

Adaptive Management of Flowering Rush Using the Contact Herbicide Diquat in Detroit Lakes, Minnesota 2015



A report to the Pelican River Watershed District

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Geosystems Research Institute Report 5067

April 2016



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Executive Summary

Conclusions

- Based on field evaluations, 2015 sites receiving two submersed treatments with the contact herbicide diquat have resulted in a decrease in rhizome bud density of flowering rush for the fourth year in a row.
- Sites receiving one diquat treatment did not see an increase in rhizome bud density during the growing season.
- Applications of diquat have significantly reduced the nuisance problem and the potential for plants to regrow and spread.
- Diquat treatments do not appear to have a significant effect on species diversity, though some individual species in some plots may have been adversely affected.

Recommendations

- Field evaluations and monitoring of diquat or other herbicides should be continued to determine if reduction in belowground biomass and rhizome bud density is repeatable.
- We recommend that other herbicide active ingredients and use patterns be evaluated under controlled conditions to determine if there are alternatives to diquat treatments, which may be field demonstrated in the future.
- We recommend ongoing assessments to continue through 2016 by harvesting forty core samples in the nine biomass assessment plots: three reference, three receiving one diquat treatment, and three receiving two diquat treatments.

Cite as:

Turnage, G., B. Alcott, and T. Guetter. 2016. Adaptive Management of Flowering Rush Using the Contact Herbicide Diquat in Detroit Lakes, Minnesota 2015. Geosystems Research Institute Report 5067, Geosystems Research Institute, Mississippi State University, Mississippi State, MS. April 2016.

Introduction

Flowering rush (*Butomus umbellatus* L.) is an emergent invasive plant that has invaded the Detroit Lakes area, specifically, Detroit Lake (Big Detroit, Little Detroit, and Curfman Lakes), Lake Sallie, Lake Melissa and Mill Pond (Becker County) since the 1960s. It is native to Europe and Asia and first entered the United States in 1928. Flowering rush has continued to be a problem in the Detroit Lakes system for the past three decades. However, applications of the contact herbicide diquat over the last four years have helped to control the spread and density of the plant.

Although flowering rush has been in North America for over forty years, very little information is known about its biology, ecology, and management. Bellaud (2009) reports that it was first observed in North America in St. Lawrence River (Quebec) in 1897. Flowering rush is currently found in all of the southern Canadian provinces except Alberta, and all of the states bordering Canada and the Great Lakes (NRCS 2013). Bellaud (2009) echoes our current state of affairs with flowering rush: "...there is not a wealth of information regarding the management of flowering rush infestations in North America." Bellaud (2009) cites Minnesota Department of Natural Resources research to support the recommendation to use imazapyr on the exposed foliage of flowering rush. Parkinson and others (2010) are also limited in their management recommendations, citing either imazapyr or imazamox foliar applications for management of flowering rush.

The US Army Engineer Research and Development Center (USAERDC) studied the available aquatic herbicides for control of submersed flowering rush plants from Minnesota and Idaho (Poovey et al. 2012). As part of their study, they determined that populations in both Idaho and Minnesota were triploid, as confirmed by ploidy and AFLP (Poovey et al. 2012). Their studies of Minnesota-derived plants used diquat, endothall and flumioxazin at relatively short exposure times. Flumioxazin did not reduce shoot biomass in either treatment. Diquat at the full label rate (0.37 ppm) and at 6 and 12 hours contact time significantly reduced shoot biomass relative to the reference. Endothall treatments at 1.5 and 3 ppm at both 12 and 24 hours exposure time also reduced shoot biomass. No treatments reduced belowground biomass. In contrast, their studies with Idaho-derived plants found flumioxazin at 400ppb and 24 hours exposure time controlled shoot biomass, and endothall at 3 ppm and 24 hour exposure time controlled both aboveground and belowground biomass (Poovey et al. 2012). They also note that repeated treatments with contact herbicides, or integration with systemic herbicides, would be needed to achieve long-term control. Skogerboe (unpub. data) analyzed in lake treatments of endothall in the Detroit Lakes and determined that the adequate concentration exposure times could not be reached to control flowering rush. However data collected on diquat treatments in the Detroit Lakes in 2012 and 2013 showed significant reduction in above and belowground biomass as well as rhizome bud density (Figure 1; Madsen et al. 2013, 2014). The 2012 diquat protocol was repeated in 2013 and 2014 on flowering rush beds in the Detroit Lakes.

In 2015 the protocol was amended such that sites with low density of flowering rush received only one (<20% prevalence) or no (<5% prevalence) diquat treatments instead of two while sites with high densities (>20% prevalence) of flowering rush still received two diquat treatments. The process of geographic range expansion is characterized by three phases once an invasive reaches new habitat: the lag phase, exponential growth phase, and carrying capacity (Figure 2). The lag phase is seen when invasive species first reach a site; typically invasive plants in this phase are found in very low densities and do not appear to pose a threat as they are not expanding rapidly. The exponential growth phase is seen when plants are actively spreading across a site often doubling in abundance from one year to the next; at this point the species becomes much more noticeable due to its larger geographic range. The carrying capacity phase is achieved when the invasive species has colonized as much available habitat as possible; often this is characterized by large monotypic stands of the invasive where a diverse assemblage of species had been present.

The purpose of amending the protocol was to decrease resources needed on sites with low flowering rush prevalence so that they could be allocated elsewhere to sites with high prevalence of flowering rush. Sites treated once with diquat were treated in July so as to apply herbicide to the maximum amount of sprouted rhizome buds. Sites receiving two treatments were treated in June and July as in years past. The ultimate goal is conversion of all flowering rush sites to low or no prevalence sites (sites characteristic of the lag phase of the invasion process) in the Detroit Lakes system so that a minimum amount of resources is needed to control the species.

Materials and Methods

Treatments were made to manage flowering rush populations at designated treatment areas (Tables 1-2; Figures 3-4) of submersed or mostly submersed plants with the contact herbicide diquat using drop hoses from a boat, in 4 feet and less of water. From two feet to four feet deep, a rate of two gallons per surface acre were used, and in water depths from shoreline to two feet deep, a rate of one gallon per surface acre was applied; as per the US EPA label. The target water column concentration was 0.37 ppm of diquat. Treatments occurred in Big and Little Detroit (Figure 3), Curfman Bay (Figure 3), Sallie (Figure 4), and Melissa Lakes (Figure 4; Tables 1-3). Diquat formulation used was a 2 lbs. per gallon diquat cation formulation (Tribune, Syngenta Crop Protection, LLC, Greensboro, NC).

Assessment

We assessed the response of flowering rush to herbicide applications using biomass estimates, and assessed the impact of submersed applications on aquatic plant communities using a point intercept method. The initial point intercept survey in June was used to assign the number of diquat applications to each treatment site. Sites with greater than 20% presence of flowering rush still received two diquat applications, sites with prevalence between 5% and 20% received one

diquat application, and sites with less than 5% prevalence received no herbicide treatment (Table 1).

Biomass estimates. Assessment of both submersed and emergent treatments in this system were done by sampling biomass collected with a 6" diameter biomass coring device to collect both shoots and rhizomes (Figure 5; Madsen et al. 2007). Forty cores per plot were collected before each proposed treatment, and at the end of the growing season in September (Table 2). After washing to remove sediment, cores were held on ice until returned to campus. Cores were separated into aboveground and belowground biomass. Rhizome buds (Figure 1) were counted, but not separated from the remainder of belowground biomass. Plants were dried for 72 hours at 50C or greater, and weighed for biomass. Successful applications should reduce rhizome weight and rhizome bud number. Nine sites were sampled for biomass: three reference and six treatment plots (Table 3); for a total of 360 biomass samples per time. Biomass samples were taken at predetermined points randomly selected from the point intercept points (below) of those plots. For post treatment samples, forty biomass samples were taken from each plot. Statistical analysis of biomass data was performed using a one way analysis of variance (ANOVA), with the categorical variable being number of treatments (zero, one, or two) and the dependent variable being biomass or bud count. Analysis was done using Statistix (Analytical Software, Tallahassee, FL).

Point Intercept. To assess the community impact of submersed diquat treatments, point intercept sampling (Madsen 1999) was done on all treated plots and reference plots (Table 2). The grid interval was no less than 25 m. There were not an equal number of points per plot. Statistical analysis was performed using a Kruskal-Wallice analysis, testing for a statistically-significant change in frequency between the three sampling dates. Analysis was done using Statistix (Analytical Software, Tallahassee, FL).

