



Flowering Rush Flowerheads, Forest Lake, August 9, 2022

Flowering Rush Delineation, Treatment, and Assessment for Forest Lake, Washington County, Minnesota, 2022

Pre-Treatment Delineation: July 12, 2022

1st Treatment: July 29, 2022

Post Treatment Assessment and Delineation: August 9, 2022

2nd Treatment: September 19, 2022

Post Treatment Assessment: October 18, 2022

Prepared for:
Washington County and
Comfort Lake - Forest Lake
Watershed District



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Flowering Rush Delineation, Control, and Assessment for Forest Lake, Washington County, Minnesota, 2022

Summary

On July 12, 2022, a flowering rush delineation was conducted and 35 sites of flowering rush covering about 0.17 acres were delineated. A diquat application on July 29, 2022 was for spot treatment of small individual patches as well as for patches that were grouped closely together.

A flowering rush assessment and new delineation survey were conducted on August 9, 2022 and flowering rush sprouting was found at 157 sites with an estimated area of flowering rush coverage of 0.57 acres. A second treatment using diquat was conducted on September 19, 2022.

The October assessment survey was conducted on October 18, 2022 and flowering rush sprouts were found at 25 sites with an estimated area of flowering rush coverage of 0.29 acres.

In Forest Lake, the total area of flowering rush has decreased from 7.8 acres in 2014 to 0.29 acres in October of 2022 indicating the flowering rush control program is reducing the distribution and density of flowering rush (Figure S1). Although the estimated total area of flowering rush was around 0.29 acres in October of 2022, flowering rush regrowth is expected in 2023. Continuing to control areas of flowering rush should reduce abundant regrowth but it appears eradication will be a challenge.

The steps for controlling flowering rush in the next few years include the following three methods.

1. Treat large continuous patches of flowering rush with diquat and spot treat small patches.
2. Treating small patches should occur 2 or 3 times/season.
3. Continue to remove flowerheads before seeds are produced which should help reduce new sites of flowering rush colonization.



Several patches of flowering rush with seedheads were found close to the swimming beach on July 12, 2022.

