

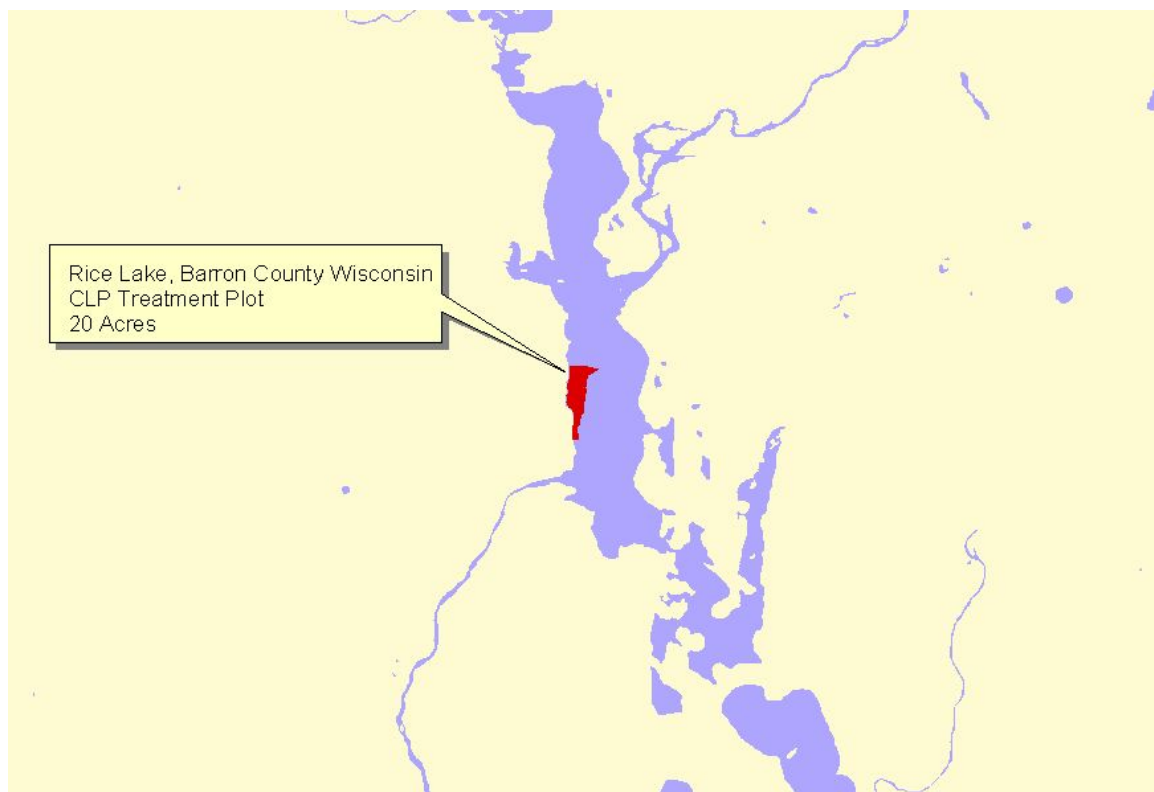
## Rice Lake CLP Treatment Analysis-2009

### Introduction

In May 2009 a 20-acre bed of *Potamogeton crispus*-curly leaf pondweed (CLP) was treated with herbicide (endothall) (see figure 1). Prior to treatment, a pre-treatment survey was conducted at 106 predetermined sample points. The density of CLP was recorded at each sample point, along with depth and dominant sediment type. See figure 2 for sample points.