Results and Discussion

Biomass. The measurement of abundance, such as biomass, is the best method to evaluate the effectiveness of control (Madsen 1993; Madsen and Bloomfield 1993; Madsen and Wersal 2012). Since the aboveground biomass often causes the nuisance problem, reduction in biomass may measure the reduction in nuisance potential. While reduction of the nuisance potential is important to resource user perception, it is also important to contribute to the long-term management of the invasive plant species. For flowering rush, the two best indicators of reduction in long-term growth potential are rhizome abundance and rhizome bud number. Rhizome abundance may be measured by belowground biomass since rhizomes are the dominant constituent of belowground biomass. Rhizome bud density is important since buds appear to be the perennating and regrowth propagule (Marko et al. 2012; Madsen et al. 2012). Rhizomes are the main location to store carbohydrates, essential for overwintering and for regrowth from

management. Rhizome buds are the individual growing points from which new ramets or leaves regrow. Reductions in these two tissues should result in long-term control.

Rhizome bud density was significantly reduced ($p < 0.0001$) in diquat treated plots in 2013, 2014, and again in 2015 in sites receiving two diquat applications (Figure 6). In those sites receiving one diquat application, bud density did not increase during the 2015 growing season (Figure 6).

Biomass plots examined for bud density over time illustrate a general trend for reference site bud density to increase during the growing season, and treatment plot density to decline (Figure 7). Bud densities in reference plots was not statistically significantly lower than previous years (Figure 7). However, bud densities in diquat treated plots has significantly decreased from 2013 densities (Figure 7).

Point Intercept. While decreasing the nuisance growth and reducing the long-term potential to spread and regrow is important for managing invasive plants, this benefit must be weighed against possible damage to the native plant community. A point intercept study was performed to evaluate the impact on native plant species and the overall community. This sampling did not detect a decrease in the abundance of native plants, but rather if plants survived and continued at the same frequency.

Flowering rush frequency was significantly lower in treated plots than untreated plots by the final assessment in September (Tables 3-5; Figure 8). In many individual plots, the frequency of flowering rush was dramatically reduced (Tables 7-30). For instance, frequency of flowering rush in plot C-DIQ-3 was 62.5% in June, 12% after one treatment in July, and 3% after two treatments in September (Table 20). In general, diquat treatments resulted in reduced nuisance from flowering rush growth.

Average species richness (no. per point) in diquat treated plots did not statistically change over the course of the growing season in sites receiving one diquat treatment (Figure 9). This suggests that while one diquat application is not enough to reduce flowering rush biomass it is sufficient to halt the spread of the invasive and maintain the current level of rush within a growing season. Prevalence of flowering rush in sites receiving two applications of diquat significantly declined over the course of the growing season as in years past (Figure 9). As in 2014, we assessed plant frequency for all diquat treated (Table 3 and 4) and untreated (Table 5) plots, determining which species had a significant change over time. Of the 34 species found in previous years, 31 were found in the 2015 survey sites. There were 13 species that had no change regardless of site location or time, three of which were not found (*Bidens beckii* – water marigold, *Juncus pelocarpus* – brownfruit rush, and *Typha latifolia* – broadleaf cattail) in the 2015 surveys. There were two species that increased in all sites. There were five species that decreased in all 2015 plots, two of which were the invasive species flowering rush and curly leaf pondweed. There remaining species showed various types of change between survey efforts (Table 6), indicating small to moderate change in frequency with treatments.

Given that there are 24 individual plots, an analysis of each plot will not be discussed.

Diquat treatments do not appear to have a significant effect on species diversity, though some individual species in some plots may have been adversely affected.

Conclusions and Recommendations

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Recommendations

- Field evaluations and monitoring of diquat or other herbicides should be continued to determine if reduction in belowground biomass and rhizome bud density is repeatable.
- We recommend that other herbicide active ingredients and use patterns be evaluated under controlled conditions to determine if there are alternatives to diquat treatments, which may be field demonstrated in the future.
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Acknowledgements

This research was supported by the Pelican River Watershed District, with additional support from the Minnesota Department of Natural Resources. Professional Lake Management (PLM) performed the herbicide treatments, and provided information on those treatments. Laboratory assistance was provided by Trey Jackson, Steven Meadows, and Samuel Hansen from Mississippi State University and field assistance was provided by Josh Sundberg and Tim Lenzmeier from the Pelican River Watershed District.

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Figure 1. Rhizome of flowering rush (*Butomus umbellatus*) with two rhizome buds visible. This is the major propagule or growing point of the triploid biotype.

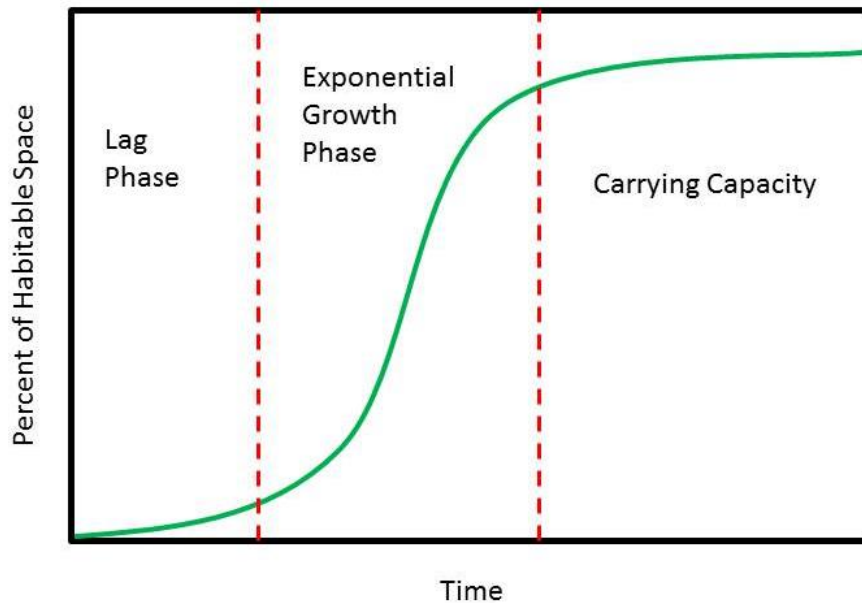


Figure 2. Figure showing the different phases of spread after a site has been invaded.



Figure 3. Treatment (“DIQ”) and reference (“REF”) plots for Detroit Lakes, MN, for 2014. To view treatment plots for 2012 and 2013, refer to Madsen et al. 2013 and 2014.



Figure 4. Treatment (“DIQ”) and reference (“REF”) plots for Lakes Sallie and Melissa, MN, for 2014. To view treatment plots for 2012 and 2013, refer to Madsen et al. 2013 and 2014.



Figure 5. The 6" diameter coring device used to collect aboveground and belowground biomass of flowering rush in the Detroit Lakes.

Rhizome Bud Density

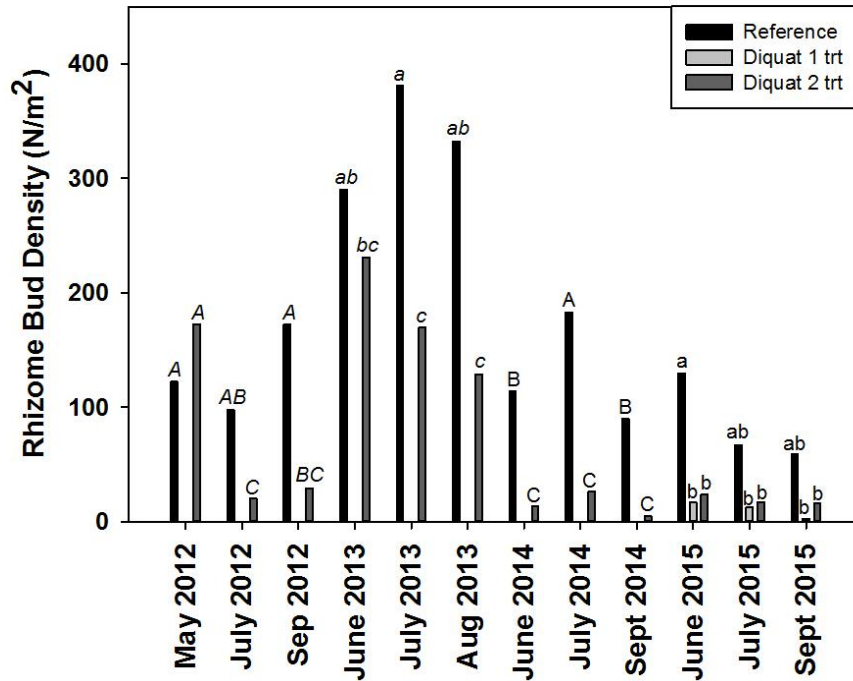


Figure 6. Rhizome bud density (N/m^2) for May, July, and September of 2012; June, July and August of 2013; June, July, and September 2014; and June, July, and September of 2015 of reference (untreated) and diquat-treated plots in the Detroit Lake Systems. Diquat 1 trt bars represent those sites that received one diquat treatment (2015 only) while those designated diquat 2 trt received two herbicide treatments. Bars sharing the same letter within a year are not significantly different from one another. Means comparison by homogenous groups, $p=0.05$, comparing means of treatments and months within a year. Therefore, comparisons for 2012 are capital italics, for 2013 are lower case italics, for 2014 are upper case normal type, and 2015 are lower case normal type. Plots varied between the three years. Data for 2012 and 2013 are from Madsen et al. 2014 while data for 2014 are from Turnage and Madsen 2015.