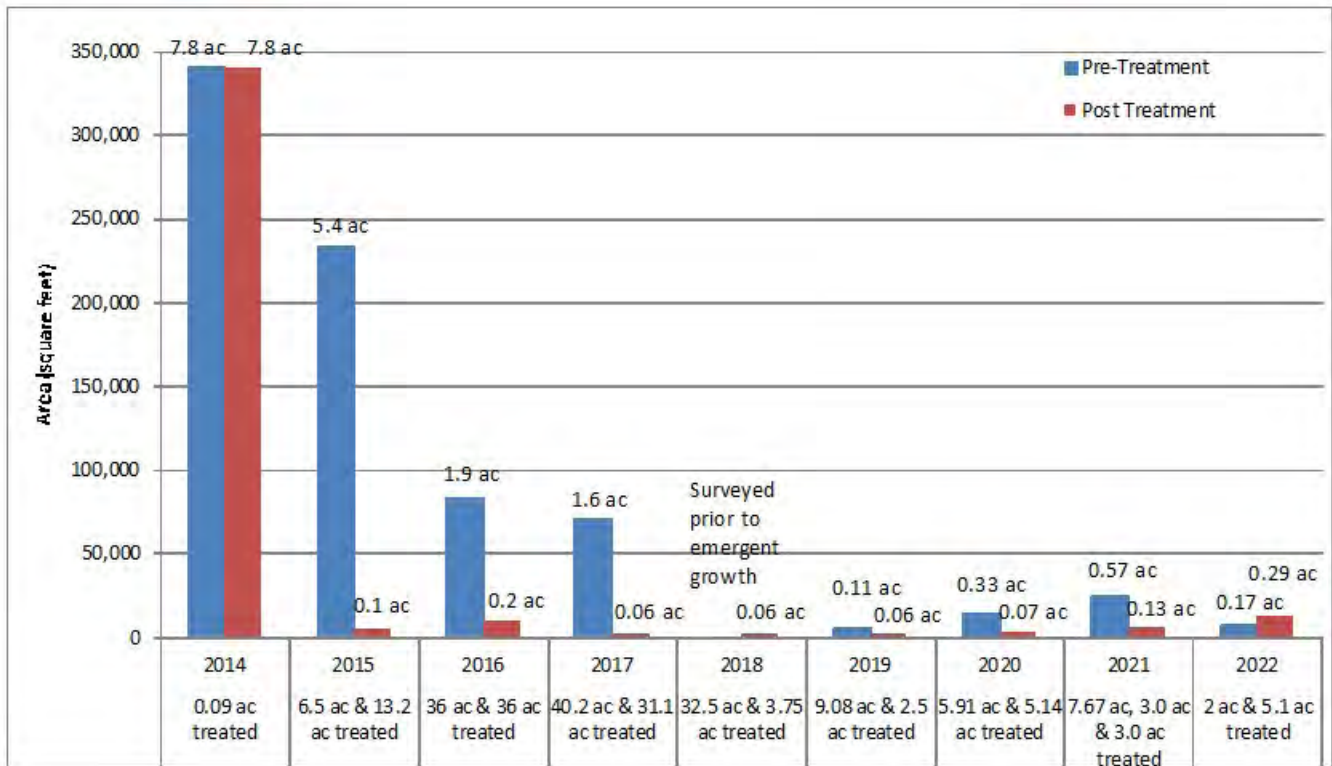


Figure S1. Flowering rush areas from 2014 through 2022 for pre-treatment and post treatment conditions.

Summary of Flowering Rush Treatments and Results for 2014-2022

A summary of flowering rush treatments and results over the previous 9 years are shown in Table S1. Flowering rush has decreased from 7.8 acres in 2014 to 0.29 acres on October 18, 2022 roughly, a decrease of about 96% from 2014. Regrowth in 2022 occurred at a number of persistent areas located in 2nd and 3rd lakes and 62 new sites of colonization were recorded.

At the end of 2022, there have been a total of 25 flowering rush sites identified. Often a flowering rush site is only 10 stems or less. Although large beds of flowering rush of over 1,000 square feet occur, they are rarely found after the second treatment. In 2022, the average size of a flowering rush site at the first delineation was 206 square feet which is more compared to the initial delineations in 2014 (Table S1).

Although a total of 409 flowering rush sites have been identified over the last 9 years, 9% of the sites had flowering rush growth in the July 12, 2022 delineation survey. After 2 treatments, flowering rush was found at 3% of the known sites, with a flowering rush patch averaging 530 square feet per site.

It appears flowering rush does not sprout every year at every site, however, it apparently continues to produce new growth at new sites as the summer progresses. Therefore a delineation in July will not delineate all the flowering rush for the summer. New growth will occur in August and September.

Although new flowering rush sites are found annually, the number of new flowering rush sites per year has averaged 32 sites per year for 2017-2022. The number of new sites found annually have decreased since flowering rush flowerheads have been removed from 2017-2022. Prior to flower and seedhead removal, new flowering rush sites averaged 52 new sites per year in 2015 and 2016.

Table S1. Summary of flowering rush sites and areas for 2014-2022.

	All Known Flowering Rush Sites at Start of the Year	New Sites	Total Known Flowering Rush Sites	Flowering Rush Sites with Plants		Flowering Rush (acres)		Average Size of Flowering Rush Patch (square feet)		Percent of All Previously Recorded Sites with Flowering Rush		Acres of Flowering Rush Treated per Application	Total Acres Treated
				start	end	start	end	start	end	start	end		
2014	--	--	142	--	142	7.8	7.8	--	2393	--	100%	0.9 ac	0.9
2015	142	72	214	107	120	5.4	0.1	2198	36	75%	56%	13.2 ac (2 times)	26.4
2016	214	32	246	182	81	1.9	0.2	455	107	87%	33%	36 ac (2 times)	72.0
2017	246	4	250	159	15	1.6	0.06	438	174	65%	1%	40.2 ac and 30.1 ac	70.3
2018	250	ND	250	ND	108	ND	0.06	ND	24	ND	43%	32.5 ac and 3.8 ac	36.3
2019	250	37	287	83	76	0.11	0.06	58	34	33%	27%	9.1 ac and 2.5 ac	11.6
2020	287	24	311	145	53	0.33	0.07	100	53	47%	17%	5.91 ac and 5.14 ac	11.1
2021	311	62	373	75	65	0.57	0.13	329	88	20%	17%	7.67 ac, 3.0 ac, 3.0 ac	13.7
2022	373	36	409	35	25	0.17	0.29	206	530	9%	3%	2.0 ac, 5.1 ac	7.1

Additional details of flowering rush in all 3 lake basins are shown in Table S2.

