Letter Report

Date: October 26, 2016

To: Mike Geier - White River Flowage Lake Management District

Re: 2016 Aquatic Plant Management, White River Flowage, Waushara County, Wisconsin

Dear Mr. Geier and other Board members;

Currently three aquatic invasive species (AIS) are present in White River Flowage and were actively managed in 2016: Eurasian water-milfoil (EWM), curly-leaf pondweed (CLP), and flowering rush (FR). Wisconsin Lake & Pond Resource, LLC (WLPR) was contacted by the District to provide aquatic plant surveys, management, and reporting. WLPR furnished all labor, materials, tools and equipment necessary to perform all operations in connection with the survey, treatment, and reporting for White River Flowage. This report provides a summary of observations and conclusions on the management of these AIS from 2016.

<u>2016 AIS MANAGEMENT</u>

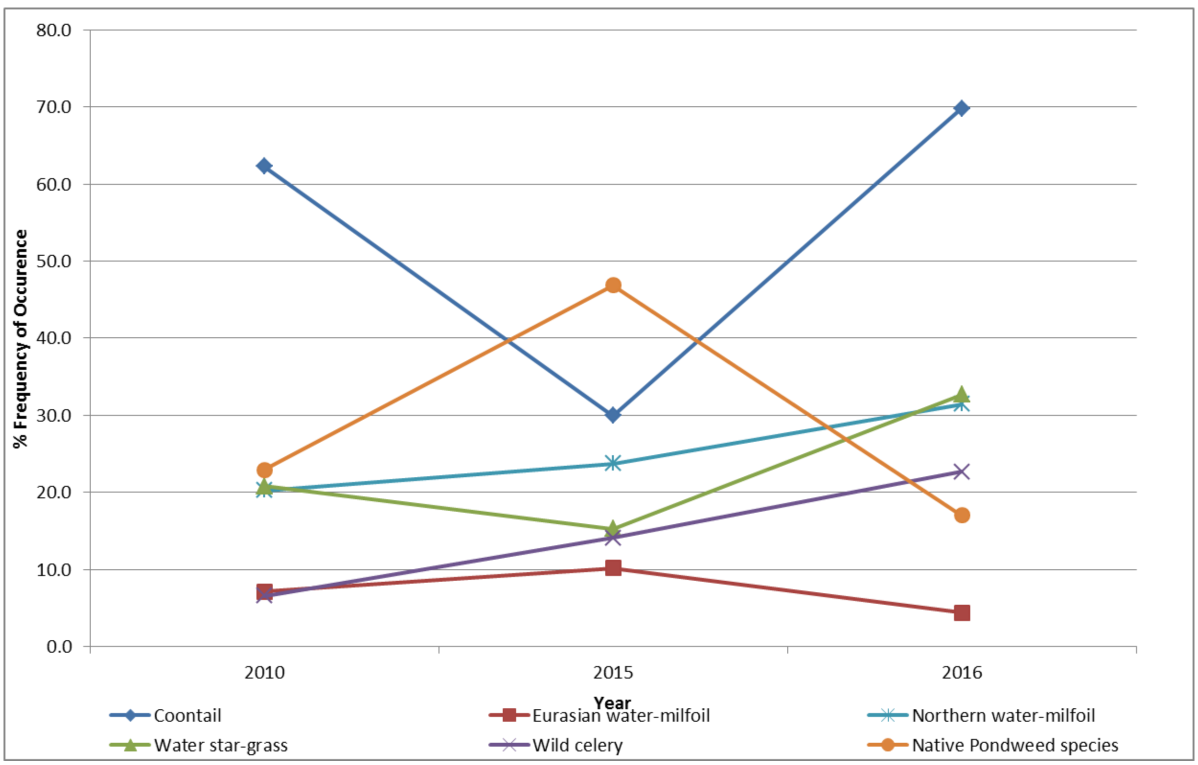
The lake was treated on May 16, 2016 for management of EWM and CLP, as shown in Attachment A. Due to the small, scattered locations with high water flow of some locations of EWM, a quick acting herbicide with the active ingredient (AI) diquat was used. For a single, larger location the granular herbicide Sculpin G (AI - 2,4-D) was used. The granular herbicide Aquathol Super K (AI - endothall) was applied to areas of active CLP growth.

Flowering rush is a newly introduced AIS into the White River Flowage and was first noted in 2015 in the upstream portion. From 2015 to 2016 populations of flowering rush spread rapidly, aided by water flow downstream and prompted active control methods. This plant typically grows in shallow, near shore areas as an emergent species but can also grow submersed or as free-floating plants and all three types were found.

Much of the flowering rush present was in scattered clumps of emergent plants with control focused on hand harvesting by Golden Sands RC&D. A larger bed was present along the western shore that was too large to hand pull and required herbicide management as shown in Attachment B. Diquat mixed with a surfactant was foliar applied at two separate intervals to this area on July 26 and September 12, 2016. Diquat was chosen as it active as a foliar spray to portions of the plant above water and as a contact herbicide to portions below the water line.

2016 SURVEY

To monitor results of HWM management and potential impacts to the native plant community, WLPR conducted a full point-intercept survey on September 12, 2016 using the same sample locations established and used in past surveys. Composition of the aquatic plant community was excellent and equaled that of past surveys. Overall, 166 points were sampled with 159 shallower than the maximum depth of plant growth. Vegetation was growing at 100% of these locations to a depth of 12'. Nearly all metrics remained stable from past surveys (Attachment C Table 1). Native species diversity (19), floristic quality index (FQI – 24.78), and average number of species per vegetated site (3.45) are all of high quality when compared with lakes within the same region (Attachment C, Tables 1-4). Results discussed here are displayed in the same format as previous surveys for the sake of comparison. Surveys from 2010, 2015, and 2016 were completed as point-intercept surveys and can be compared statistically, which is found in Table 5. Changes in EWM and the most common species present and are displayed below from 2010, 2015, and 2016.



Results of the EWM and CLP applications were positive, as both species saw a reduction in presence from 2015 pre-treatment to 2016 post-treatment surveys. Though diquat is a fast acting contact and was used on much of the EWM there was no noted impacts to native species with a statistical increase of native northern water-milfoil noted from 2015 to 2016 (Attachment C, Table 5). Remaining populations of EWM and CLP are scattered throughout the Flowage, as shown in Attachment D, Figures 1 & 2.

Flowering rush was noted to decrease outside of the large bed that was treated (Attachment A). Many of the smaller clumps and free floating plants were collected and removed by Golden Sands RC&D with few noted during the post-treatment survey. Though no flowering rush was directly sampled, it is still present and observed in much of the diquat treatment area. Increasingly shallower water limited navigation to the river channel in the upper portion of the flowage and shallow points offering better flowering rush habitat were non-accessible.

At first glance during the post-treatment survey, the diquat application area for flowering rush appeared successful. However, as a very fast acting contact herbicide, diquat appeared to simply burn off the biomass of the plants above the roots without penetrating the rhizomes, which is ultimately required for effective long lasting control. New growth an inch or two above the bottom was observed below the surface in 1' – 2' of water from the massive system of rhizomes present in sediment within the highest density area. This is strong indication that the herbicide was not translocated to the roots and, in order to see positive results, multiple applications are necessary over consecutive years.

Brent Alcott from the Pelican River Watershed District is responsible for flowering rush management on the Detroit Lakes chain, Minnesota. In speaking with him, he indicated that, with diquat, twice a year treatments are needed at a minimum of at least 4 consecutive years to see substantial reductions. They are currently evaluating other active ingredients for flowering rush control in cooperation with Gray Turnage of Mississippi State University. A copy of their most recent 2015 report is attached hereto in Attachment E.

NEXT STEPS

The infestation of EWM and CLP has been reduced with little impact to the native plant community. However, though both were still noted during the 2016 survey they may not be present at large enough populations to warrant annual herbicide management. Since the District operates a mechanical harvester on the lake, which can help spread EWM, the populations of this AIS should be monitored annually in early spring to determine if management is necessary, and an effort should be made to avoid harvesting activities in areas where it has been documented. The use of diquat to control both of these invasive species appears promising, as it is fast acting, requiring minimal contact time in this flowing water environment. This allows the use of a single active for both species and appeared to have little or no negative effect on native plants in or outside the treatment areas. There is also no evidence of plants developing resistance to diquat and it is generally a low cost management option. We would recommend this as the primary active ingredient for future management of CLP and/or EWM.

As seen from 2015 to 2016 flowering rush is a new and increasing threat on White River Flowage, that can spread very rapidly, as it more than quadrupled its range in less than a year. Though diquat did provide temporary control in 2016, its use going forward should be done with caution and the full understanding that this is going to require multiple annual treatments each growing season over the period of possibly many years. Diquat acts very quickly by burning off active growth and requires multiple applications annually over a yet unknown number of years into the future to diminish the food supply and potential of generating new growth from the root structure.

