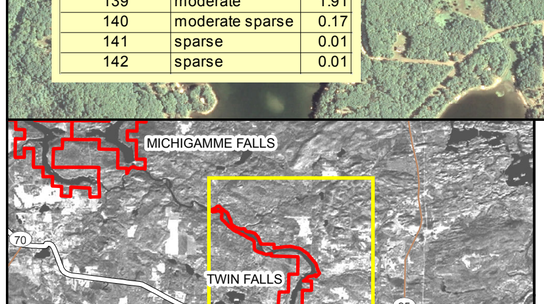
Table 1TF. 2012 Twin Falls Reservoir
Eurasian Water Milfoil Stand Data

Stand Number	Density[1]	Mat Thickness	Stand Size[2]
97	Not Present	NA	NA
98	Combined with 55	NA	NA
99	3 (-1)	None	1.75 (+1.16)
100	Combined with 55	NA	NA
101	3	None	1.23 (+0.36)
102	Number Skip	NA	NA
103	4	None	2.23 (-0.77)
104	3 (+2)	None	0.05
105	1	None	0.01
106	2 (+1)	None	1.56 (+0.26)
107	1	None	0.19 (+0.18)
108	1	None	4.12 (+3.12)
109	1	None	1.03 (+0.79)
110	1	None	1.18 (+0.49)
111	Combined with 109	NA	NA
112	Not Present	NA	NA
113	2	None	0.27
114	1	None	0.51
115	1	None	0.15
116	1	None	0.98
117	4	None	0.29
118	4	None	0.69
119	4	None	0.71
120	1	None	0.28
121	1	None	0.01
122	1	None	0.01
123	1	None	0.01
124	1	None	0.41
125	1	None	0.62
126	3	None	1.69
127	3	None	0.22
128	2	None	0.49
129	3	None	0.09
130	4	None	1.79
131	3	None	0.21
132	4	None	0.17
133	3	None	0.07
134	4	None	1.02
135	3	None	0.50
136	4	None	1.04
137	3	None	0.31
138	2	None	1.12
139	3	None	1.91
140	2	None	0.17
141	1	None	0.01
142	1	None	0.01

1 – (+/-) change in density rating from 2010 to 2012

2 – (+/-) change in stand size in acres from 2010 to 2012

Eurasian Water Millfoil		
Stand Number	Infestation	acres
1	sparse	0.01
2	sparse	0.33
3	sparse	0.14
5	sparse	0.24
7	sparse	0.76
8	sparse	0.48
10	sparse	13.91
11	sparse	0.84
12	sparse	1.18
13	sparse	0.78
14	sparse	0.80
18	sparse	2.77
19	moderate	5.42
20	moderate dense	5.83
21	sparse	0.11
22	sparse	0.94
23	sparse	7.31
24	sparse	0.01
25	sparse	0.40
26	sparse	0.49
27	sparse	0.49
31	sparse	0.43
32	sparse	0.42
33	sparse	6.10
34	sparse	10.07
35	dense	0.32
37	sparse	0.38
38	moderate	0.48
39	moderate	1.37
40	moderate sparse	4.30
41	moderate dense	3.68
42	sparse	4.42
43	moderate dense	0.07
44	sparse	0.37
45	sparse	11.13
49	moderate	5.90
51	sparse	0.03
52	sparse	1.15
55	sparse	68.08
60	moderate dense	3.57
62	moderate	1.56
63	sparse	6.06
65	moderate	3.55
67	sparse	0.32
69	moderate	0.19
70	moderate dense	27.65
72	moderate sparse	1.35
73	moderate dense	0.04
74	dense	0.98
75	moderate	0.50
76	sparse	1.06
77	moderate	0.45
78	sparse	0.68
80	sparse	0.01
81	moderate dense	0.06
82	sparse	0.01
83	sparse	0.34
84	moderate sparse	0.72
85	sparse	0.47
86	sparse	1.99
87	sparse	0.03
88	sparse	0.09
89	sparse	0.01
90	sparse	1.10
92	moderate	1.38
93	moderate	0.31
95	sparse	0.38
99	moderate	1.75
101	moderate	1.23
103	moderate dense	2.20
104	moderate	0.05
105	sparse	0.01
106	moderate sparse	1.56
107	sparse	0.19
108	sparse	4.12
109	sparse	1.03
110	sparse	1.18
113	moderate sparse	0.27
114	sparse	0.51
115	sparse	0.15
116	sparse	0.98
117	moderate dense	0.29
118	moderate dense	0.69
119	moderate dense	0.71
120	sparse	0.28
121	sparse	0.01
122	sparse	0.01
123	sparse	0.01
124	sparse	0.41
125	sparse	0.62
126	moderate	1.69
127	moderate	0.22
128	moderate sparse	0.49
129	moderate	0.09
130	moderate dense	1.79
131	moderate	0.21
132	moderate dense	0.17
133	moderate	0.07
134	moderate dense	1.02
135	moderate	0.50
136	moderate dense	1.04
137	moderate	0.31
138	moderate sparse	1.12
139	moderate	1.91
140	moderate sparse	0.17
141	sparse	0.01
142	sparse	0.01



Year 2012 Field Work

- sparse
- moderate sparse
- moderate
- moderate dense
- dense

- Public Boat Launch
- FERC Hydro Project Boundary

Feet
1,000 0 1,000 2,000

N
W E
S

Twin Falls Hydro Project - Year 2012
Eurasian Water Milfoil and Purple Loosestrife Survey

Source: USDA -NAIP Imagery, 2010
GPS field data collected 7/29/2012 & 8/2/2012