Table S2. Summary of flowering rush sites and areas for 2014 through 2022.

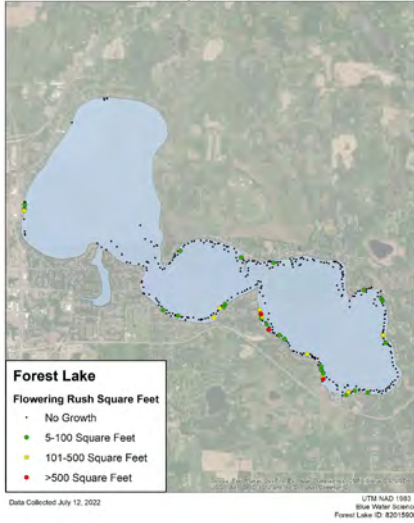
Total Sites	1 st Lake		2 nd Lake		3 rd Lake		Total	
	Number of sites with plants	Area (sf)	Number of sites with plants	Area (sf)	Number of sites with plants	Area (sf)	Number of sites with plants	Area (sf)
July 22, 2014 (Delineation)	0	0	34	3,750	--	336,990 (estimated based on Oct 8 survey)	34+ (not including 3 rd lake)	340,740 (estimated) (7.8 ac)
2 nd Lake was treated with diquat on 0.09 ac on September 9, 2014								
October 8, 2014 (Assessment)	0	0	26	3,135	116	336,990	142	340,125 (7.8 ac)
July 17, 2015 (Delineation)	0	0	22	2,360	85	230,939	107	233,299 (5.4 ac)
2 nd and 3 rd Lakes were treated by cutting in July and August; 3 rd Lake treated with diquat twice in August, 2015 (13.2 ac)								
September 28, 2015 (Assessment)	11	170	20	237	88	4,004	120	4,411 (0.1 ac)
(new sites compared to 2014)	(11)	--	(13)	--	(25)	--	(49)	--
July 14 and 15, 2016 (Delineation)	4	100	46	33,000	132	50,000	182	83,189 (1.9 ac)
2 nd and 3 rd Lakes were treated with diquat twice in August, 2016 (36 ac)								
September 21, 2016 (Assessment)	0	0	21	305	60	8,818	81	9,183 (0.2 ac)
(new sites compared to 2015)	(0)	--	(0)	--	(3)	--	(3)	--
August 1, 2017 (Delineation)	4	170	37	1,735	118	69,190	159	71,095 (1.6 ac)
2 nd and 3 rd Lakes were treated with diquat twice, once in August (40.2) and once in September, 2017 (30.1 ac)								
October 23, 2017 (Assessment)	1	20	4	150	10	2,485	15	2,655 (0.06 ac)
(new sites compared to 2016)	(1)	--	(1)	--	(5)	--	(7)	--
July 5, 2018 (Pre-treatment survey)	no emergent plants observed	--	no emergent plants observed	--	no emergent plants observed	--	no emergent plants observed	--
12 areas, delineated in 2017 totaling 32.5 acres were treated with diquat on July 13, 2018.								
July 25, 2018 (Survey)	0	0	73	2,540	54	1,280	127	3,820 (0.09 ac)
Spot treatment of 125 patches totaling 3.75 acres on August 21, 2018.								
September 19, 2018 (Post treatment assessment)	0	0	54	1,160	54	1,566	108	2,726 (0.06 ac)
July 9, 2019 (Pre-treatment survey)	4		34		43		83 (13 new)	4,990 (0.11 ac)
9.1 acres plus spot treatments on July 31, 2019								
August 12, 2019 (Survey)	11		26				105 (17 new)	18,505 (0.42 ac)
Spot treatment of 105 patches totaling 2.5 acres on August 30, 2019.								
September 30, 2019 (Post treatment assessment)	1		21		54		76 (7 new)	2,790 (0.06 ac)
(new sites compared to 2018)	(5)	--	(22)	--	(10)	--	(37)	--
July 21, 2020 (Pre-treatment survey)	7		44		94		145 (21 new)	14,562 (0.33 ac)
5.91 acres plus spot treatments on August 6, 2020.								
August 26, 2020 (Survey)	5		43		83		131 (0 new)	26,330 (0.60 ac)
5.14 ac spot treatments on September 2, 2020								
October 12, 2020 (Post treatment assessment)	0		7		46		53 (3 new)	3,200 (0.07 ac)
(new sites compared to 2019)	(3)	--	(10)	--	(11)	--	(24)	--
7.67 acres plus spot treatments on July 26, 2021.								