To achieve long lasting success, a systemic herbicide that is translocated into the roots and therefore kills the plant in this way is recommended. Initial trials of foliar application using Habitat® (AI – imazapyr) in Waterford, WI have shown promise, with more definitive results forthcoming in 2017. It appears that longer term control is possible and, more importantly, this active looks to have strong impact on the root stock of the plant. Plants like flowering rush that spread through asexual rhizomes begin to store nutrients within the roots in early fall to prepare for overwintering. This is an ideal time to treat flowering rush and this same technique has shown great success on controlling the highly invasive common reed (Phragmites), which also spreads primarily through rhizomes. For flowering rush plants that are both emergent and submersed, a combination approach may be best suited using a product such as Habitat® foliar sprayed to the portion of the plant above water in combination with a subsurface systemic herbicide such as granular Renovate MaxG (AI 2,4-D & triclopyr) applied to the lake bed.

We trust this information meets your needs and appreciate the opportunity to continue to work with the District. If you have any questions, or require any additional information, please contact us directly as follows:

Mark Kordus: (715) 781-9976 or mark@wisconsinlpr.com

Jim Scharl: (920) 979-3072 or jim@wisconsinlpr.com

Attachment A – 2016 AIS EWM/CLP Treatment Maps and Treatment Record

State of Wisconsin
Department of Natural Resources
dnr.wi.gov

Aquatic Plant Management Herbicide Treatment Record

Form 3200-111 (R 11/11)

Notice: Completion of this form is a condition of the permit and provides records required by WDNR (NR 107) and DATCP (ATCP 29.21 and 29.22). The Department may not issue you future permits unless you complete and submit this form. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Open Records Law [ss. 19.31-19.39, Wis. Stats.].

Submit this form: **(1) immediately if any unusual circumstances occurred during treatment**
(2) as soon after treatment as possible, no later than 30 days
(3) by October 1 if no treatment occurred

Completion of this form along with the permit satisfies the requirements of WDNR (NR 107) and DATCP (ATCP 29.21 and 29.22).

General Permit Information

Permit Number	Waterbody Name (including ponds, e.g., Smith Pond)		
NE-2016-70-01	White River Flowage		
County	**Permit Holder Name (Customer Name)**		
Waushara	White River Flowage Lake Management District		
Permit Holder Address	**City**	**State**	**ZIP Code**
W7529 White River Trail	Wautoma	WI	54982

Treatment Information

Treatment Date (mm/dd/yyyy)	Starting Time (24 hr)	Ending Time (24 hr)	Water Temp (ºC)	Ambient Air Temp (ºC)
05/16/2016	9:00	11:30	51 F	52 F
Wind Speed (mph)	**Wind Direction**	**Expected Duration of Chemical Residuals**		
5-10	NW	21		

Adverse Conditions Noted (i.e., dead fish, spawning fish, algae bloom, etc.)

If adverse conditions noted, indicate corrective actions taken

Onsite Supervision Present? ○ Yes ◉ No

If Yes, Supervisor Name

Mixing and Loading Site Location (if other than business site or from prepackaged retail container or applied with equipment with a total capacity of not more than 5 gallons liquid or 50 pounds dry)

White River Flowage boat landing

Herbicide Treatment and Water Use Restrictions Signs Posted In Accordance With NR 107? ◉ Yes ○ No

Applicator shall provide each customer with a free copy of each pesticide label used (if requested)

Applicator Information

Individual or Business Name		Telephone Number
Wisconsin Lake and Pond Resource		920 872-2032
Street Address		
N7828 Town Hall Road		
City	**State**	**ZIP Code**
Eldorado	WI	54932

Individuals Making Pesticide Application:

Last Name	First	Certification #
Scharl	James	77803
Kordus	Mark	82178

Name of Person Completing Form	Signature	Date Signed	DNR Use Only – Date Received
James Scharl			

Sheet 2 of 2 Date: 05/17/2016

Aquatic Plant Management Herbicide Treatment Record

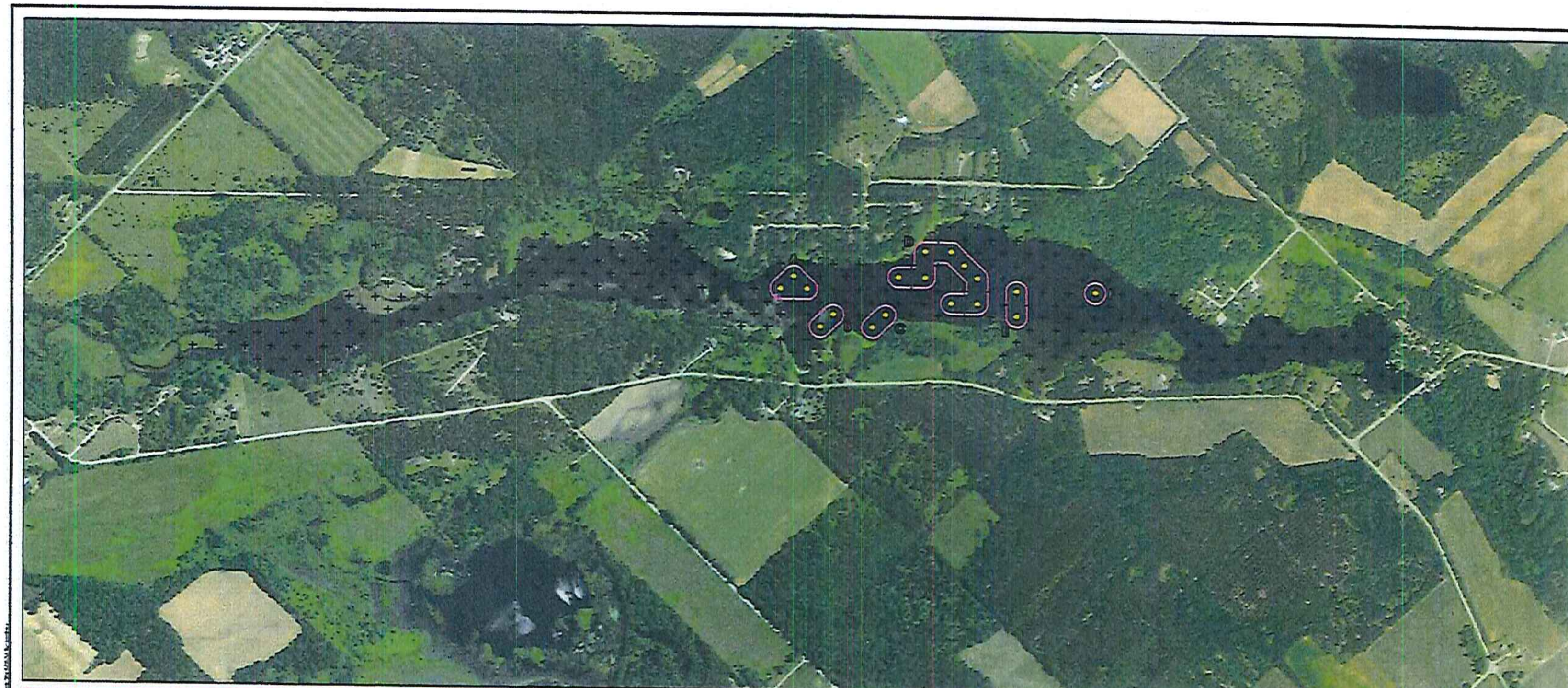
Form 3200-111 (R 11/11)

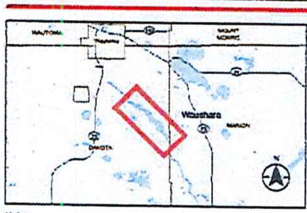
Treatment Site and Chemical Information (attach additional sheets if necessary)

Site No, Property Name, Address / Fire No	Treated Acreage	Permitted Acreage	Sensitive Area?	Latitude	Longitude	Herbicide Name: Tribune, EPA Reg No.: 100-1390 — Amount Applied	Concentration (mg/l = ppm)	Herbicide Name: Sculpin G, EPA Reg No.: 67690-49 — Amount Applied	Concentration (mg/l = ppm)	Herbicide Name: AquatholSuperK, EPA Reg No.: 70506-191 — Amount Applied	Concentration (mg/l = ppm)
EWM-D	5.48	5.48	☐ Y			10	0.29 ppm				
EWM-A*	1.7	1.7	☐ Y					600	3.0 ppm		
CLP-D	2.09	2.09	☐ Y							115	3.0 ppm
CLP-E	2.42	2.42	☐ Y							110	2.0 ppm
			☐ Y								
*Area entirely within CLP-E			☐ Y								
total treated = 9.99 ac			☐ Y								
within EWM-D & CLP-D & E			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
					Totals	10		600		225	