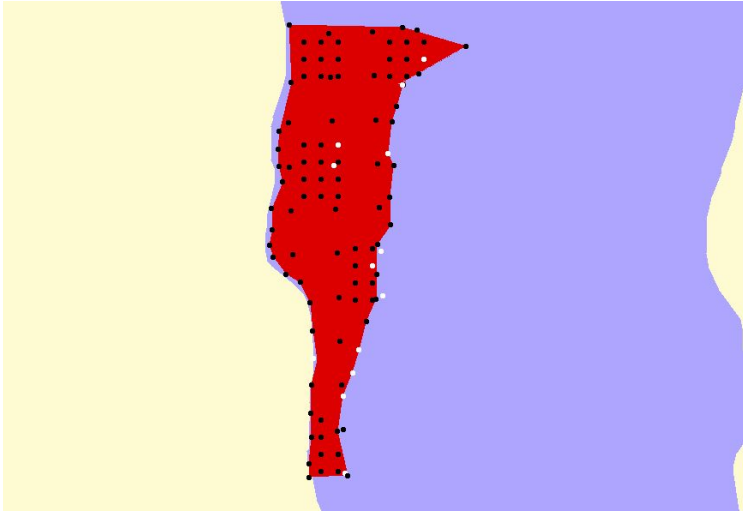
Approximately 4 weeks after treatment took place, a post-treatment survey was conducted. Each of the sample points used in the pre-treatment survey was used. The CLP density was recorded as well as the density of each native plant species found.

To examine the effectiveness of an herbicide treatment, data collected one year prior to the treatment is compared to the post-treatment survey. Because the first year data is limited to a small number of points used in the PI survey, and that CLP had died back during the PI survey in the prior year, it is difficult to follow this protocol. However, if the pre-treatment density is compared to the post-treatment density, effectiveness can be evaluated. This is based on the premise that if the CLP density is present early in the season, this density should at the very least stay the same, or could possibly increase. If the density decreases or the CLP is gone from that sample point, we could deem the herbicide successful at that point. The native plants present in the PI survey one year prior will be used to see how the native plants responded. The native plant data from this year's post treatment survey can be used in future years.



*Figure 1: CLP treatment site polygon.*





*Figure 3: Map of pre-treatment sample points with CLP (black) and without (white)*