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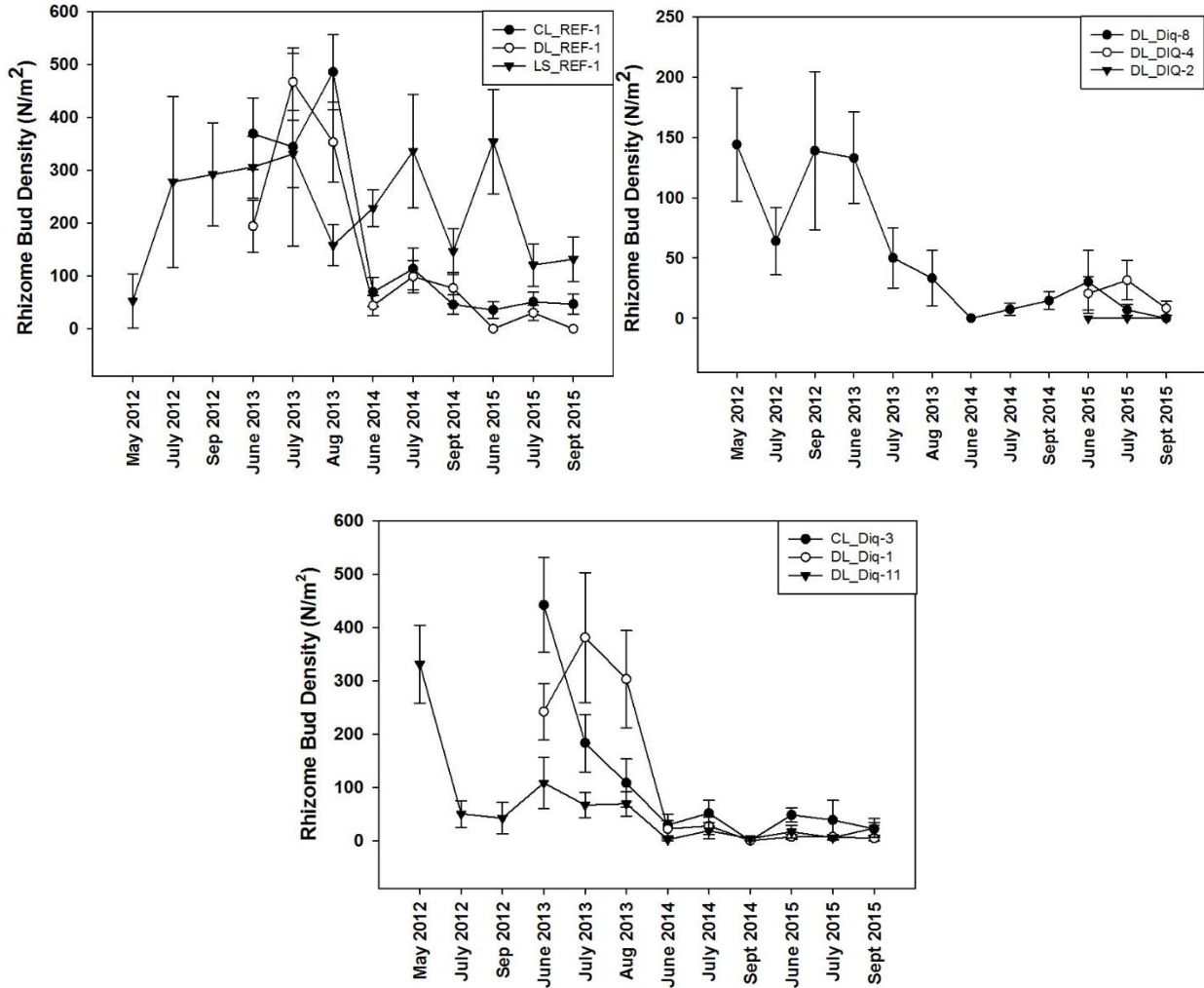


Figure 7. Rhizome bud density (N/m²) for reference sites (top left), sites receiving one diquat treatment (top right), and sites receiving two treatments (bottom) in the Detroit Lakes system from 2012 through 2015. See Table 2 for a key to plots and their treatments in respective years. Points are the means for twenty samples in 2012 and 2013, 30 samples in 2014, and 40 samples in 2015 per plot per time interval, and the bars indicate one standard error of the mean. Diquat plots treated after the June and July sampling.

Flowering Rush Frequency

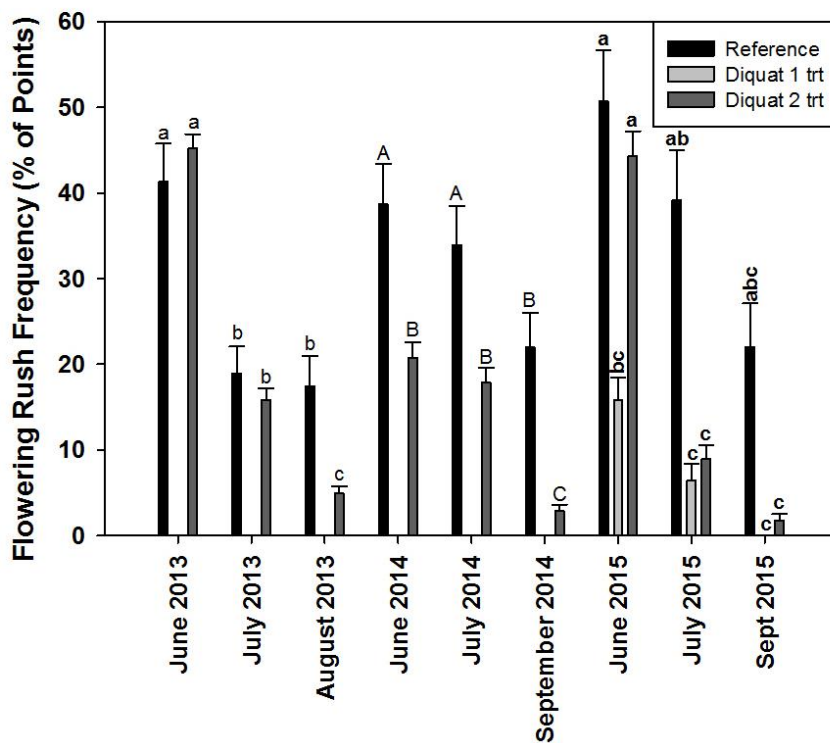


Figure 8. Percent frequency of flowering rush in June, July, and August of 2013 and June, July, and September of 2014 and 2015 in plots on Detroit Lakes system, MN. Lower case letters are for 2013 data, upper case are for 2014, and lower case bold type are for 2015 data. Different letters indicate that the means are different according to ANOVA at the p-0.05 level within years.