Aquatics at Treatment Site: TS = Target Species SP = Species Present

TS	SP	Species	Site(s)	TS	SP	Species	Site(s)	TS	SP	Species	Site(s)	TS	SP	Other Aquatics	Site(s)
☐	☐	Cattail		☐	☒	Filamentous Algae		☐	☐	Planktonic Algae		☐	☐	White-Stem Pondweed	
☐	☐	Chara		☐	☐	Flat-Stem Pondweed		☐	☐	Purple Loosestrife		☐	☐	Wild Celery	
☐	☒	Coontail		☐	☐	Floating-Leaf Pondweed		☐	☐	Richardson Pondweed		☐	☐	white water crowfoot	
☒	☐	Curly-Leaf Pondweed		☐	☐	Illinois Pondweed		☐	☐	Robbins Pondweed		☐	☐	Spatterdock	
☐	☐	Duckweed		☐	☐	Large-Leaf Pondweed		☐	☐	Sago Pondweed		☐	☐		
☐	☒	Elodea		☐	☐	Northern Milfoil		☐	☐	Watershield		☐	☐		
☒	☐	Eurasian/hybrid Milfoil		☐	☐	Phragmites		☐	☒	White Water Lily		☐	☐		





Legend

- + GPS Sample Points*
- Fullness Rating 1
- Aquatic Invasive Species Area

AIS Area (acreage)	
A	1.70
B	1.06
C	1.06
D	5.48
E	1.29
F	0.50
TOTAL	11.08

Fullness Rating	Coverage	Description
1		Few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
2		There are enough plants to cover the length of the rake head in a single layer, but not enough to fully cover tines.
3		The rake is completely covered and tines are not visible.

Notes

1. Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet
2. Data Sources Include: Stantec, WDNR, WDOT
3. Orthophotography: 2013 NAIP

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

*Survey conducted by James Scharl & Chris Caplan on 2015/07/07

Figure No.
1

DRAFT

Title
2015 AIS Survey: White River Flowage
Eurasian Water-Milfoil

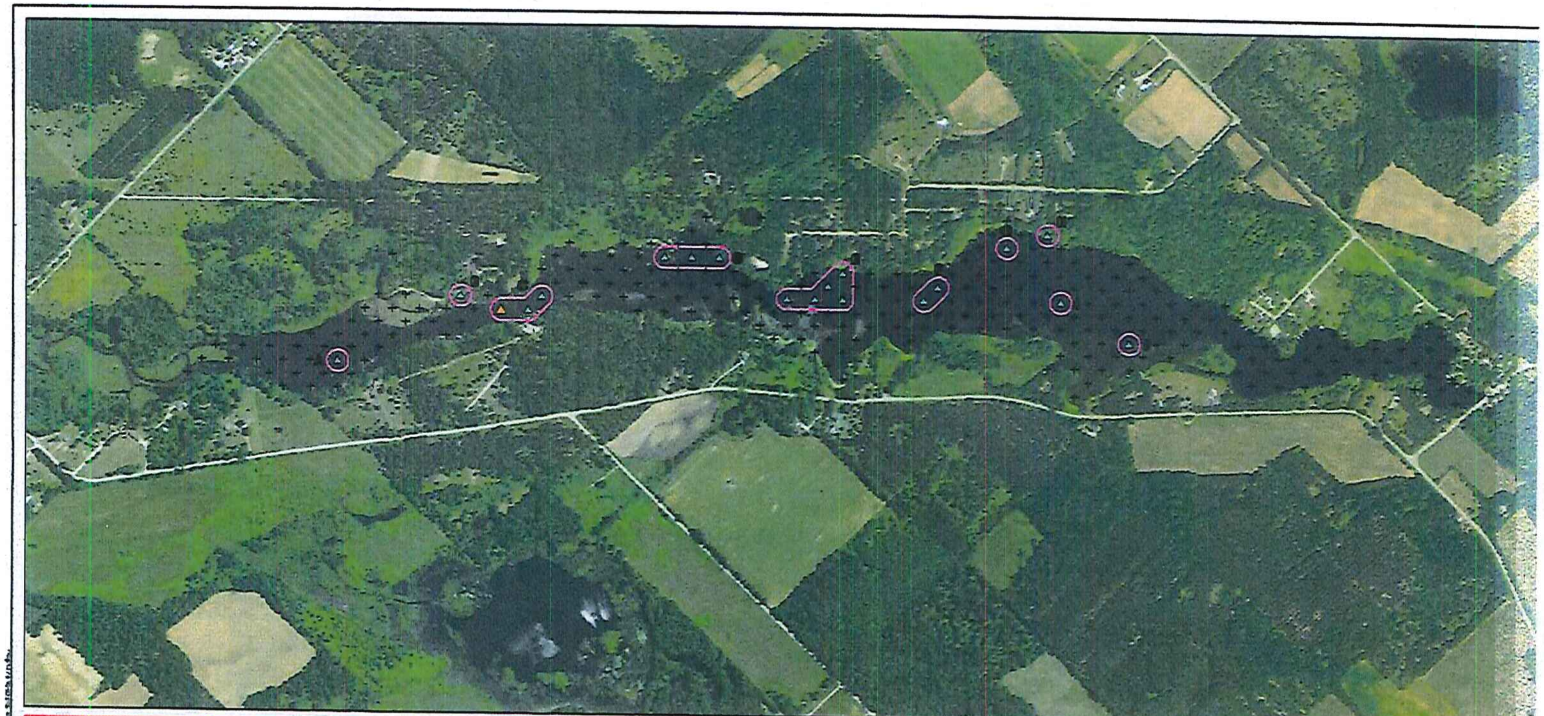
Client/Project
White River Flowage

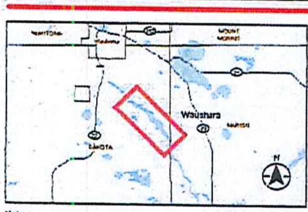
Project Location
T. of Wautoma, Waushara Co., WI

193703821
Prepared by EAJ on 2015-08-06
Technical Review by LP on 2015-08-06
Independent Review by XXX on 2015-XX-XX

0 400 800 Feet
1:9,600 (At original document size of 11x17)

Stantec





Notes
1. Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet
2. Data Sources Include: Stantec, WDNR, WDOT
3. Orthophotography: 2013 NAIP

Legend
+ GPS Sample Points*
△ Fullness Rating 1
△ Fullness Rating 3
○ Aquatic Invasive Species Area

AIS Area (acreage)										
A	B	C	D	E	F	G	H	I	J	Total
0.50	0.50	1.85	2.09	3.15	1.06	0.50	0.50	0.50	0.50	11.14

* Survey conducted by James Scharl & Chris Cazlan on 2015/07/07

Fullness Rating	Coverage	Description
1		Few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
2		There are enough plants to cover the length of the rake head in a single layer, but not enough to fully cover tines.
3		The rake is completely covered and tines are not visible.

Figure No.
2

Title
2015 AIS Survey: White Ri
Curly-leaf Pondweed

Client/Project
White River Flowage

Project Location
E of Wautoma, Waushara Co., WI

0 400 800
Feet

Stantec

Attachment B – 2016 Flowering Rush Map and Treatment Records

State of Wisconsin
Department of Natural Resources
dnr.wi.gov

Aquatic Plant Management Herbicide Treatment Record

Form 3200-111 (R 11/11)

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General Permit Information

Permit Number	Waterbody Name (including ponds, e.g., Smith Pond)		
NE-2016-70-1171	White River Flowage		
County	**Permit Holder Name (Customer Name)**		
Waushara	White River Flowage Lake Management District.		
Permit Holder Address	**City**	**State**	**ZIP Code**
W7529 White River Trail	Wautoma	WI	54982

Treatment Information

Treatment Date (mm/dd/yyyy)	Starting Time (24 hr)	Ending Time (24 hr)	Water Temp (°C)	Ambient Air Temp (°C)
7/26/2016	9:30	11:00	63°F	78° F
Wind Speed (mph)	**Wind Direction**	**Expected Duration of Chemical Residuals**		
0-5	W	5 days		

Adverse Conditions Noted (i.e., dead fish, spawning fish, algae bloom, etc.)
Invasive plants

If adverse conditions noted, indicate corrective actions taken
Treatment

Onsite Supervision Present? ○ Yes ☑ No — If Yes, Supervisor Name:

Mixing and Loading Site Location (if other than business site or from prepackaged retail container or applied with equipment with a total capacity of not more than 5 gallons liquid or 50 pounds dry)

Herbicide Treatment and Water Use Restrictions Signs Posted In Accordance With NR 107? ☑ Yes ○ No

Applicator shall provide each customer with a free copy of each pesticide label used (if requested)

Applicator Information

Individual or Business Name		Telephone Number
Street Address		
City	**State**	**ZIP Code**

Individuals Making Pesticide Application:

Last Name	First	Certification #
Berg	Joseph	289538-CA
Kordus	Mark	258412-CA

Name of Person Completing Form	Signature	Date Signed	DNR Use Only Date Received
Joseph J. Berg	[signature]	7/26/16	

Sheet 2 of 2 Date: 7/26/16

Aquatic Plant Management Herbicide Treatment Record

Form 3200-111 (R 11/11)

Treatment Site and Chemical Information (attach additional sheets if necessary)

Site No, Property Name, Address / Fire No	Treated Acreage	Permitted Acreage	Sensitive Area?	Latitude	Longitude	Herbicide Name: Tribune EPA Reg No.: Amount Applied	Concentration (mg/l = ppm)	Herbicide Name: EPA Reg No.: Amount Applied	Concentration (mg/l = ppm)	Herbicide Name: EPA Reg No.: Amount Applied	Concentration (mg/l = ppm)
Whiteriver Flowage	3.0	3.0	☐ Y			6 gal	2 gal/acre				
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
					Totals	6 gal					

Aquatics at Treatment Site: TS = Target Species SP = Species Present

TS	SP		Site(s)	TS	SP		Site(s)	TS	SP		Site(s)	TS	SP	Other Aquatics	Site(s)
☐	☐	Cattail		☐	☑	Filamentous Algae		☐	☐	Planktonic Algae		☐	☐	White-Stem Pondweed	
☐	☐	Chara		☐	☐	Flat-Stem Pondweed		☐	☐	Purple Loosestrife		☐	☐	Wild Celery	
☐	☑	Coontail		☐	☐	Floating-Leaf Pondweed		☐	☐	Richardson Pondweed		☑	☐	Flowering Rush	
☐	☑	Curly-Leaf Pondweed		☐	☐	Illinois Pondweed		☐	☐	Robbins Pondweed		☐	☐		
☐	☐	Duckweed		☐	☐	Large-Leaf Pondweed		☐	☑	Sago Pondweed		☐	☐		
☐	☐	Elodea		☐	☐	Northern Milfoil		☐	☐	Watershield		☐	☐		
☐	☐	Eurasian/hybrid Milfoil		☐	☐	Phragmites		☐	☑	White Water Lily		☐	☐		

State of Wisconsin
Department of Natural Resources
dnr.wi.gov

Aquatic Plant Management Herbicide Treatment Record

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General Permit Information

Permit Number	Waterbody Name (including ponds, e.g., Smith Pond)
NE-2016-70-1171	White River Flowage
County	**Permit Holder Name (Customer Name)**
Waushara	White River Flowage Lake Management District

Permit Holder Address	City	State	ZIP Code
W7529 White River Trail	Wautoma	WI	54982

Treatment Information

Treatment Date (mm/dd/yyyy)	Starting Time (24 hr)	Ending Time (24 hr)	Water Temp (ºC)	Ambient Air Temp (ºC)
09/12/2016	11:00	12:30	64 F	70 F

Wind Speed (mph)	Wind Direction	Expected Duration of Chemical Residuals
5-10	S	3

Adverse Conditions Noted (i.e., dead fish, spawning fish, algae bloom, etc.)

If adverse conditions noted, indicate corrective actions taken

Onsite Supervision Present? ○ Yes ● No

If Yes, Supervisor Name

Mixing and Loading Site Location (if other than business site or from prepackaged retail container or applied with equipment with a total capacity of not more than 5 gallons liquid or 50 pounds dry)

White River Flowage boat landing

Herbicide Treatment and Water Use Restrictions Signs Posted In Accordance With NR 107? ● Yes ○ No

Applicator shall provide each customer with a free copy of each pesticide label used (if requested)

Applicator Information

Individual or Business Name	Telephone Number
Wisconsin Lake and Pond Resource	920 872-2032

Street Address

N7828 Town Hall Road

City	State	ZIP Code
Eldorado	WI	54932

Individuals Making Pesticide Application:

Last Name	First	Certification #
Scharl	James	77803
Kordus	Mark	82178

Name of Person Completing Form	Signature	Date Signed	DNR Use Only Date Received
James Scharl			

Aquatic Plant Management Herbicide Treatment Record

Form 3200-111 (R 11/11)

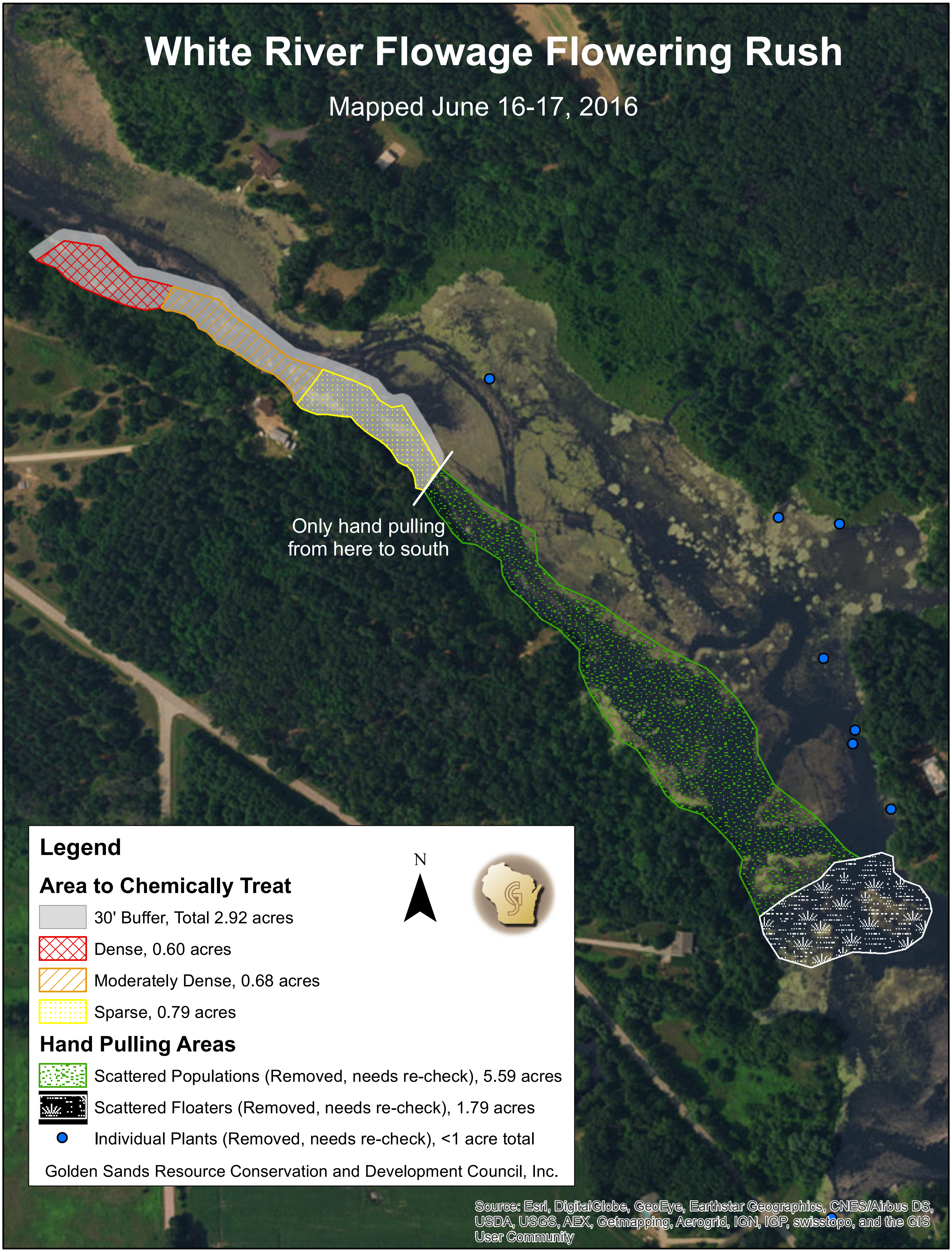
Sheet 2 of 2 Date: 09/14/2016

Treatment Site and Chemical Information (attach additional sheets if necessary)

Site No, Property Name, Address / Fire No	Treated Acreage	Permitted Acreage	Sensitive Area?	Latitude	Longitude	Herbicide Name: Tribune EPA Reg No.: 100-1390 Amount Applied	Herbicide Name: Tribune Concentration (mg/l = ppm)	Herbicide Name: Cygnet + EPA Reg No.: N/A Amount Applied	Herbicide Name: Cygnet + Concentration (mg/l = ppm)	Herbicide Name: EPA Reg No.: Amount Applied	Herbicide Name: Concentration (mg/l = ppm)
Flowering Rush	3	3	☐ Y			6 gal	0.29 ppm	16 oz	---		
			☐ Y								
*bump application			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
			☐ Y								
					Totals						