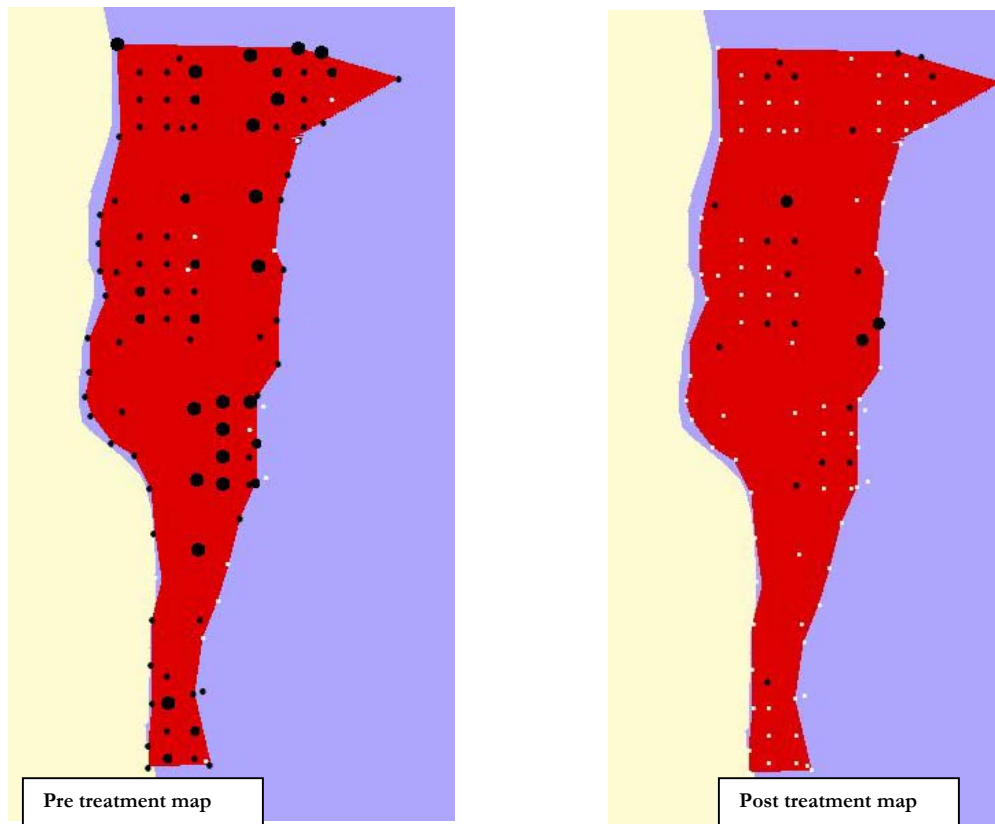
### Post treatment survey

The post-treatment survey showed a significant decrease in CLP coverage and density. The frequency of the CLP went from 88% of the points in the pre treatment survey to 22% of the points (chi square determined this was a significant decrease). The mean density of all points with CLP went from 1.33 to 0.25, which a t-test determined was a significant decrease. In addition the mean density when considering only sample points with CLP in the pre treatment survey went from 1.50 to 0.27. Again the t-test showed this to be a significant reduction.

<b>Statistic</b>	<b>Pre treatment</b>	<b>Post Treatment</b>	<b>Change</b>	<b>Significant</b>
Frequency	0.88	0.22	-	Yes (P<0.05 with chi square)
Mean density all pts	1.33	0.25	-	Yes (P<0.05 with t-test)
Mean density pre-treat CLP pts	1.50	0.27	-	Yes (P<0.05 with t-test)

*Table 1: Statistical summary of pre treatment and post treatment surveys.*

Figure 4 shows the comparison of the pre treatment density to the post treatment density. The larger the black dots the higher the density with white being a density of "0". This shows graphically a significant change, which is supported by the statistical analysis.



*Figure 4: Pre treatment survey and post treatment survey density maps.*

Another aspect of the treatment effect is a comparison of the native plant's response to the herbicide. Unfortunately the only potential comparisons is between the sample points that were part of the point intercept survey from 2008 and those common points that fall within the boundaries of the CLP polygon. This limits the points to be compared in addition to the difference in data collection time. The point intercept survey was conducted in late July to early August while the post treatment survey of 2009 was conducted in June. This could lead to invalid data as some of the natives may not have been robust enough to be sampled in the post treatment survey. Nonetheless, these points were used for a native plant response and is summarized in Table 2.

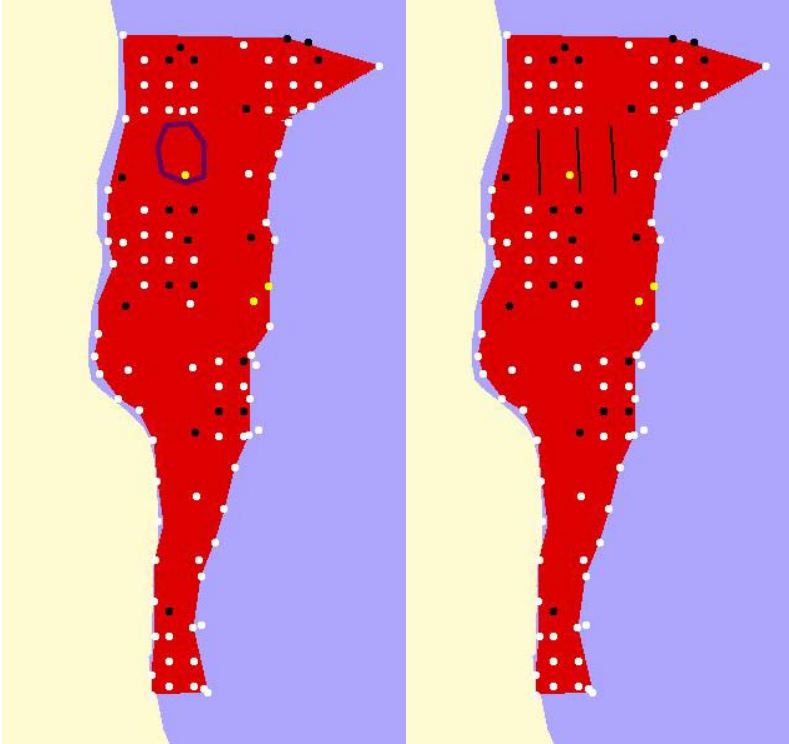
Species	Sampled	Sampled	Change	P	Significant
	in 2008	in 2009			
	PI-24 pts	post treat- 24pts			
Coontail	14	9	decrease	0.148562	no
Elodea	11	13	increase	0.563703	no
Filamentous algae	0	2	increase	0.148562	no
Flat-stem pondweed	4	0	decrease	0.04	yes
Forked duckweed	1	3	increase	0.29627	no
Leafy pondweed	2	0	decrease	0.15	no
<i>Nitella sp.</i>	1	0	decrease	0.31	no
Northern milfoil	5	3	decrease	0.438578	no
Small pondweed	7	0	decrease	0.004	yes
Stiffwater crowfoot	0	2	increase	0.148562	no
Wild celery	6	2	decrease	0.121335	no