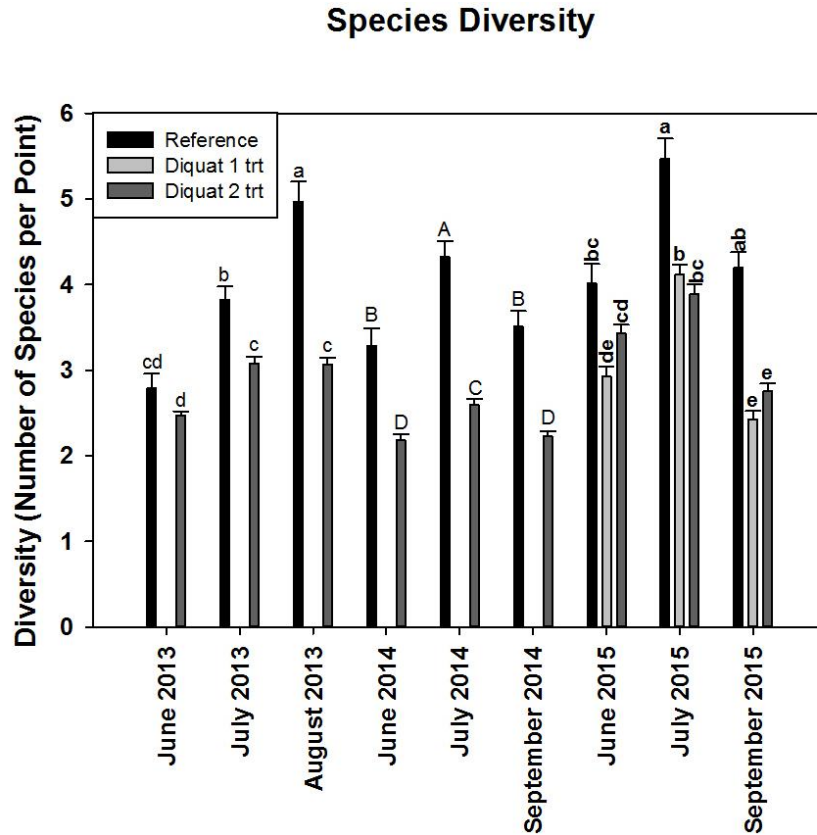


Figure 9. Species diversity (as average number of species per point) in reference and diquat-treated plots in the Detroit Lake system in 2013, 2014, and 2015. Diquat plots treated after the June and July sampling. Lower case letters are for 2013 data, upper case are for 2014 data, and lower case bold type are for 2015. Different letters indicate that the means are statistically different according to ANOVA at the p-0.05 level within a given year.

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Table 1. Treatment and reference plot names for Detroit Lakes basins for 2015 with the 2014 plot designation, plot area, and number of diquat treatments per plot.

Lake	2015 Plot Designation	2014 Plot Designation	Area (acres)	# of Diquat Treatments
Curfman	CL_Diq-1	CL_Diq-1	1.4	2
Curfman	CL_REF-1	CL_REF-1	2.2	Reference
Curfman	CF_Diq-3	CF_Diq-3	13.3	2
Little Detroit	DL_Diq-1	DL_Diq-1	4.0	2
Little Detroit	DL_Diq-2	DL_Diq-2	5.6	1
Little Detroit	DL_Diq-3	DL_Diq-3	9.5	2
Big Detroit	DL_Diq-4	DL_Diq-4	6.9	1
Big Detroit	DL_Diq-5	DL_Diq-5	11.0	2
Big Detroit	DL_Diq-6	DL_Diq-6	19.3	2
Big Detroit	DL_Diq-7	DL_Diq-7	5.4	1
Big Detroit	DL_Diq-8	DL_Diq-8	83.4	1
Big Detroit	DL_Diq-9	DL_Diq-9	4.2	2
Big Detroit	DL_Diq-10	DL_Diq-10	8.3	1
Big Detroit	DL_Diq-11	DL_Diq-11	14.7	2
Big Detroit	DL_REF-1	DL_REF-1	6.4	Reference
Melissa	LM_Diq-1	LM_Diq-1	7.4	1
Melissa	LM_Diq-2	LM_Diq-2	3.4	1
Melissa	LM_Diq-3	LM_Diq-3	4.1	0
Melissa	LM_Diq-4	LM_Diq-4	7.9	2
Melissa	LM_Diq-5	LM_Diq-5	20.1	2
Sallie	LS_REF-1	LS_REF-1	21.0	Reference
Sallie	LS_Diq-1	LS_Diq-1	16.5	2
Sallie	LS_Diq-2	LS_Diq-2	0.8	2
Sallie	LS_Diq-3	LS_Diq-3	7.7	2
TOTAL			284.5	

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Table 2. Nine sites at which forty biomass samples per site were collected in June, July, and September of 2015.

Lake	2015 Plot Designation	2014 Plot Designation	Area (acres)	Notes
Curfman	CL_REF-1	CL_REF-1	2.20	Reference
Big Detroit	DL_REF-1	DL_REF-1	6.41	Reference
Sallie	LS_REF-1	LS_REF-1	21.01	Reference
Little Detroit	DL_Diq-2	DL_Diq-2	3.37	One Treatment
Big Detroit	DL_Diq-4	DL_Diq-4	6.92	One Treatment
Big Detroit	DL_Diq-8	DL_Diq-8	83.40	One Treatment
Little Detroit	DL_Diq-1	DL_Diq-1	4.00	Two Treatment
Curfman	CL_Diq-3	CL_Diq-3	13.27	Two Treatment
Big Detroit	DL_Diq-11	DL_Diq-11	14.73	Two Treatment

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Table 3. Point intercept frequency of species in all plots receiving one diquat treatment in the Detroit Lakes system, 2015 for three months. P-value is based on a Kruskal-Wallis test, with month as the variable. A p-value of “M” indicates insufficient presence while p-values in bold type indicate a statistically significant difference. N= 184, 190, 190; respectively.

Common	Scientific	CODE	June	July	Sep	P-value
Water marigold	<i>Bidens beckii</i>	BBEC	0	0	0	M
Flowering rush	<i>Butomus umbellatus</i>	BUMB	29	11	0	<0.0001
Coontail	<i>Ceratophyllum demersum</i>	CDEM	12	21	20	0.2625
Chara	<i>Chara</i>	chara	158	165	162	0.9053
Water moss	<i>Drepanocladus</i>	DREP	26	45	55	0.0022
Elodea	<i>Elodea canadensis</i>	ECAN	3	3	0	0.2149
Water stargrass	<i>Heteranthera dubia</i>	HDUB	0	0	4	0.0188
Brownfruit rush	<i>Juncus pelocarpus</i>	JPEL	0	0	0	M
Common duckweed	<i>Lemna minor</i>	LMIN	0	0	0	M
Star duckweed	<i>Lemna trisulca</i>	LTRI	44	41	47	0.7538
Northern watermilfoil	<i>Myriophyllum sibiricum</i>	MSIB	11	100	27	<0.0001
Bushy naiad	<i>Najas flexilis</i>	NFLEX	0	28	190	<0.0001
Nitella	<i>Nitella</i>	NITEL	0	2	0	0.1392
White waterlily	<i>Nymphaea odorata</i>	NODOR	0	0	0	M
Yellow pondlily	<i>Nuphar lutea</i>	NVARI	2	0	0	0.1263
Curlyleaf pondweed	<i>Potamogeton crispus</i>	PCRI	26	0	2	<0.0001
Leafy pondweed	<i>Potamogeton foliosus</i>	PFOL	45	16	0	<0.0001
Variable pondweed	<i>Potamogeton gramineus</i>	PGRAM	2	0	0	0.1263
Illinois pondweed	<i>Potamogeton illinoensis</i>	PILL	52	75	19	<0.0001
Floating pondweed	<i>Potamogeton nataus</i>	PNAT	0	0	0	M
Whitestem pondweed	<i>Potamogeton praelongus</i>	PPRA	5	10	8	0.4595
Richardson's pondweed	<i>Potamogeton richardsonii</i>	PRICH	32	60	19	<0.0001
Robbin's pondweed	<i>Potamogeton robbinsii</i>	PROBB	2	4	0	0.1357
Flatstem pondweed	<i>Potamogeton zosteriformis</i>	PZOS	36	55	9	<0.0001
Widgeongrass	<i>Ruppia cirrhosa</i>	RCIRR	0	0	0	M
White water buttercup	<i>Ranunculus longirostris</i>	RLON	1	0	0	0.3567
Hardstem bulrush	<i>Schoenoplectus acutus</i>	SACU	0	0	1	0.3744
Arumleaf arrowhead	<i>Sagittaria cuneata</i>	SCUN	0	2	0	0.1392
Sago pondweed	<i>Stuckenia pectinata</i>	SPEC	0	6	2	0.0310
Narrowleaf cattail	<i>Typha angustifolia</i>	TANG	0	0	0	M
Broadleaf cattail	<i>Typha latifolia</i>	TLAT	0	0	0	M
Common bladderwort	<i>Utricularia macrorhiza</i>	UMAC	1	6	2	0.1002
Watercelery	<i>Vallisneria americana</i>	VAME	52	132	83	<0.0001
Watermeal	<i>Wolffia</i>	WOOLF	0	0	0	M
Total species richness		SPP	19	19	16	
Native species richness		NATSPP	17	18	15	

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Table 4. Point intercept frequency of species in all plots receiving two diquat treatments in the Detroit Lakes system, 2015 for three months. P-value is based on a Kruskal-Wallis test, with month as the variable. A p-value of “M” indicates insufficient presence while p-values in bold type indicate a statistically significant difference. N= 311, 314, 314; respectively.