Aquatics at Treatment Site: TS = Target Species SP = Species Present

TS	SP	Species	Site(s)	TS	SP	Species	Site(s)	TS	SP	Species	Site(s)	TS	SP	Other Aquatics	Site(s)
☐	☐	Cattail		☐	☐	Filamentous Algae		☐	☐	Planktonic Algae		☐	☐	White-Stem Pondweed	
☐	☐	Chara		☐	☐	Flat-Stem Pondweed		☐	☐	Purple Loosestrife		☐	☐	Wild Celery	
☐	☒	Coontail		☐	☐	Floating-Leaf Pondweed		☐	☐	Richardson Pondweed		☒	☐	Flowering Rush	
☐	☒	Curly-Leaf Pondweed		☐	☐	Illinois Pondweed		☐	☐	Robbins Pondweed		☐	☐		
☐	☐	Duckweed		☐	☐	Large-Leaf Pondweed		☐	☐	Sago Pondweed		☐	☐		
☐	☒	Elodea		☐	☐	Northern Milfoil		☐	☐	Watershield		☐	☐		
☐	☐	Eurasian/hybrid Milfoil		☐	☐	Phragmites		☐	☒	White Water Lily		☐	☐		



White River Flowage Flowering Rush
Mapped June 16-17, 2016
Only hand pulling
from here to south
Legend
Area to Chemically Treat
30' Buffer, Total 2.92 acres
Dense, 0.60 acres
Moderately Dense, 0.68 acres
Sparse, 0.79 acres
Hand Pulling Areas
Scattered Populations (Removed, needs re-check), 5.59 acres
Scattered Floaters (Removed, needs re-check), 1.79 acres
Individual Plants (Removed, needs re-check), <1 acre total
Golden Sands Resource Conservation and Development Council, Inc.
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Attachment C – Tables

Table 1: Aquatic Plant Community Statistics. White River Flowage, Waushara County, Wisconsin.

	2010	2015	2016
Number of sites sampled	190	187	166
Number of sites with vegetation	174	164	159
Number of sites shallower than maximum depth of plants	183	177	159
Frequency of occurrence at sites shallower than maximum depth of plants (%)	95.1%	92.7%	100.0%
Simpson Diversity Index	0.88	0.92	0.87
Maximum Depth of Plants (Feet)	16	12	12
Taxonomic Richness (Number Taxa - includes visuals)	20	26	21
Average Number of Species per Site (less than max depth of plant growth)	3.25	2.62	3.03
Average Number of Species per Site (sites with vegetation)	3.43	2.84	3.04
Average Number of Native Species per Site (less than max depth of plant growth)	3.13	2.42	2.97
Average Number of Native Species per Site (sites with vegetation)	3.3	2.64	2.98

Table 2: Frequency of Occurrence of Aquatic Plant Species by Year. White River Flowage, Waushara County, Wisconsin.

Species	Frequency of Occurrence (%)		
	2010	**2015**	**2016**
Eurasian water-milfoil	**7.1**	**10.2**	**4.4**
Curly-leaf pondweed	**4.9**	**10.7**	**1.3**
Flowering rush (emergent)	**---**	**3.4**	**---**
Coontail	62.3	29.9	69.8
Muskgrass	3.8	4.0	12.0
Common waterweed	55.7	44.6	61.6
Water star-grass	20.8	15.3	32.7
Small duckweed	25.7	6.2	8.8
Forked duckweed	---	0.6	0.6
Northern water-milfoil	20.2	23.7	31.5
Slender naiad	3.8	1.7	15.7
Nitella	---	---	5.0
White water lily	3.8	6.8	4.4
Frie's pondweed	---	7.9	---
Floating-leaf pondweed	14.8	17.0	8.8
Long-leaf pondweed	---	0.6	---
White-stem pondweed	3.3	0.6	2.5
Small pondweed	---	4.5	---
Flat-stem pondweed	4.9	16.4	5.7
White water crowfoot	3.3	7.3	1.9
Common arrowhead	---	0.6	---
Large duckweed	29.5	12.4	1.9
Flliform pondweed	0.6	---	---
Sago pondweed	2.7	7.9	2.5
Wild celery	6.6	14.1	22.6
Common watermeal	21.3	11.9	9.4
Horned pondweed	---	1.1	---
Southern wild rice	1.1	3.4	0.6
Filamentous algae	---	2.3	3.8

--- - species not sampled

Table 3: FQI and Average Coefficient of White River Flowage Compared to Northern Central Hardwood Forests Lakes						
	Average Coefficient of Conservatism			**Floristic Quality**		
Quartile	Lower	Mean	Upper	Lower	Mean	Upper
Wisconsin Lakes	5.5	6	6.9	16.9	22.2	27.5
Northern Central Hardwoods Forests	5.2	5.6	5.8	17	20.9	24.4
2016	5.68			24.78		
2015	5.78			27.73		
2010	5.72			24.28		

Table 4: FQI Breakdown by species for White River Flowage, Waushara County, Wisconsin

	Coefficient of Conservatism		
Common Name	**2010**	**2015**	**2016**
Coontail	3	3	3
Muskgrass	7	7	7
Common waterweed	3	3	3
Water star-grass	6	6	6
Small duckweed	4	4	4
Forked duckweed	---	6	6
Northern water-milfoil	6	6	6
Slender naiad	6	6	6
Nitella	---	---	7
White water lily	6	6	6
Frie's pondweed	---	8	---
Floating-leaf pondweed	5	5	5
Long-leaf pondweed	---	7	---
White-stem pondweed	8	8	8
Small pondweed	---	7	---
Flat-stem pondweed	6	6	6
White water crowfoot	8	8	8
Common arrowhead	---	3	---
Large duckweed	5	5	5
Flliform pondweed	8	---	---
Sago pondweed	3	3	3
Wild celery	6	6	6
Common watermeal	5	5	5
Horned pondweed	---	7	---
Southern wild rice	8	8	8
Total Species	18	23	19
Mean C	5.72	5.78	5.68
Floristic Quality Index (FQI)	**24.28**	**27.73**	**24.78**

Table 5: Statistical Significance of Species Between Sampling Events. White River Flowage, Waushara County, Wisconsin

Species	2016 v 2010			2016 v 2015		
	P-value	Significance	+ / -	P-value	Significance	+ / -
Eurasian water-milfoil	0.288297807	n.s.	↓	**0.044305556**	*	↓
Curly-leaf pondweed	0.055684216	n.s.	↓	**0.000339716**	***	↓
Flowering rush (emergent)	---	---	---	0.019149325	*	↓
Coontail	0.143920065	n.s.	↑	**2.8891E-13**	***	↑
Muskgrass	**0.004690959**	**	↑	**0.006173591**	**	↑
Common waterweed	0.269617413	n.s.	↑	**0.001829491**	**	↑
Water star-grass	**0.000721823**	***	↓	**0.000165919**	***	↑
Small duckweed	**4.76861E-05**	***	↓	0.366333851	n.s.	↑
Forked duckweed	0.282646937	n.s.	↑	0.939341762	n.s.	↑
Northern water-milfoil	**0.017407727**	*	↑	0.113193503	n.s.	↑
Slender naiad	**0.000164279**	***	↑	**3.39698E-06**	***	↑
Nitella	**0.002136871**	**	↑	**0.002524334**	**	↑
White water lily	0.788098824	n.s.	↑	0.346244581	n.s.	↓
Frie's pondweed	---	---	---	**0.000291682**	***	↓
Floating-leaf pondweed	0.091158932	n.s.	↓	**0.027144376**	*	↓
Long-leaf pondweed	---	---	---	0.342517307	n.s.	↓
White-stem pondweed	0.676160562	n.s.	↓	0.140335132	n.s.	↑
Small pondweed	---	---	---	**0.006662704**	**	↓
Flat-stem pondweed	0.759114645	n.s.	↑	**0.001942584**	**	↓
White water crowfoot	0.422524939	n.s.	↓	**0.019000136**	*	↓
Common arrowhead	---	---	---	0.342517307	n.s.	↓
Large duckweed	**8.12473E-12**	***	↓	0.000236321	***	↓
Flliform pondweed	0.350567907	n.s.	↓	---	---	---
Sago pondweed	0.900711109	n.s.	↓	**0.028355514**	*	↓
Wild celery	**1.94505E-05**	***	↑	**0.043157085**	*	↑
Common watermeal	**0.002660338**	**	↓	0.472039135	n.s.	↓
Horned pondweed	---	---	---	0.178824248	n.s.	↓
Southern wild rice	0.646272452	n.s.	↓	0.076873035	n.s.	↓
Filamentous algae	**0.008020121**	**	↑	0.414935201	n.s.	↑