**Table 2: Summary of native plants from PI survey in 2008 and post treatment survey in 2009.**

As can be seen in Table 2, the native plants didn't seem adversely affected across the board. Two species appear to have a significant decrease (as determined by a chi square analysis). However, this could be due to the difference in the sampling times in the summer as mentioned earlier. There were also numerous species that had an apparent increase, but they are not considered significant. As a result, it appears the herbicide had no major effect on the native plants at those sample points.

## Summary

It appears that the 2009 herbicide treatment of CLP on Rice Lake was effective in the 20 acre plot. Statistical analysis shows significant decreases in frequency of occurrence and density at the sample points. There were a few locations outside of the sample points but within the treatment polygon that seemed unaffected. Figure 5 shows these areas. This would not be reflected in the statistical analysis as there were no sample points in these locations. Had there been, it may have made the decreases less significant.



*Figure 5: Maps of areas the seemed to be unaffected by herbicide.*

These two areas seemed to have been missed by the applicator. In the first map, an area is approximated as to a bed that was near or at the surface. The second map shows actual strips of CLP. It is assumed that this may be due to lack of overlap of application areas and resulted in these untreated strips.

The native plants seem unaffected by the herbicides. Although the analysis is limited by data points, no significant decrease in most native species seems to have occurred. If herbicide treatment should take place next spring (2010), the native species can be evaluated at all sample points.

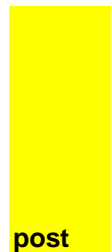
## Appendix-Data

Sample point	LAT	LONG	DEPTH	Pre treat CLP	Post treat CLP	Coontail	Elolea	Northern milfoil	Forked duckweed	Wild celery	Whitewater crowfoot	Clasping pondweed	Arum arrowhead	Robbin's pondweed	Nitella sp	Small pondweed	Stargrass	Flat-stem pondweed	Filamentous algae
RICE136	45.507122710	-91.730758090	4	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
RICE137	45.506546900	-91.730740440	5	1	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0
RICE138	45.505971090	-91.730722790	5	1	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0
RICE139	45.505395280	-91.730705140	5	1	0	1	2	0	0	0	1	0	0	0	0	0	0	0	0
RICE182	45.508286740	-91.729974470	5	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
RICE183	45.507710930	-91.729956830	4	1	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0
RICE184	45.507135120	-91.729939180	3	2	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0
RICE185	45.506559310	-91.729921540	3	0	1	0	2	0	0	1	0	0	0	0	0	0	0	0	0
RICE186	45.505983500	-91.729903900	3	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1
RICE187	45.505407690	-91.729886260	6	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
RICE188	45.504831880	-91.729868620	6	3	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0
RICE189	45.504256070	-91.729850970	6	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
RICE190	45.503680260	-91.729833330	6	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
RICE191	45.503104450	-91.729815700	12	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE192	45.502528650	-91.729798060	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE239	45.508299140	-91.729155540	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE240	45.507723330	-91.729137910	7	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE241	45.507147520	-91.729120270	10	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE242	45.506571710	-91.729102640	8	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE243	45.505995900	-91.729085000	7	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE244	45.505420090	-91.729067370	11	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE245	45.504844280	-91.729049740	12	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
RICE297	45.508311540	-91.728336610	8	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE298	45.507735730	-91.728318990	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	45.507602160	-91.728609210	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	45.507594110	-91.728610000		0					0	0	0	0	0	0	0	0	0	0	0
3	45.507318560	-91.728731320	5	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
4	45.507111910	-91.728822310	10	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1
5	45.506700070	-91.728907010	10	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
6	45.506541950	-91.728804850	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	45.506130110	-91.728889560	7	1	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0
8	45.505765340	-91.728878390	10	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
9	45.505510630	-91.729130090	7	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	45.505122570	-91.729150640	10	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
11	45.504802900	-91.729173290	8	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	45.504503580	-91.729358750	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	45.504136350	-91.729509680	8	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
14	45.503838010	-91.729630290	10	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
15	45.503538680	-91.729815740	9	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
16	45.503080750	-91.729931460	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
17	45.502490450	-91.729751200	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
18	45.502479650	-91.730464450	2	1	0	0	2	0	0	1	0	1	0	0	0	0	0	0	0
19	45.502662030	-91.730470040	3	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
20	45.503004990	-91.730415680	3	1	0	0	2	0	0	0	1	1	0	0	0	0	0	0	0