Common	Scientific	CODE	June	July	Sep	P-value
Water marigold	<i>Bidens beckii</i>	BBEC	0	0	0	M
Flowering rush	<i>Butomus umbellatus</i>	BUMB	142	30	2	<0.0001
Coontail	<i>Ceratophyllum demersum</i>	CDEM	9	16	6	0.0263
Chara	<i>Chara</i>	chara	295	312	304	<0.0001
Water moss	<i>Drepanocladus</i>	DREP	54	70	71	0.0021
Elodea	<i>Elodea canadensis</i>	ECAN	1	0	0	0.3647
Water stargrass	<i>Heteranthera dubia</i>	HDUB	0	0	2	0.1363
Brownfruit rush	<i>Juncus pelocarpus</i>	JPEL	0	0	0	M
Common duckweed	<i>Lemna minor</i>	LMIN	0	0	0	M
Star duckweed	<i>Lemna trisulca</i>	LTRI	14	36	33	0.0011
Northern watermilfoil	<i>Myriophyllum sibiricum</i>	MSIB	44	60	29	0.0016
Bushy naiad	<i>Najas flexilis</i>	NFLEX	0	47	13	<0.0001
Nitella	<i>Nitella</i>	NITEL	0	0	1	0.3700
White waterlily	<i>Nymphaea odorata</i>	NODOR	5	13	7	0.1222
Yellow pondlily	<i>Nuphar lutea</i>	NVARI	41	44	16	0.0004
Curlyleaf pondweed	<i>Potamogeton crispus</i>	PCRI	56	3	1	<0.0001
Leafy pondweed	<i>Potamogeton foliosus</i>	PFOL	106	17	1	<0.0001
Variable pondweed	<i>Potamogeton gramineus</i>	PGRAM	1	0	0	M
Illinois pondweed	<i>Potamogeton illinoensis</i>	PILL	72	93	44	<0.0001
Floating pondweed	<i>Potamogeton nataus</i>	PNAT	0	6	0	0.0024
Whitestem pondweed	<i>Potamogeton praelongus</i>	PPRA	4	11	2	0.0185
Richardson's pondweed	<i>Potamogeton richardsonii</i>	PRICH	106	130	87	0.0011
Robbin's pondweed	<i>Potamogeton robbinsii</i>	PROBB	1	6	1	0.0437
Flatstem pondweed	<i>Potamogeton zosteriformis</i>	PZOS	71	48	11	<0.0001
Widgeongrass	<i>Ruppia cirrhosa</i>	RCIRR	1	0	0	0.3647
White water buttercup	<i>Ranunculus longirostris</i>	RLON	2	0	0	0.1325
Hardstem bulrush	<i>Schoenoplectus acutus</i>	SACU	18	14	12	0.4957
Arumleaf arrowhead	<i>Sagittaria cuneata</i>	SCUN	0	0	0	M
Sago pondweed	<i>Stuckenia pectinata</i>	SPEC	0	1	0	0.3700
Narrowleaf cattail	<i>Typha angustifolia</i>	TANG	6	6	3	0.5395
Broadleaf cattail	<i>Typha latifolia</i>	TLAT	0	0	0	M
Common bladderwort	<i>Utricularia macrorhiza</i>	UMAC	0	3	5	0.0932
Watercelery	<i>Vallisneria americana</i>	VAME	99	237	200	<0.0001
Watermeal	<i>Wolffia</i>	WOOLF	0	0	0	M
Total species richness		SPP	22	22	22	
Native species richness		NATSPP	20	20	20	

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Table 5. Point intercept frequency of species in all untreated reference plots in the Detroit Lakes system, 2015 for three months. P-value is based on a Kruskal-Wallis test, with month as the variable. A p-value of “M” indicates insufficient presence while p-values in bold type indicate a statistically significant difference. N= 71, 69, 68; respectively.

Common	Scientific	CODE	June	July	Sep	P-value
Water marigold	<i>Bidens beckii</i>	BBEC	0	0	0	M
Flowering rush	<i>Butomus umbellatus</i>	BUMB	36	27	15	0.0020
Coontail	<i>Ceratophyllum demersum</i>	CDEM	10	38	29	<0.0001
Chara	<i>Chara</i>	chara	37	31	24	0.1364
Water moss	<i>Drepanocladus</i>	DREP	4	12	9	0.0953
Elodea	<i>Elodea canadensis</i>	ECAN	9	9	9	0.9951
Water stargrass	<i>Heteranthera dubia</i>	HDUB	0	0	8	0.0001
Brownfruit rush	<i>Juncus pelocarpus</i>	JPEL	0	0	0	M
Common duckweed	<i>Lemna minor</i>	LMIN	0	0	1	0.3590
Star duckweed	<i>Lemna trisulca</i>	LTRI	32	40	43	0.0853
Northern watermilfoil	<i>Myriophyllum sibiricum</i>	MSIB	17	45	28	<0.0001
Bushy naiad	<i>Najas flexilis</i>	NFLEX	0	8	9	0.0074
Nitella	<i>Nitella</i>	NITEL	0	0	0	M
White waterlily	<i>Nymphaea odorata</i>	NODOR	8	17	11	0.1084
Yellow pondlily	<i>Nuphar lutea</i>	NVARI	20	13	2	0.0003
Curlyleaf pondweed	<i>Potamogeton crispus</i>	PCRI	22	0	4	<0.0001
Leafy pondweed	<i>Potamogeton foliosus</i>	PFOL	17	6	0	<0.0001
Variable pondweed	<i>Potamogeton gramineus</i>	PGRAM	0	0	0	M
Illinois pondweed	<i>Potamogeton illinoensis</i>	PILL	16	10	4	0.0198
Floating pondweed	<i>Potamogeton natans</i>	PNAT	0	1	1	0.5962
Whitestem pondweed	<i>Potamogeton praelongus</i>	PPRA	1	9	11	0.0090
Richardson's pondweed	<i>Potamogeton richardsonii</i>	PRICH	10	12	6	0.3373
Robbin's pondweed	<i>Potamogeton robbinsii</i>	PROBB	1	0	0	0.3829
Flatstem pondweed	<i>Potamogeton zosteriformis</i>	PZOS	30	31	6	<0.0001
Widgeongrass	<i>Ruppia cirrhosa</i>	RCIRR	0	0	11	M
White water buttercup	<i>Ranunculus longirostris</i>	RLON	12	4	6	0.0188
Hardstem bulrush	<i>Schoenoplectus acutus</i>	SACU	12	21	18	0.1612
Arumleaf arrowhead	<i>Sagittaria cuneata</i>	SCUN	0	1	0	0.3670
Sago pondweed	<i>Stuckenia pectinata</i>	SPEC	0	2	2	0.3510
Narrowleaf cattail	<i>Typha angustifolia</i>	TANG	3	4	2	0.7158
Broadleaf cattail	<i>Typha latifolia</i>	TLAT	0	0	0	M
Common bladderwort	<i>Utricularia macrorhiza</i>	UMAC	0	17	20	<0.0001
Watercelery	<i>Vallisneria americana</i>	VAME	14	35	28	0.0004
Watermeal	<i>Wolffia</i>	WOOLF	0	0	0	M
Total species richness		SPP	20	23	25	
Native species richness		NATSPP	18	22	23	

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Table 6. Dynamics of species in diquat-treated and untreated reference plots in the Detroit Lake system across three months in 2015; where a “+” indicates species that statistically increased, a “0” indicate species with no significant change, and a “-“ indicates species with a significant decrease in frequency at points.