* - somewhat significant change, ** - moderatly significant change, *** - very significant change

n.s. - Change not significant

--- - Species was not sampled in both comparison years

Attachment D – 2016 post-treatment Figures

N7828 Town Hall Rd.
Eldorado, WI 54932
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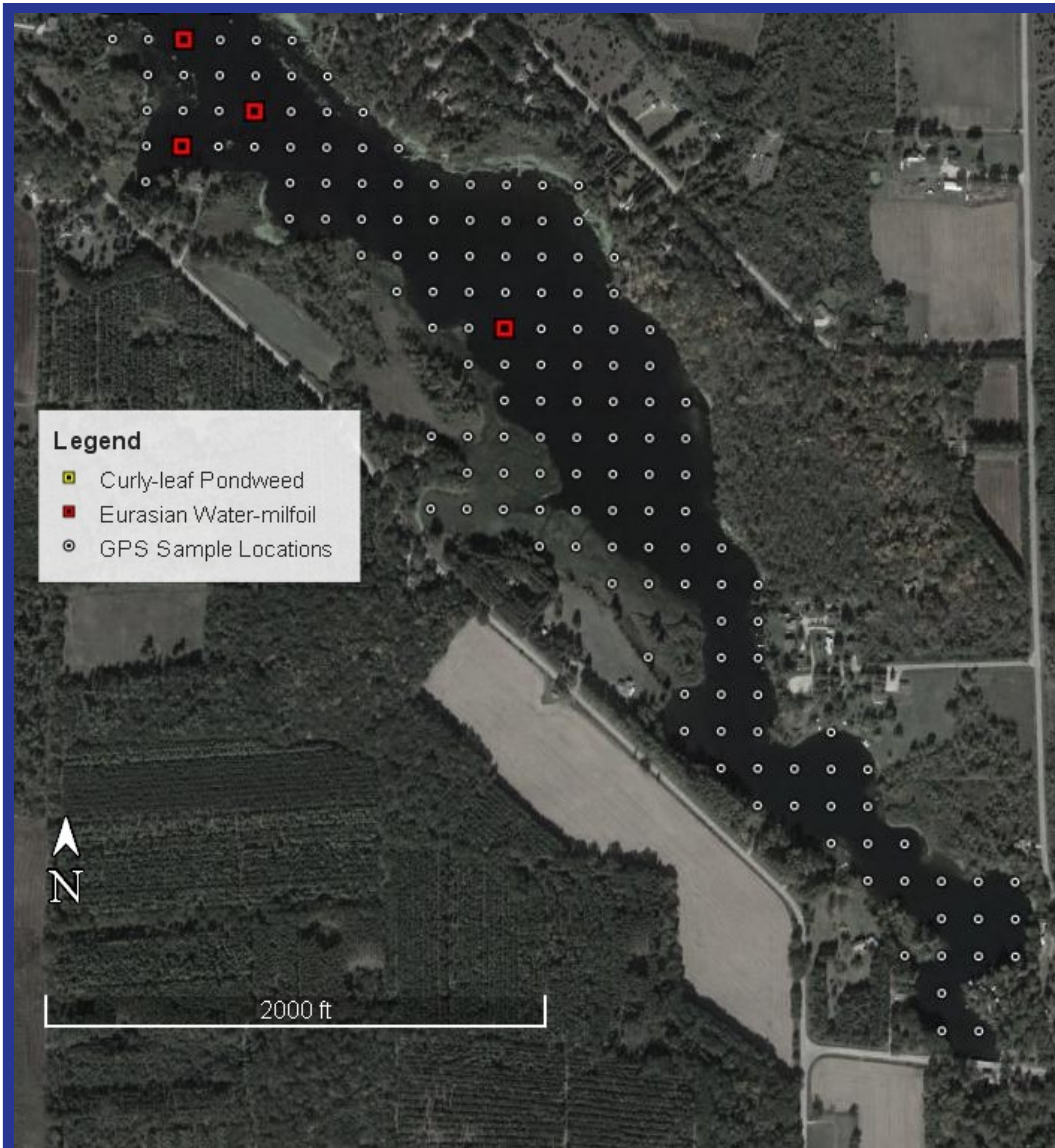

Figure 1 - 2016 AIS Locations South

Wisconsin Lake & Pond Resource LLC
"Providing Professional Resources for Management of Your Lake or Pond"
www.WisconsinLPR.com (920) 872-2032

White River Flowage
Waushara County
Surveyed: September 12, 2016
All AIS present at Rake Density – 1

Wisconsin Lake & Pond Resource LLC
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Figure 2 - 2016 AIS Locations North
White River Flowage, Waushara County
Surveyed: September 12, 2016
All AIS Present at Rake Density - 1

Attachment E – Detroit Lakes Flowering Rush Management Report

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

A report to the Pelican River Watershed District

Gray Turnage[1], Brent Alcott[2], and Tera Guetter[2]

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Geosystems Research Institute Report 5067

April 2016

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[2] Pelican River Watershed District, Detroit Lakes, MN 56501

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

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.
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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.
- 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.

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.

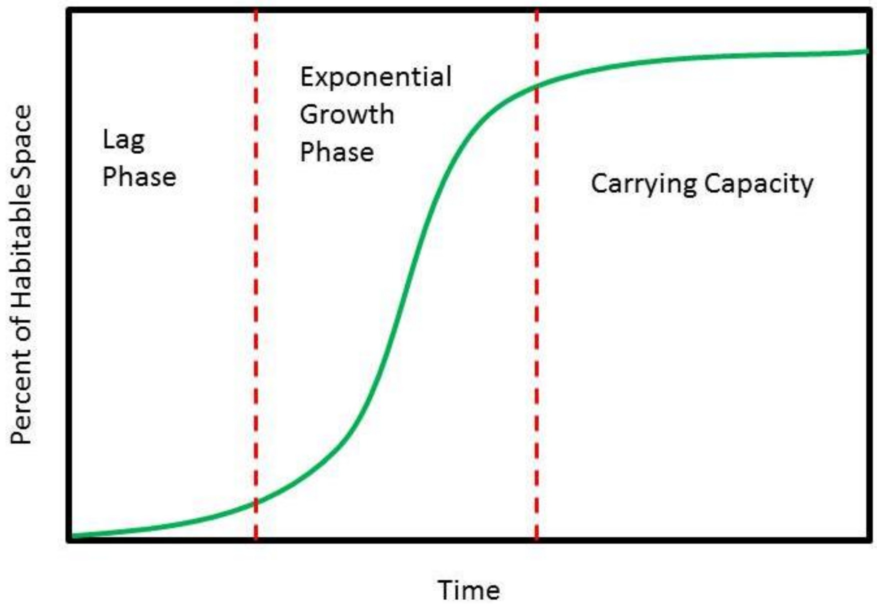

Figure 2. Figure showing the different phases of spread after a site has been invaded.

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.