21	45.503324160	-91.730425460	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
22	45.503689430	-91.730404220	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	45.504032380	-91.730349860	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
24	45.504397160	-91.730361030	4	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
25	45.504761440	-91.730404630	3	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0
26	45.505032560	-91.730575130	4	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0
27	45.505142620	-91.730838000	4	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0
28	45.505367160	-91.731071950	4	1	0	1	1	0	0	0	0	0	0	0	0	0	0	1
29	45.505525770	-91.731141690	5	1	0	1	1	0	1	0	0	0	0	0	0	0	1	0
30	45.505731940	-91.731083130	5	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
31	45.506005520	-91.731091520		1			0	0	0	0	0	0	0	0	0	0	0	0
32	45.506350930	-91.730875040	5	1	0	1	1	0	1	0	0	0	0	0	0	0	0	1
33	45.506555130	-91.730946180	5	1	0	0	1	0	1	0	0	0	0	0	0	0	0	1
34	45.506783110	-91.730953170	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
35	45.507011590	-91.730927740	2	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0
36	45.507653870	-91.730687920	4	1	0	1	1	0	1	1	0	0	0	0	0	0	0	0
37	45.508406210	-91.730710980	3	3	0	1	1	0	0	1	1	1	0	0	0	0	0	0
38	45.508346940	-91.728600610	7	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0
39	45.508091020	-91.727424970	11	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Poly1-11	45.508178930	-91.730442150	5	1	0	2	0	1	0	0	1	0	0	0	0	0	0	0
Poly1-12	45.507953950	-91.730447210	4	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0
Poly1-13	45.507728980	-91.730452270	4	1	0	2	1	1	0	0	0	0	0	0	0	0	0	0
Poly1-26	45.508175370	-91.730122190	4	1	1	0	0	3	0	0	0	0	0	0	0	0	0	0
Poly1-27	45.507950400	-91.730127250	4	1	0	1	0	3	0	0	1	0	0	0	0	0	0	0
Poly1-28	45.507725430	-91.730132310	4	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0
Poly1-52	45.508171810	-91.729802230	7	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Poly1-53	45.507946840	-91.729807290	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poly1-54	45.507721870	-91.729812350	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poly2-111	45.508161130	-91.728842350	11	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Poly2-112	45.507936160	-91.728847410	10	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Poly2-113	45.507711190	-91.728852480	12	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Poly2-119	45.508157570	-91.728522390	12	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Poly2-120	45.507932600	-91.728527450	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poly2-121	45.507707630	-91.728532520	13	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Poly2-122	45.508154010	-91.728202430	10	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Poly2-123	45.507929040	-91.728207500	12	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
Poly3-17	45.506829090	-91.730472500	4	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1
Poly3-18	45.506604120	-91.730477560	4	1	0	1	2	0	1	0	0	0	0	0	0	0	1	0
Poly3-19	45.506379150	-91.730482610	5	2	0	1	1	1	1	0	0	0	0	0	0	0	0	0
Poly3-20	45.506154170	-91.730487670	5	2	0	1	1	0	1	0	0	0	0	0	0	0	0	0
Poly3-32	45.506825530	-91.730152540	4	1	1	0	2	1	0	1	0	0	0	0	0	0	0	0
Poly3-33	45.506600560	-91.730157600	4	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0
Poly3-34	45.506375590	-91.730162660	3	1	0	0	1	0	0	1	1	1	0	0	0	0	0	0
Poly3-35	45.506150620	-91.730167720	3	1	1	1	2	2	0	0	1	0	0	0	0	0	0	0
Poly3-58	45.506821980	-91.729832590	3	0	1	0	2	1	0	1	1	1	0	0	0	0	0	0
Poly3-59	45.506597000	-91.729837650	3	2		0	2	1	0	1	1	1	0	0	1	0	0	0
Poly3-60	45.506372030	-91.729842710	3	1	0	1	3	1	0	1	0	0	0	0	1	0	0	0
Poly3-61	45.506147060	-91.729847770	9	2	1	1	2	1	0	1	0	0	0	0	0	0	0	0
Poly4-107	45.505465020	-91.729223060	8	3	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Poly4-108	45.505240050	-91.729228130	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Poly4-109	45.505015080	-91.729233190	10	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Poly4-110	45.504790100	-91.729238250	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poly4-88	45.505468580	-91.729543010	9	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Poly4-89	45.505243610	-91.729548070	9	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poly4-90	45.505018640	-91.729553130	9	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Poly4-91	45.504793660	-91.729558190	10	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Poly5-48	45.503225970	-91.730233480	4	1	1	1	1	0	1	0	1	0	0	0	0	0	0	1
Poly5-49	45.503001000	-91.730238540	4	3	0	1	1	0	1	0	1	0	0	0	0	0	0	1
Poly5-50	45.502776020	-91.730243600	4	1	0	1	2	1	0	0	1	0	0	0	1	0	0	1
Poly5-51	45.502551050	-91.730248660	3	2	0	0	1	1	0	0	1	0	0	0	1	0	0	1
Poly5-74	45.502772470	-91.729923670	11	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poly5-75	45.502547490	-91.729928730	12	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Native stats PI points only