Common	Scientific	CODE	1 Diquat	2 Diquat	Reference
Water marigold	<i>Bidens beckii</i>	BBEC	0	0	0
Flowering rush	<i>Butomus umbellatus</i>	BUMB	-	-	-
Coontail	<i>Ceratophyllum demersum</i>	CDEM	0	-	+
Chara	<i>Chara</i>	chara	0	+	0
Water moss	<i>Drepanocladus</i>	DREP	+	+	0
Elodea	<i>Elodea canadensis</i>	ECAN	0	0	0
Water stargrass	<i>Heteranthera dubia</i>	HDUB	+	0	+
Brownfruit rush	<i>Juncus pelocarpus</i>	JPEL	0	0	0
Common duckweed	<i>Lemna minor</i>	LMIN	0	0	0
Star duckweed	<i>Lemna trisulca</i>	LTRI	0	+	0
Northern watermilfoil	<i>Myriophyllum sibiricum</i>	MSIB	+	-	+
Bushy naiad	<i>Najas flexilis</i>	NFLEX	+	+	+
Nitella	<i>Nitella</i>	NITEL	0	0	0
White waterlily	<i>Nymphaea odorata</i>	NODOR	0	0	0
Yellow pondlily	<i>Nuphar lutea</i>	NVARI	0	-	-
Curlyleaf pondweed	<i>Potamogeton crispus</i>	PCRI	-	-	-
Leafy pondweed	<i>Potamogeton foliosus</i>	PFOL	-	-	-
Variable pondweed	<i>Potamogeton gramineus</i>	PGRAM	0	0	0
Illinois pondweed	<i>Potamogeton illinoensis</i>	PILL	-	-	-
Floating pondweed	<i>Potamogeton natans</i>	PNAT	0	-	0
Whitestem pondweed	<i>Potamogeton praelongus</i>	PPRA	0	-	+
Richardson's pondweed	<i>Potamogeton richardsonii</i>	PRICH	-	-	0
Robbin's pondweed	<i>Potamogeton robbinsii</i>	PROBB	0	-	0
Flatstem pondweed	<i>Potamogeton zosteriformis</i>	PZOS	-	-	-
Widgeongrass	<i>Ruppia cirrhosa</i>	RCIRR	0	0	0
White water buttercup	<i>Ranunculus longirostris</i>	RLON	0	0	-
Hardstem bulrush	<i>Schoenoplectus acutus</i>	SACU	0	0	0
Arumleaf arrowhead	<i>Sagittaria cuneata</i>	SCUN	0	0	0
Sago pondweed	<i>Stuckenia pectinata</i>	SPEC	+	0	0
Narrowleaf cattail	<i>Typha angustifolia</i>	TANG	0	0	0
Broadleaf cattail	<i>Typha latifolia</i>	TLAT	0	0	0
Common bladderwort	<i>Utricularia macrorhiza</i>	UMAC	0	0	+
Watercelery	<i>Vallisneria americana</i>	VAME	+	+	+
Watermeal	<i>Wolffia</i>	WOOLF	0	0	0
	Increases		6	5	7
	No change		22	17	20
	Decreasers		6	12	7

Table 7. Species prevalence at survey points in site DL-DIQ-1 in 2015.

SITE	DL-DIQ-1		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	20	20	20
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	13	7	0
<i>Ceratophyllum demersum</i>	0	0	0
<i>Chara</i>	20	20	20
<i>Drepanocladus</i>	0	7	4
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	2	2
<i>Myriophyllum sibiricum</i>	0	0	0
<i>Najas flexilis</i>	0	0	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	6	8	2
<i>Potamogeton crispus</i>	0	0	0
<i>Potamogeton foliosus</i>	11	2	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	5	9	7
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	2	3	1
<i>Potamogeton richardsonii</i>	13	16	8
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	4	2	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	10	9	7
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	1	0
<i>Vallisneria americana</i>	17	17	13
<i>Wolffia</i>	0	0	0

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Table 8. Species prevalence at survey points in site DL-DIQ-2 in 2015.

SITE	DL-DIQ-2		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	23	24	24
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	3	1	0
<i>Ceratophyllum demersum</i>	0	0	0
<i>Chara</i>	23	24	23
<i>Drepanocladus</i>	0	4	1
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	0	0
<i>Myriophyllum sibiricum</i>	0	2	1
<i>Najas flexilis</i>	0	0	1
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	1	0	0
<i>Potamogeton crispus</i>	0	0	0
<i>Potamogeton foliosus</i>	10	7	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	9	12	8
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	3	2	1
<i>Potamogeton richardsonii</i>	11	9	8
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	5	4	1
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	1
<i>Sagittaria cuneata</i>	0	2	0
<i>Stuckenia pectinata</i>	0	5	2
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	4	8	8
<i>Wolffia</i>	0	0	0

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Table 9. Species prevalence at survey points in site DL-DIQ-3 in 2015.

SITE	DL-DIQ-3		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	25	25	25
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	12	3	1
<i>Ceratophyllum demersum</i>	0	0	0
<i>Chara</i>	20	25	24
<i>Drepanocladus</i>	0	0	2
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	2	0
<i>Myriophyllum sibiricum</i>	4	2	1
<i>Najas flexilis</i>	0	1	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	0	0	0
<i>Potamogeton crispus</i>	2	0	0
<i>Potamogeton foliosus</i>	12	0	1
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	4	4	3
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	1	0	0
<i>Potamogeton richardsonii</i>	10	10	5
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	7	4	0
<i>Ruppia cirrhosa</i>	1	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	1	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	11	18	18
<i>Wolffia</i>	0	0	0

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Table 10. Species prevalence at survey points in site DL-DIQ-4 in 2015.

SITE	DL-DIQ-4		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	30	31	31
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	5	0	0
<i>Ceratophyllum demersum</i>	0	0	0
<i>Chara</i>	29	31	1
<i>Drepanocladus</i>	4	2	3
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	22	0	3
<i>Myriophyllum sibiricum</i>	1	24	2
<i>Najas flexilis</i>	0	0	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	0	0	0
<i>Potamogeton crispus</i>	0	0	0
<i>Potamogeton foliosus</i>	1	0	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	6	25	3
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	0	1
<i>Potamogeton richardsonii</i>	0	4	0
<i>Potamogeton robbinsii</i>	1	0	0
<i>Potamogeton zosteriformis</i>	3	9	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	6	16	7
<i>Wolffia</i>	0	0	0

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Table 11. Species prevalence at survey points in site DL-DIQ-5 in 2015.

SITE	DL-DIQ-5		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	20	20	20
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	9	4	0
<i>Ceratophyllum demersum</i>	0	1	1
<i>Chara</i>	19	19	19
<i>Drepanocladus</i>	5	5	8
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	1	1
<i>Myriophyllum sibiricum</i>	0	2	3
<i>Najas flexilis</i>	0	4	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	0	0	0
<i>Potamogeton crispus</i>	1	0	0
<i>Potamogeton foliosus</i>	3	0	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	0	4	1
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	2	0
<i>Potamogeton richardsonii</i>	1	4	0
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	0	3	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	1	14	11
<i>Wolffia</i>	0	0	0

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Table 12. Species prevalence at survey points in site DL-DIQ-6 in 2015.

SITE	DL-DIQ-6		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	34	34	34
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	8	0	0
<i>Ceratophyllum demersum</i>	0	0	0
<i>Chara</i>	34	34	34
<i>Drepanocladus</i>	12	13	14
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	0	2
<i>Myriophyllum sibiricum</i>	2	2	0
<i>Najas flexilis</i>	0	3	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	3	2	1
<i>Potamogeton crispus</i>	5	0	0
<i>Potamogeton foliosus</i>	21	4	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	0	1	0
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	0	0
<i>Potamogeton richardsonii</i>	6	9	1
<i>Potamogeton robbinsii</i>	1	0	0
<i>Potamogeton zosteriformis</i>	0	1	1
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	10	25	14
<i>Wolffia</i>	0	0	0

Table 13. Species prevalence at survey points in site DL-DIQ-7 in 2015.

SITE	DL-DIQ-7		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	25	25	25
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	5	0	0
<i>Ceratophyllum demersum</i>	3	2	2
<i>Chara</i>	7	20	16
<i>Drepanocladus</i>	14	19	22
<i>Elodea canadensis</i>	0	1	0
<i>Heteranthera dubia</i>	0	0	1
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	2	14	18
<i>Myriophyllum sibiricum</i>	2	17	4
<i>Najas flexilis</i>	0	1	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	1	0	0
<i>Potamogeton crispus</i>	8	0	0
<i>Potamogeton foliosus</i>	3	4	0
<i>Potamogeton gramineus</i>	1	0	0
<i>Potamogeton illinoensis</i>	2	9	1
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	3	0
<i>Potamogeton richardsonii</i>	5	8	0
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	10	11	1
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	1	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	11	24	19
<i>Wolffia</i>	0	0	0

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Table 14. Species prevalence at survey points in site DL-DIQ-8 in 2015.