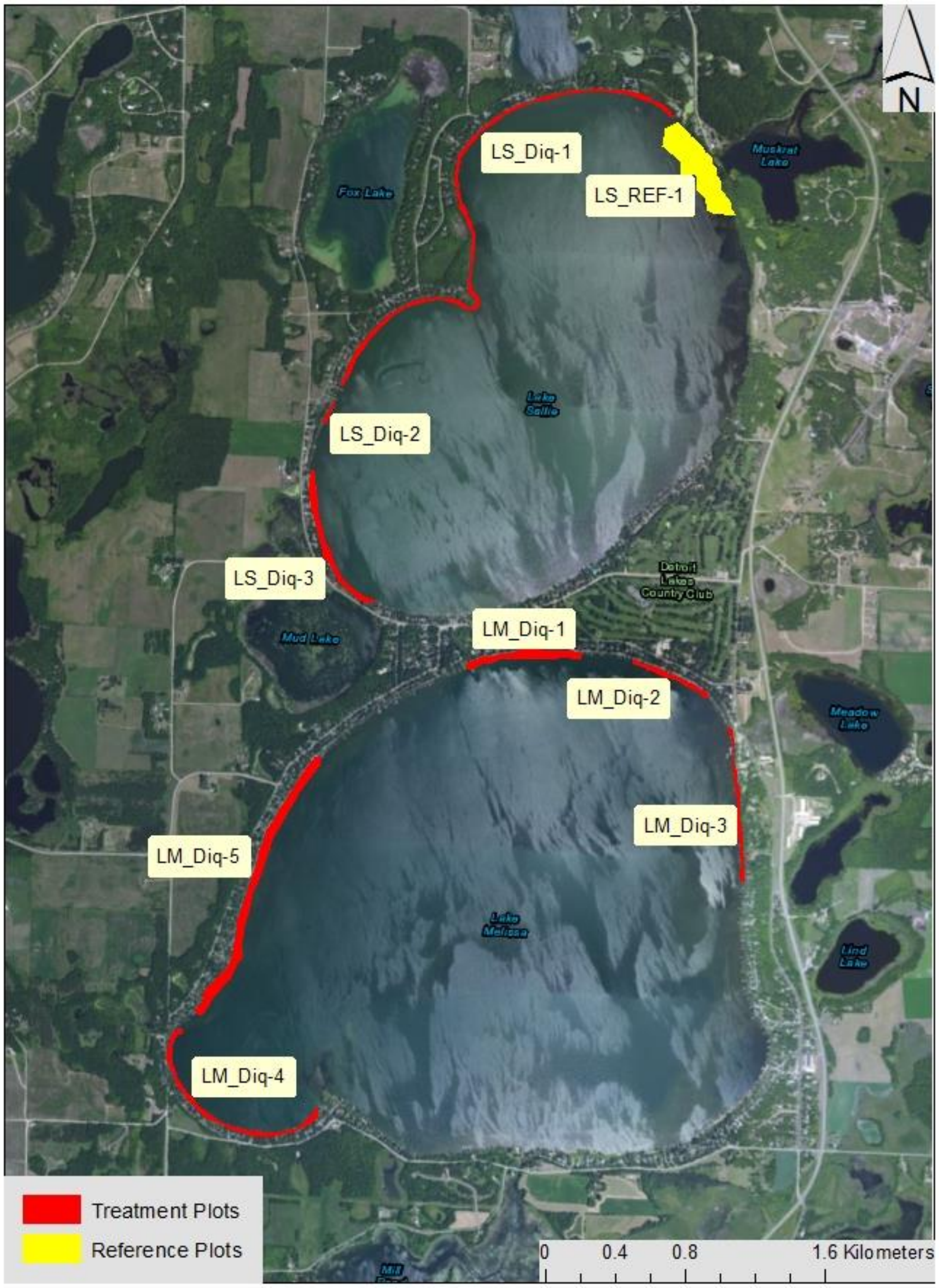

Figure 4. Treatment ("DIQ") and reference ("REF") plots for Lakes Sallie and Melissa, MN, for 2014. To view treatment plots for 2012 and 2013, refer to Madsen et al. 2013 and 2014.

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

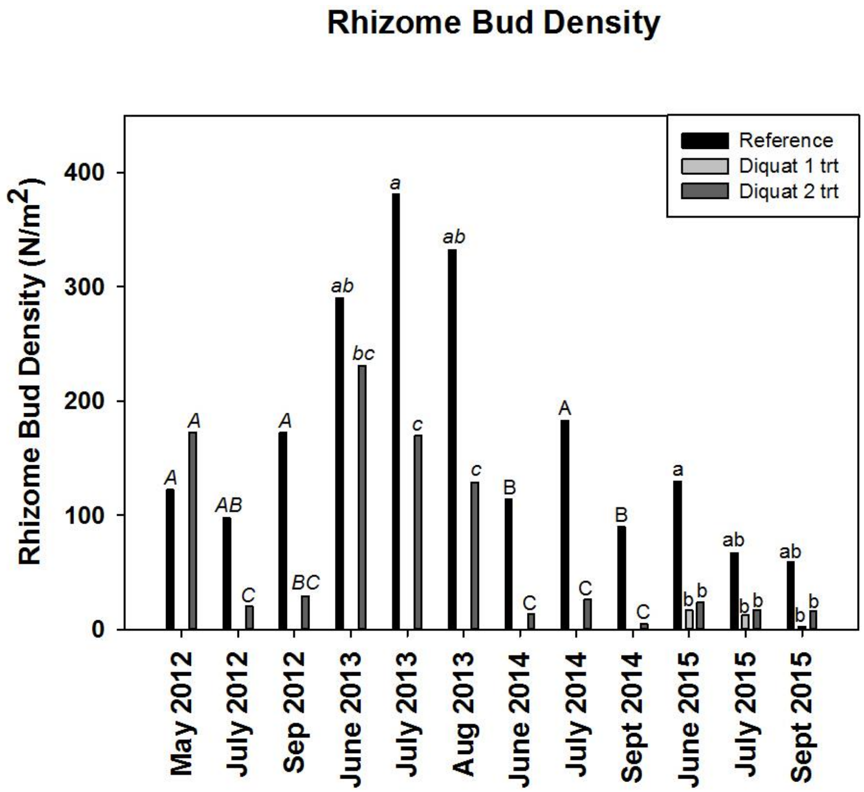

Figure 6. Rhizome bud density (N/m^2) for May, July, and September of 2012; June, July and August of 2013; June, July, and September 2014; and June, July, and September of 2015 of reference (untreated) and diquat-treated plots in the Detroit Lake Systems. Diquat 1 trt bars represent those sites that 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.

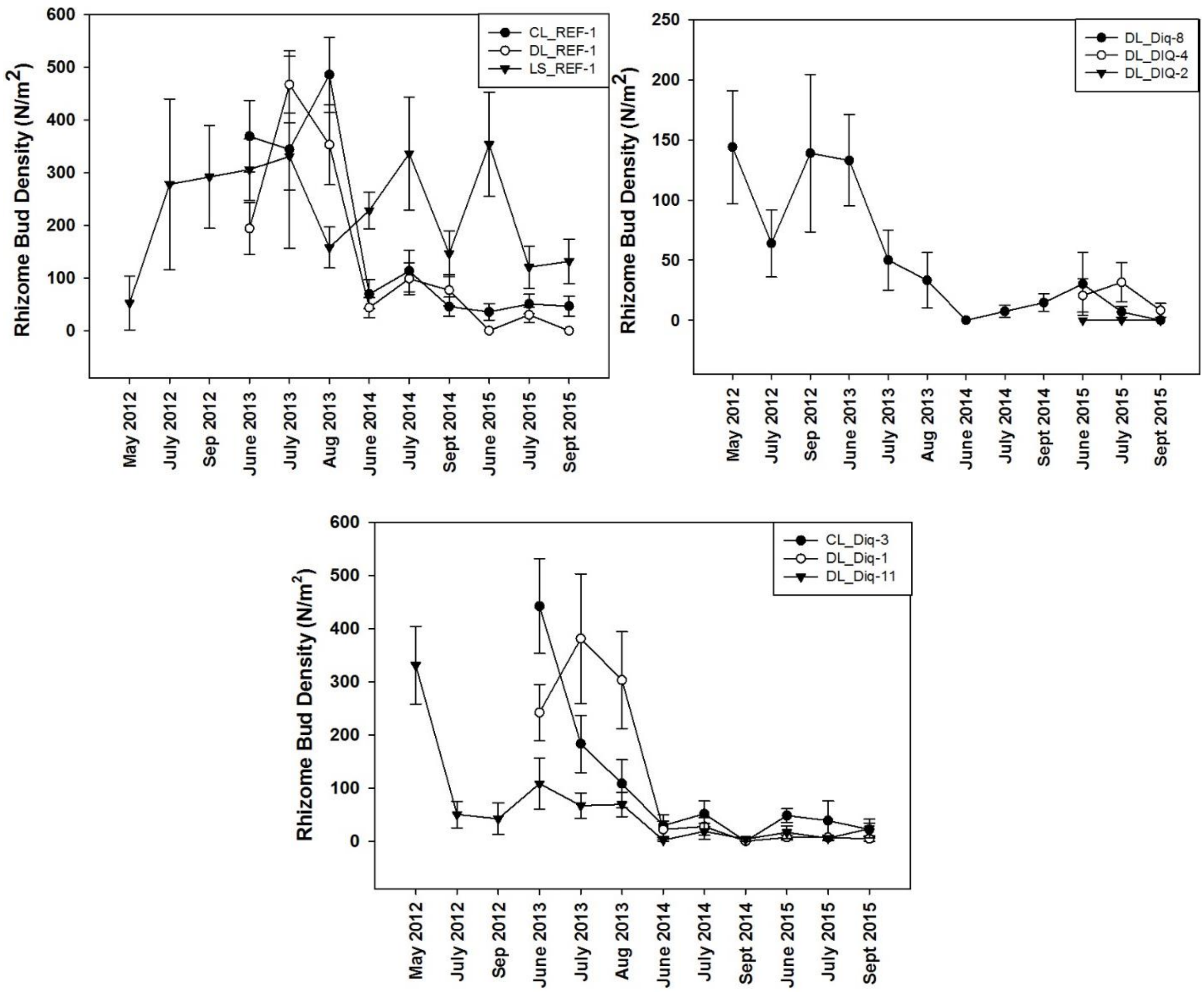

Figure 7. Rhizome bud density (N/m^2) for reference sites (top left), sites receiving one diquat treatment (top right), and sites receiving two treatments (bottom) in the Detroit Lakes system from 2012 through 2015. See Table 2 for a key to plots and their treatments in respective years. Points are the 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.