post	Coontail	Elodea	Northern milfoil	Forked duckweed	Wild celery	Whitewater crowfoot	Clasping pondweed	Arum arrowhead	Robbin's pondweed	Nitella sp	Small pondweed	Flat-stem Stargrass	Filamentous pondweed	algae	Flat-stem pondweed	Small pondweed	Leafy pondweed	Nitella sp.
RICE136	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
RICE137	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
RICE138	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE139	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
RICE182	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE183	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE184	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE185	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE186	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
RICE187	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE188	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE189	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE190	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE191	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE241	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE244	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE245	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

RICE297	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE298	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total	<b>9</b>	<b>13</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	0	0	0	0	

PI	Coontail	Elodea	Northern milfoil	Forked duckweed	Wild celery	Whitewater crowfoot	Clasping pondweed	Sagittaria sp	Robbin's pondweed	Nitella sp	Small pondweed	Stargrass	Flat-stem pondweed	Filamentous algae	Flat-stem pondweed	Small pondweed	Leafy pondweed	Nitella pondweed sp.
	RICE136	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1
RICE137	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
RICE138	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
RICE139	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
RICE182	3	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE183	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
RICE184	0	1	1	0	2	0	0	0	0	0	0	0	0	0	1	1	0	0
RICE185	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
RICE186	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1
RICE187	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE188	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE189	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE190	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE191	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE239	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE241	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE242	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

RICE244	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE297	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RICE298	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
<b>Total</b>	<b>14</b>	<b>11</b>	<b>5</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>7</b>	<b>2</b>	<b>1</b>