Webster Lake

2022 Annual Management and Clipper Study Report

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Contents

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Introduction

Webster Lake has been suffering from non-native and nuisance aquatic plant growth for several decades. Annual management has been performed on target areas within the three basins consistently since 2005; additionally, a specialized management study on the use of flumioxazin (Clipper) herbicide was initiated in the 2018 season in an effort to provide greater efficacy for fanwort (*Cabomba caroliniana*) control. In 2022, the Webster Lake Association contracted SŌLitude Lake Management (SŌLitude) to continue the five-year management study on variable watermilfoil (*Myriophyllum heterophyllum*) and fanwort through the use of flumioxazin herbicide**,** in addition to the continued monitoring and management of nuisance and non-native macrophyte growth throughout Webster Lake.

All work performed in 2022 was conducted in accordance with a License to Apply Chemicals from the MA DEP (#WM04-0000995) and an Order of Conditions from the Webster Conservation Commission (#323-1215).

The following report will discuss: methodology, program results, summary of findings, and management recommendations.

Program Schedule

- Received MA DEP License to Apply Chemicals 06/17/2022
- Early-season Survey 05/26/2022
- Initial Herbicide Treatment 06/21/2022
- Follow-Up Herbicide Treatments 07/20/2022 & 09/08/2022
- Late-season Survey 09/01-02/2022

Methodology

Visual surveys were performed early- and late-season at Webster Lake this year while point-intercept surveys associated with the Clipper study were conducted only late season. The visual technique was employed to document observed growth of target species within the littoral zone of the entire lake. The point-intercept survey was used to collect data within the Clipper Study areas. The pre-treatment surveys were completed approximately three weeks before expected treatment, and the post-treatment surveys occurred in early September.

Visual Target Species Survey

The understood littoral zone of the lake was systematically toured using a motorized boat early- and late-season, where any observed growth of variable watermilfoil and fanwort was documented through the use of a hand-held GPS unit. Visual technique was enhanced with on-board sonar (Lowrance or equivalent), throw-rake, or underwater camera in order to document areas of target growth too deep for observation from the surface, when applicable.

Point-Intercept Macrophyte Mapping

The Point-Intercept Method (PIM) of sampling macrophytes is designed to determine the extent of aquatic growth within an area of concern and can be used over multiple years and growing seasons to analyze changes in plant assemblage. A total of 79 sample sites were established across seven management areas (see **Figure 1**); the sample sites were created by placing a georeferenced 55-m grid data layer over orthophotos of the chosen study areas in Webster Lake and placing data collection sites at each vertex. A handheld Garmin GPS unit was used to locate each data point in the field. The point intercept survey was performed on September 1-2, 2022.

At each site the following parameters were collected: water depth, overall percent cover, overall biovolume, relative percent cover of each species, and any other pertinent field notes regarding the sample location (such as bottom substrate and nearby aquatic/emergent plant growth). Percentages and biovolume were determined through the use of an underwater camera, in addition to a rake toss for macrophyte identification confirmation as needed.

Macrophyte specimens not readily identifiable in the field were collected and bagged with corresponding sample site information. The collected vegetation samples were then transported to SŌLitude for further inspection and positive identification. Regionally appropriate taxonomic keys were used to identify the aquatic macrophytes to the lowest practical taxa – typically to species.

Results & Discussion

Annual Program

Early Season Littoral Survey

On May 26th, SŌLitude Biologists performed the pre-treatment survey, where the main objective was to document the presence of invasive, non-native species, variable watermilfoil and fanwort, within the littoral zone of Webster Lake and determine potential management areas (see **Figure 2**). Variable watermilfoil was observed at varying densities, from sparse to dense patches along the shoreline in First and Second lake. Similarly, fanwort growth was also dominant in Third lake, however, several areas of fanwort were observed in First and Second Lake. Curly-leaf pondweed (newly observed in 2020) was observed once again near Treasure Island (**Figure 2**).

Visually, the general native macrophyte assemblage remains relatively consistent with previous years. Non-target, native species previously identified include: various bladderwort species (*Utricularia spp.*), pondweeds such as Robbins' pondweed (*Potamogeton robbinsii*), snail-seed pondweed (*Potamogeton bicupulatus)*, and large-leaf pondweed (*Potamogeton amplifolius)*, as well as tapegrass (*Vallisneria americana)*, slender naiad (*Najas flexilis)*, spikerush (*Eleocharis spp.)*, and floating-leaf species such as white and yellow water lilies (*Nymphaea odorata* and *Nuphar variegata*).

Due to the early nature of the survey, variable watermilfoil was more common when compared to the fanwort distribution. A map depicting management (treatment) areas for target species was created based off of the late 2021 and early 2022 surveys, considering that peak target species growth and any regrowth will occur late season. Management (treatment) areas supported dense growth of target species primarily in high-use locations and developed shoreline sections (**Figure 3**). Outside of the Clipper study areas, the use of flumioxazin in specific areas continues to be restricted by MassDEP to once every four years. For this reason, there are some areas of fanwort growth in the lake that cannot be treated in a given year with flumioxazin but could be addressed using Sonar (fluridone) herbicide.