Table S2. Summary of flowering rush sites and areas for 2014 through 2022.

Total Sites	1 st Lake		2 nd Lake		3 rd Lake		Total	
	Number of sites with plants	Area (sf)	Number of sites with plants	Area (sf)	Number of sites with plants	Area (sf)	Number of sites with plants	Area (sf)
July 27, 2021 (Pre-treatment survey)	4	1,640	20	1,295	53	2,190	75 (14 new)	24,695 (0.57 ac)
3.0 acres of spot treatments on August 13, 2021.								
September 9, 2021 (Survey)	26	1,923	26	4,540	51	14,169	98 (46 new)	19,082 (0.44 ac)
3.0 ac of spot treatments on September 13, 2021.								
October 18, 2021 (Post treatment assessment)	11	825	19	1,490	35	3,415	65 (2 new)	5,695 (0.13 ac)
(new sites compared to 2020)	(18)	--	(29 less)	--	(84 less)	--	(62)	--
July 12, 2022 (Pre-treatment survey)	3	240	8	920	24	6,065	35 (4 new)	7,225 (0.17 ac)
0.17 acres of spot treatments on July 29, 2022.								
August 9, 2022 (Survey)							157 (32 new)	24,868 (0.57 ac)
0.57 ac of spot treatments i September, 2022.								
October 18, 2022 (Post treatment assessment)							25 (0 new)	12,720 (0.29 ac)
(new sites compared to 2021)							(36)	--

Flowering Rush Delineations, Treatments, and Assessments in 2022

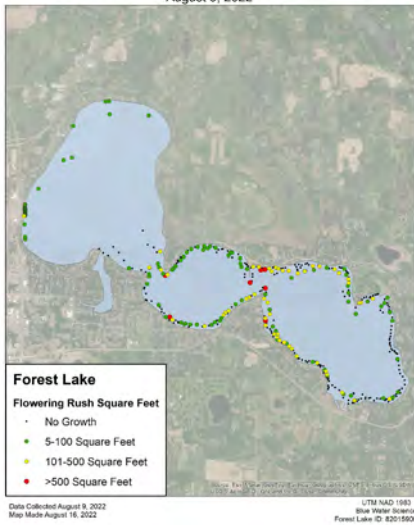
2022 Forest Lake Flowering Rush Growth
July 12, 2022



1st Treatment July 29, 2022



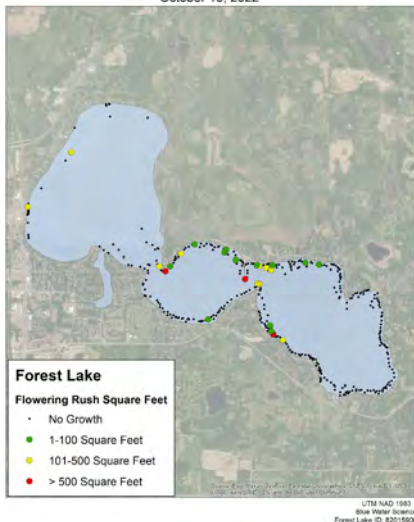
2022 Forest Flowering Rush Growth
August 9, 2022



2nd Treatment September 19, 2022



2022 Forest Lake Flowering Rush Growth
October 18, 2022



Final Assessment October 18, 2022

Flowering Rush Status After Final Treatments from 2014-2022

At the middle of October 2022, the area of flowering rush was about 99% less compared to 2014. The number of sites, usually less than 88 square feet per site, also declined slightly compared to 2014. Maps of flowering rush assessments for 2014-2022 are shown in Figure S2.