SITE	DL-DIQ-8		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	43	44	44
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	6	0	0
<i>Ceratophyllum demersum</i>	0	1	1
<i>Chara</i>	42	44	44
<i>Drepanocladus</i>	0	13	11
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	0	0
<i>Myriophyllum sibiricum</i>	1	17	0
<i>Najas flexilis</i>	0	20	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	0	0	0
<i>Potamogeton crispus</i>	2	0	0
<i>Potamogeton foliosus</i>	27	1	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	3	6	1
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	1	0	2
<i>Potamogeton richardsonii</i>	3	8	4
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	1	1	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	23	38	23
<i>Wolffia</i>	0	0	0

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Table 15. Species prevalence at survey points in site DL-DIQ-9 in 2015.

SITE	DL-DIQ-9		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	19	20	20
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	6	1	0
<i>Ceratophyllum demersum</i>	0	0	0
<i>Chara</i>	19	20	19
<i>Drepanocladus</i>	1	12	18
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	7	1
<i>Myriophyllum sibiricum</i>	1	8	1
<i>Najas flexilis</i>	0	2	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	0	0	0
<i>Potamogeton crispus</i>	0	0	0
<i>Potamogeton foliosus</i>	2	1	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	7	15	10
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	5	0
<i>Potamogeton richardsonii</i>	8	4	1
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	5	4	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	1	1
<i>Vallisneria americana</i>	9	12	17
<i>Wolffia</i>	0	0	0

Table 16. Species prevalence at survey points in site DL-DIQ-10 in 2015.

SITE	DL-DIQ-10		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	25	26	26
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	4	6	0
<i>Ceratophyllum demersum</i>	9	16	14
<i>Chara</i>	9	6	9
<i>Drepanocladus</i>	8	7	13
<i>Elodea canadensis</i>	2	1	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	20	26	24
<i>Myriophyllum sibiricum</i>	1	12	14
<i>Najas flexilis</i>	0	0	0
<i>Nitella</i>	0	2	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	0	0	0
<i>Potamogeton crispus</i>	15	0	0
<i>Potamogeton foliosus</i>	1	1	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	10	0	0
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	1	5	3
<i>Potamogeton richardsonii</i>	1	8	0
<i>Potamogeton robbinsii</i>	1	0	0
<i>Potamogeton zosteriformis</i>	9	13	6
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	1	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	5	2
<i>Vallisneria americana</i>	6	14	14
<i>Wolffia</i>	0	0	0

Table 17. Species prevalence at survey points in site DL-DIQ-11 in 2015.

SITE	DL-DIQ-11		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	23	23	23
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	16	1	0
<i>Ceratophyllum demersum</i>	0	0	0
<i>Chara</i>	22	23	21
<i>Drepanocladus</i>	12	19	12
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	0	2
<i>Myriophyllum sibiricum</i>	1	0	0
<i>Najas flexilis</i>	0	1	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	7	7	4
<i>Potamogeton crispus</i>	5	1	0
<i>Potamogeton foliosus</i>	7	1	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	1	1	0
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	0	0
<i>Potamogeton richardsonii</i>	3	4	1
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	1	0	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	1
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	1	1	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	7	20	17
<i>Wolffia</i>	0	0	0

Table 18. Species prevalence at survey points in site DL-REF-1 in 2015.

SITE	DL-REF-1		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	21	21	21
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	2	2	0
<i>Ceratophyllum demersum</i>	3	12	9
<i>Chara</i>	4	5	7
<i>Drepanocladus</i>	3	3	4
<i>Elodea canadensis</i>	0	1	1
<i>Heteranthera dubia</i>	0	0	5
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	20	15	17
<i>Myriophyllum sibiricum</i>	5	14	9
<i>Najas flexilis</i>	0	0	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	0	0	0
<i>Potamogeton crispus</i>	16	0	3
<i>Potamogeton foliosus</i>	0	0	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	8	5	1
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	1	9	11
<i>Potamogeton richardsonii</i>	5	4	0
<i>Potamogeton robbinsii</i>	1	0	0
<i>Potamogeton zosteriformis</i>	15	14	4
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	4	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	2	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	3	5
<i>Vallisneria americana</i>	3	11	8
<i>Wolffia</i>	0	0	0

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Table 19. Species prevalence at survey points in site C-DIQ-1 in 2015.

SITE	C-DIQ-1		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	9	9	9
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	6	0	0
<i>Ceratophyllum demersum</i>	2	2	2
<i>Chara</i>	7	9	9
<i>Drepanocladus</i>	0	1	0
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	6	5	3
<i>Myriophyllum sibiricum</i>	4	6	4
<i>Najas flexilis</i>	0	2	2
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	8	7	4
<i>Potamogeton crispus</i>	3	0	1
<i>Potamogeton foliosus</i>	5	0	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	2	0	0
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	0	0
<i>Potamogeton richardsonii</i>	4	6	5
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	4	5	1
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	3	4	3
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	1
<i>Vallisneria americana</i>	0	9	8
<i>Wolffia</i>	0	0	0

Table 20. Species prevalence at survey points in site C-DIQ-3 in 2015.

SITE	C-DIQ-3		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	32	33	33
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	20	4	1
<i>Ceratophyllum demersum</i>	3	2	1
<i>Chara</i>	29	33	33
<i>Drepanocladus</i>	0	1	1
<i>Elodea canadensis</i>	1	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	6	5	3
<i>Myriophyllum sibiricum</i>	11	16	0
<i>Najas flexilis</i>	0	14	3
<i>Nitella</i>	0	0	1
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	15	17	5
<i>Potamogeton crispus</i>	9	0	0
<i>Potamogeton foliosus</i>	23	4	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	8	6	0
<i>Potamogeton natans</i>	4	0	0
<i>Potamogeton praelongus</i>	0	0	1
<i>Potamogeton richardsonii</i>	4	7	2
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	6	3	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	1	0	0
<i>Schoenoplectus acutus</i>	4	3	4
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	1	0
<i>Typha angustifolia</i>	2	1	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	2	21	14
<i>Wolffia</i>	0	0	0

Table 21. Species prevalence at survey points in site C-REF-1 in 2015.

SITE	C-REF-1		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	14	14	14
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	6	2	0
<i>Ceratophyllum demersum</i>	0	1	5
<i>Chara</i>	12	14	13
<i>Drepanocladus</i>	0	3	3
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	1	1	1
<i>Myriophyllum sibiricum</i>	0	7	1
<i>Najas flexilis</i>	0	7	5
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	3	0
<i>Nuphar lutea</i>	5	6	1
<i>Potamogeton crispus</i>	3	0	0
<i>Potamogeton foliosus</i>	7	1	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	1	0	0
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	0	0
<i>Potamogeton richardsonii</i>	2	3	2
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	3	4	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	3	4	2
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	1	13	12
<i>Wolffia</i>	0	0	0

Table 22. Species prevalence at survey points in site S-DIQ-1 in 2015.

SITE	S-DIQ-1		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	20	3	17
POINTS	41	42	42
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	23	5	0
<i>Ceratophyllum demersum</i>	0	5	1
<i>Chara</i>	27	41	38
<i>Drepanocladus</i>	0	5	6
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	2
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	10	14
<i>Myriophyllum sibiricum</i>	2	5	5
<i>Najas flexilis</i>	0	8	6
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	4	10	6
<i>Nuphar lutea</i>	1	1	0
<i>Potamogeton crispus</i>	2	0	0
<i>Potamogeton foliosus</i>	4	1	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	6	12	2
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	1	0
<i>Potamogeton richardsonii</i>	15	24	27
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	8	5	5
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	3	2	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	3
<i>Vallisneria americana</i>	11	38	40
<i>Wolffia</i>	0	0	0

Table 23. Species prevalence at survey points in site S-DIQ-2 in 2015.

SITE	S-DIQ-2		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	20	3	17
POINTS	5	5	5
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	2	0	0
<i>Ceratophyllum demersum</i>	0	0	0
<i>Chara</i>	4	5	5
<i>Drepanocladus</i>	0	0	0
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	0	0
<i>Myriophyllum sibiricum</i>	0	0	0
<i>Najas flexilis</i>	0	0	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	0	0	0
<i>Potamogeton crispus</i>	2	0	0
<i>Potamogeton foliosus</i>	0	0	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	2	2	0
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	0	0
<i>Potamogeton richardsonii</i>	0	3	4
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	1	0	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	2	5	5
<i>Wolffia</i>	0	0	0

Table 24. Species prevalence at survey points in site S-DIQ-3 in 2015.