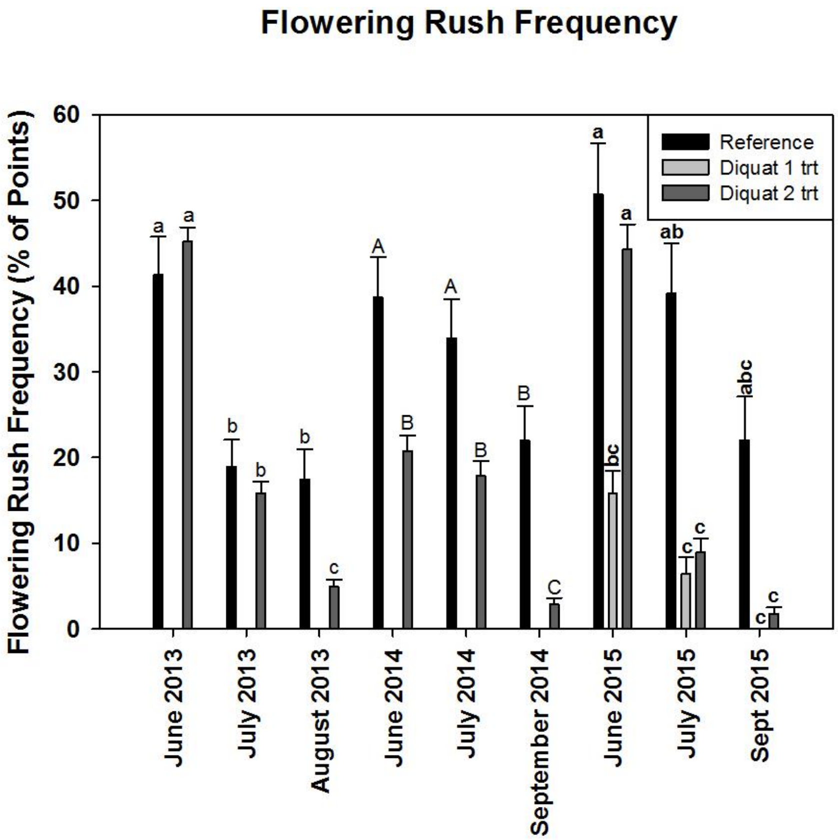

Figure 8. Percent frequency of flowering rush in June, July, and August of 2013 and June, July, and September of 2014 and 2015 in plots on Detroit Lakes system, MN. Lower case letters are for 2013 data, upper case are for 2014, and lower case bold type are for 2015 data. Different letters indicate that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

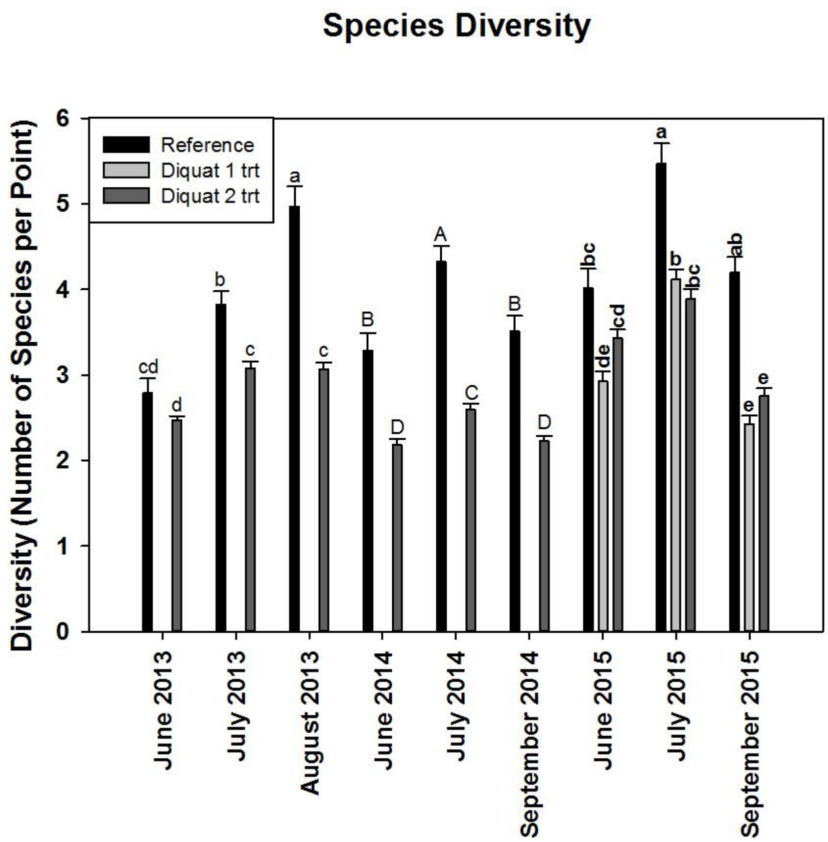

Figure 9. Species diversity (as average number of species per point) in reference and diquat-treated plots in the Detroit Lake system in 2013, 2014, and 2015. Diquat plots treated after the June and July sampling. Lower case letters are for 2013 data, upper case are for 2014 data, and lower case bold 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.

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	

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

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

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

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

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	*Bidens beckii*	BBEC	0	0	0
Flowering rush	*Butomus umbellatus*	BUMB	-	-	-
Coontail	*Ceratophyllum demersum*	CDEM	0	-	+
Chara	*Chara*	chara	0	+	0
Water moss	*Drepanocladus*	DREP	+	+	0
Elodea	*Elodea canadensis*	ECAN	0	0	0
Water stargrass	*Heteranthera dubia*	HDUB	+	0	+
Brownfruit rush	*Juncus pelocarpus*	JPEL	0	0	0
Common duckweed	*Lemna minor*	LMIN	0	0	0
Star duckweed	*Lemna trisulca*	LTRI	0	+	0
Northern watermilfoil	*Myriophyllum sibiricum*	MSIB	+	-	+
Bushy naiad	*Najas flexilis*	NFLEX	+	+	+
Nitella	*Nitella*	NITEL	0	0	0
White waterlily	*Nymphaea odorata*	NODOR	0	0	0
Yellow pondlily	*Nuphar lutea*	NVARI	0	-	-
Curlyleaf pondweed	*Potamogeton crispus*	PCRI	-	-	-
Leafy pondweed	*Potamogeton foliosus*	PFOL	-	-	-
Variable pondweed	*Potamogeton gramineus*	PGRAM	0	0	0
Illinois pondweed	*Potamogeton illinoensis*	PILL	-	-	-
Floating pondweed	*Potamogeton natans*	PNAT	0	-	0
Whitestem pondweed	*Potamogeton praelongus*	PPRA	0	-	+
Richardson's pondweed	*Potamogeton richardsonii*	PRICH	-	-	0
Robbin's pondweed	*Potamogeton robbbinsii*	PROBB	0	-	0
Flatstem pondweed	*Potamogeton zosteriformis*	PZOS	-	-	-
Widgeongrass	*Ruppia cirrhosa*	RCIRR	0	0	0
White water buttercup	*Ranunculus longirostris*	RLON	0	0	-
Hardstem bulrush	*Schoenoplectus acutus*	SACU	0	0	0
Arumleaf arrowhead	*Sagittaria cuneata*	SCUN	0	0	0
Sago pondweed	*Stuckenia pectinata*	SPEC	+	0	0
Narrowleaf cattail	*Typha angustifolia*	TANG	0	0	0
Broadleaf cattail	*Typha latifolia*	TLAT	0	0	0
Common bladderwort	*Utricularia macrorhiza*	UMAC	0	0	+
Watercelery	*Vallisneria americana*	VAME	+	+	+
Watermeal	*Wolffia*	WOOLF	0	0	0
	Increasers		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		
YEAR	2015	2015	2015
MONTH	JUNE	AUG	SEPT
DAY	19	5	16
POINTS	20	20	20
Bidens beckii	0	0	0
Butomus umbellatus	13	7	0
Ceratophyllum demersum	0	0	0
Chara	20	20	20
Drepanocladus	0	7	4
Elodea canadensis	0	0	0
Heteranthera dubia	0	0	0
Juncus pelocarpus	0	0	0
Lemna minor	0	0	0
Lemna trisulca	0	2	2
Myriophyllum sibiricum	0	0	0
Najas flexilis	0	0	0
Nitella	0	0	0
Nymphaea odorata	0	0	0
Nuphar lutea	6	8	2
Potamogeton crispus	0	0	0
Potamogeton foliosus	11	2	0
Potamogeton gramineus	0	0	0
Potamogeton illinoensis	5	9	7
Potamogeton natans	0	0	0
Potamogeton praelongus	2	3	1
Potamogeton richardsonii	13	16	8
Potamogeton robbinsii	0	0	0
Potamogeton zosteriformis	4	2	0
Ruppia cirrhosa	0	0	0
Ranunculus longirostris	0	0	0
Schoenoplectus acutus	10	9	7
Sagittaria cuneata	0	0	0
Stuckenia pectinata	0	0	0
Typha angustifolia	0	0	0
Typha latifolia	0	0	0
Utricularia macrorhiza	0	1	0
Vallisneria americana	17	17	13
Wolffia	0	0	0

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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