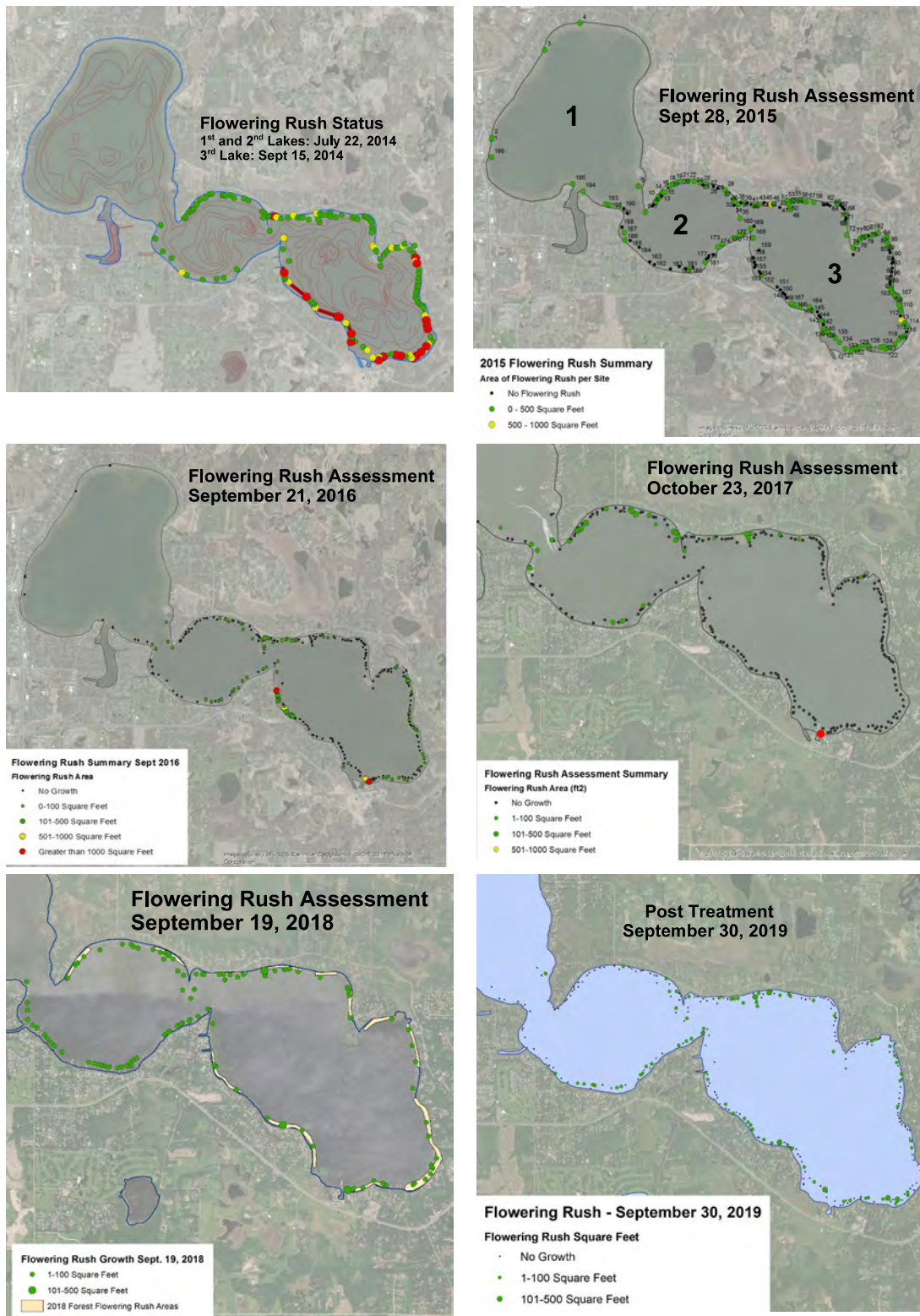


Figure S2. Estimated flowering rush coverage. [top-left] Sept 2014: 340,125 square feet (sf)(only 0.09 acres were treated). [top-right] Sept 2015: 4,411 sf. [middle-left] Sept 2016: 9,183 sf. [middle-right] October 2017: 2,655 sf. [bottom-left] Sept 2018: 2,726 sf. [bottom-right] Sept 2019: 2,790 sf.