SITE	S-DIQ-3		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	20	3	17
POINTS	25	25	25
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	7	0	0
<i>Ceratophyllum demersum</i>	0	0	0
<i>Chara</i>	21	25	25
<i>Drepanocladus</i>	0	2	1
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	0	1
<i>Myriophyllum sibiricum</i>	1	1	0
<i>Najas flexilis</i>	0	1	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	0	0	0
<i>Potamogeton crispus</i>	10	0	0
<i>Potamogeton foliosus</i>	4	0	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	6	3	0
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	0	0
<i>Potamogeton richardsonii</i>	12	14	15
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	6	1	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	11	21	15
<i>Wolffia</i>	0	0	0

Table 25. Species prevalence at survey points in site S-REF-1 in 2015.

SITE	S-REF-1		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	20	3	17
POINTS	35	34	33
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	28	23	15
<i>Ceratophyllum demersum</i>	6	25	15
<i>Chara</i>	20	12	4
<i>Drepanocladus</i>	1	6	2
<i>Elodea canadensis</i>	9	8	8
<i>Heteranthera dubia</i>	0	0	3
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	1
<i>Lemna trisulca</i>	10	24	25
<i>Myriophyllum sibiricum</i>	12	24	18
<i>Najas flexilis</i>	0	1	4
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	8	14	11
<i>Nuphar lutea</i>	15	7	1
<i>Potamogeton crispus</i>	3	0	1
<i>Potamogeton foliosus</i>	10	5	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	7	5	3
<i>Potamogeton natans</i>	0	1	1
<i>Potamogeton praelongus</i>	0	0	0
<i>Potamogeton richardsonii</i>	3	5	4
<i>Potamogeton robbinsii</i>	0	0	0
<i>Potamogeton zosteriformis</i>	11	13	2
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	8	4	3
<i>Schoenoplectus acutus</i>	12	21	18
<i>Sagittaria cuneata</i>	0	1	0
<i>Stuckenia pectinata</i>	0	0	2
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	14	15
<i>Vallisneria americana</i>	10	11	8
<i>Wolffia</i>	0	0	0

Table 26. Species prevalence at survey points in site M-DIQ-1 in 2015.

SITE	M-DIQ-1		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	21	4	18
POINTS	19	20	20
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	4	0	0
<i>Ceratophyllum demersum</i>	0	0	1
<i>Chara</i>	18	20	19
<i>Drepanocladus</i>	0	0	1
<i>Elodea canadensis</i>	0	1	0
<i>Heteranthera dubia</i>	0	0	2
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	0	2
<i>Myriophyllum sibiricum</i>	1	8	2
<i>Najas flexilis</i>	0	6	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	0	0	0
<i>Potamogeton crispus</i>	0	0	2
<i>Potamogeton foliosus</i>	2	1	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	8	6	0
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	0	1
<i>Potamogeton richardsonii</i>	6	15	5
<i>Potamogeton robbinsii</i>	0	2	0
<i>Potamogeton zosteriformis</i>	4	6	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	1	14	7
<i>Wolffia</i>	0	0	0

Table 27. Species prevalence at survey points in site M-DIQ-2 in 2015.

SITE	M-DIQ-2		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	20	4	17
POINTS	19	20	20
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	2	4	0
<i>Ceratophyllum demersum</i>	0	2	2
<i>Chara</i>	19	20	20
<i>Drepanocladus</i>	0	0	4
<i>Elodea canadensis</i>	1	0	0
<i>Heteranthera dubia</i>	0	0	1
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	1	0
<i>Myriophyllum sibiricum</i>	5	20	4
<i>Najas flexilis</i>	0	1	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	0	0	0
<i>Potamogeton crispus</i>	1	0	0
<i>Potamogeton foliosus</i>	1	2	0
<i>Potamogeton gramineus</i>	1	0	0
<i>Potamogeton illinoensis</i>	14	17	6
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	0	0	0
<i>Potamogeton richardsonii</i>	6	8	2
<i>Potamogeton robbinsii</i>	0	2	0
<i>Potamogeton zosteriformis</i>	4	11	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	1	0	0
<i>Vallisneria americana</i>	1	18	5
<i>Wolffia</i>	0	0	0

Table 28. Species prevalence at survey points in site M-DIQ-3 in 2015.

SITE	M-DIQ-3		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	20	4	18
POINTS	31	32	32
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	1	1	0
<i>Ceratophyllum demersum</i>	0	0	3
<i>Chara</i>	25	32	31
<i>Drepanocladus</i>	0	1	0
<i>Elodea canadensis</i>	1	7	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	1	2	0
<i>Myriophyllum sibiricum</i>	9	19	19
<i>Najas flexilis</i>	0	9	1
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	0	0
<i>Nuphar lutea</i>	0	0	0
<i>Potamogeton crispus</i>	1	1	0
<i>Potamogeton foliosus</i>	5	10	1
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	21	17	21
<i>Potamogeton natans</i>	3	3	0
<i>Potamogeton praelongus</i>	0	1	0
<i>Potamogeton richardsonii</i>	8	12	7
<i>Potamogeton robbinsii</i>	0	6	6
<i>Potamogeton zosteriformis</i>	9	6	7
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	12	12	12
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	2	8
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	1
<i>Vallisneria americana</i>	2	9	10
<i>Wolffia</i>	0	0	0

Table 29. Species prevalence at survey points in site M-DIQ-4 in 2015.

SITE	M-DIQ-4		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	21	4	18
POINTS	27	27	27
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	7	1	0
<i>Ceratophyllum demersum</i>	1	1	1
<i>Chara</i>	25	27	26
<i>Drepanocladus</i>	9	5	5
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	3	4
<i>Myriophyllum sibiricum</i>	2	6	8
<i>Najas flexilis</i>	0	9	1
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	1	2	1
<i>Nuphar lutea</i>	0	1	0
<i>Potamogeton crispus</i>	4	2	0
<i>Potamogeton foliosus</i>	0	1	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	4	13	10
<i>Potamogeton natans</i>	0	0	0
<i>Potamogeton praelongus</i>	1	0	0
<i>Potamogeton richardsonii</i>	9	10	10
<i>Potamogeton robbinsii</i>	0	0	1
<i>Potamogeton zosteriformis</i>	8	9	4
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	1	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	1	0
<i>Vallisneria americana</i>	2	13	16
<i>Wolffia</i>	0	0	0

Table 30. Species prevalence at survey points in site M-DIQ-5 in 2014.

SITE	M-DIQ-5		
	2015	2015	2015
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	21	4	18
POINTS	31	31	31
<i>Bidens beckii</i>	0	0	0
<i>Butomus umbellatus</i>	8	4	0
<i>Ceratophyllum demersum</i>	0	5	0
<i>Chara</i>	30	31	31
<i>Drepanocladus</i>	1	0	0
<i>Elodea canadensis</i>	0	0	0
<i>Heteranthera dubia</i>	0	0	0
<i>Juncus pelocarpus</i>	0	0	0
<i>Lemna minor</i>	0	0	0
<i>Lemna trisulca</i>	0	0	0
<i>Myriophyllum sibiricum</i>	14	12	7
<i>Najas flexilis</i>	0	2	0
<i>Nitella</i>	0	0	0
<i>Nymphaea odorata</i>	0	1	0
<i>Nuphar lutea</i>	0	1	0
<i>Potamogeton crispus</i>	5	0	0
<i>Potamogeton foliosus</i>	11	3	0
<i>Potamogeton gramineus</i>	0	0	0
<i>Potamogeton illinoensis</i>	25	23	11
<i>Potamogeton natans</i>	0	6	0
<i>Potamogeton praelongus</i>	0	0	0
<i>Potamogeton richardsonii</i>	16	20	9
<i>Potamogeton robbinsii</i>	0	6	0
<i>Potamogeton zosteriformis</i>	11	11	0
<i>Ruppia cirrhosa</i>	0	0	0
<i>Ranunculus longirostris</i>	0	0	0
<i>Schoenoplectus acutus</i>	0	0	0
<i>Sagittaria cuneata</i>	0	0	0
<i>Stuckenia pectinata</i>	0	0	0
<i>Typha angustifolia</i>	0	0	0
<i>Typha latifolia</i>	0	0	0
<i>Utricularia macrorhiza</i>	0	0	0
<i>Vallisneria americana</i>	5	24	12
<i>Wolffia</i>	0	0	0