Flowering Rush Status After Final Treatments from 2014-2022 (Concluded)

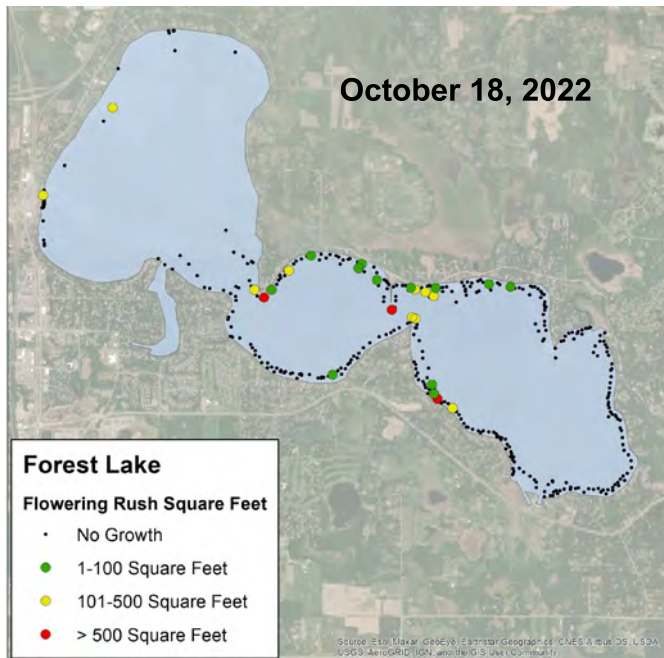
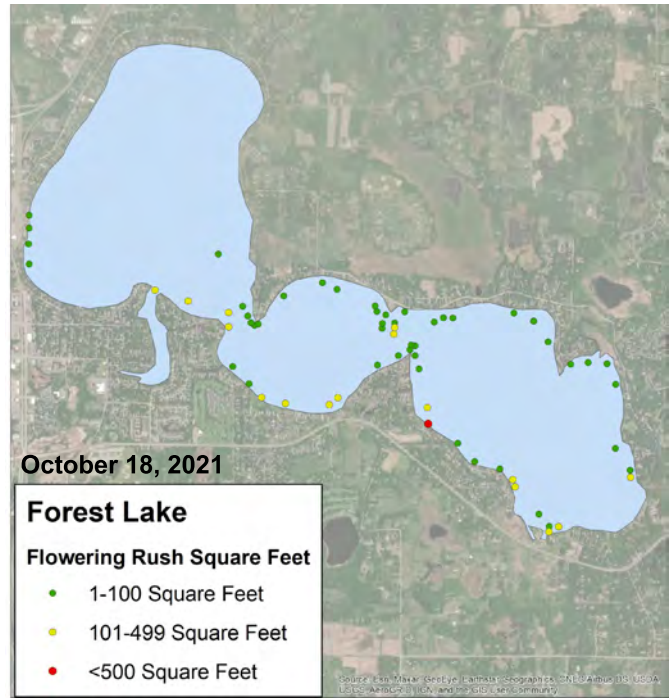
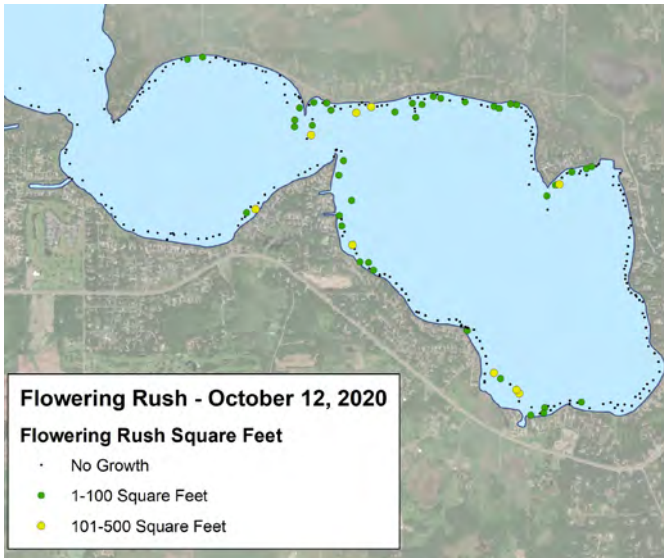


Figure S2 concluded. Estimated flowering rush coverage. [top-left] October 2020, 3,200 square feet (sf). [top-right] October 2021, 5,695 sf. [bottom-left] October 2022, 12,720 sf.