Treatment Program Summary

The aquatic herbicide treatment at Webster Lake was conducted on June 21st using two treatment vessels, including an airboat and 20-foot Jon boat, both equipped with GPS and calibrated application systems. Prior to treatment, the lake shoreline was posted with signs notifying the public of the treatment date and temporary water use restrictions. Notifications were also posted on the WLA's website and at the Town beach/boat launch.

All management areas (**Figure 3**) were systematically treated by SOLitude's licensed applicators. Based on designated species present, areas were treated with Tribune (diquat) and/or Flumigard SC (Clipper equivalent) (flumioxazin) and/or Sonar (fluridone). Concentrated products were diluted with lake water in the onboard mixing tank and applied subsurface using a calibrated application system and stern mounted, submersed spray boom. Granular products were applied with a bow mounted, calibrated electric rotary spreader.

Sonar (fluridone) herbicide is a slow acting product that requires an extended (90+ day) contact time with the target plants. For that reason, follow-up herbicide applications were conducted in the Sonar treatment areas to supplement and maintain target concentrations on July 20th and September 8th.

The original Clipper study plan had this as the final year of the study and the 2nd of two monitoring only years following the three years of consecutive treatment (2018-2020). As described later, the years of treatment did not provide lasting control of fanwort in the study areas. As a result, some of these areas exhibited dense growth of invasive species which provided a substantial risk of spread to the rest of the lake as well as degraded conditions in those areas. The WLA and SOLitude mutually decided that treatment was needed in these areas to mitigate that risk and any associated adverse effects.

Late-Season Survey

The late-season survey was performed on September 1st and September 2nd by SŌLitude Biologists.

The majority of variable watermilfoil and fanwort was reduced and was found at lower densities than the early-season survey throughout the three basins (**Figure 4**). In general, fanwort was more prevalent than variable watermilfoil during the late-season survey. Fanwort was observed throughout all three basins, in varying abundances from trace to dense. Within First Lake, fanwort was only observed in a few areas along the east and west shorelines, with trace densities of variable watermilfoil in the large southern cove along Killdeer Road. In Second Lake, fanwort was primarily collected on the eastern and western shorelines, specifically inside and just outside of Reid Smith Cove and in Winter Cove. However, dense occurrences of both fanwort and variable watermilfoil were observed on the western shoreline from Union Point to Point Pleasant out to Long/Cobble Islands. Within Third Lake, fanwort and variable watermilfoil primarily occurred together in historical areas of this basin, including Bates Cove, on the western shoreline of Lower Cedar Cove, and within the area of Wakefield Avenue. Fanwort was more prevalent and dense in Third Lake than was variable watermilfoil.

Late-season recovery of these plants inside the treatment areas is also a potential since both diquat and flumioxazin are considered contact herbicides. Regarding the treatment areas, good control of the target species was achieved although there was some late season regrowth in many of the areas. In the Sonar herbicide treatment areas, the occurrence of fanwort was significantly less and remaining biomass was degraded and chlorotic. The exception to this was Lower Cedar Cove where the efficacy of treatment was less than desirable as evidenced by areas of healthy fanwort growth with less evidence of chlorosis. This has been the case in past Sonar treatments of this area although it is not entirely clear why but could be related to increased water movement.

Clipper Study Observations

Only a post-management point intercept survey was required of the study areas; therefore, no pre-management clipper study data will be discussed. The post-treatment survey of the Clipper study areas was completed by SŌLitude Biologists on September 1st and 2nd. Field data tables can be found following the report.

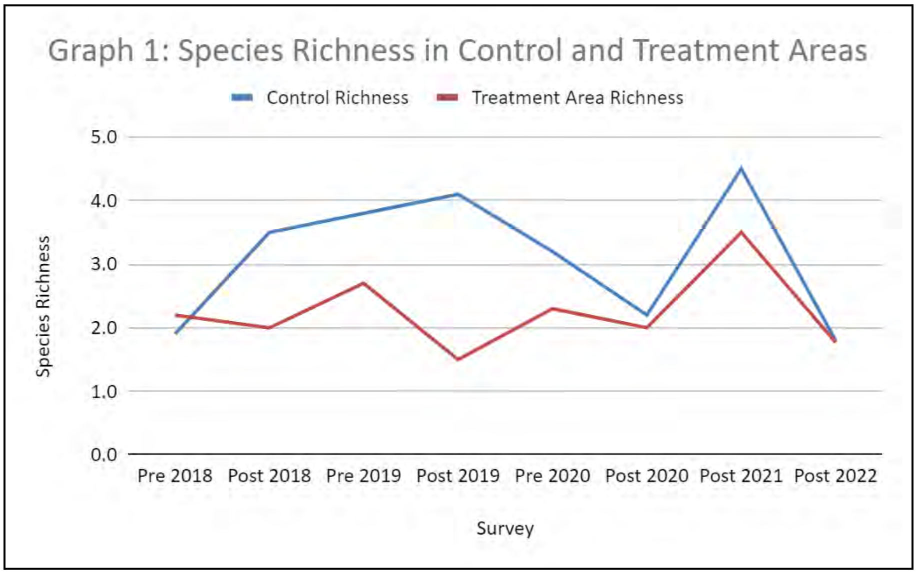
Average percent cover for each species across Sections A-F (treated areas) and the Control area (Section X) are attached (Raw Data Table 1, Appendix A). The Total Percent Cover is the average of the total percent coverage from the points in each section. The plant assemblage for each section varies, where not all plants are present within all sections.

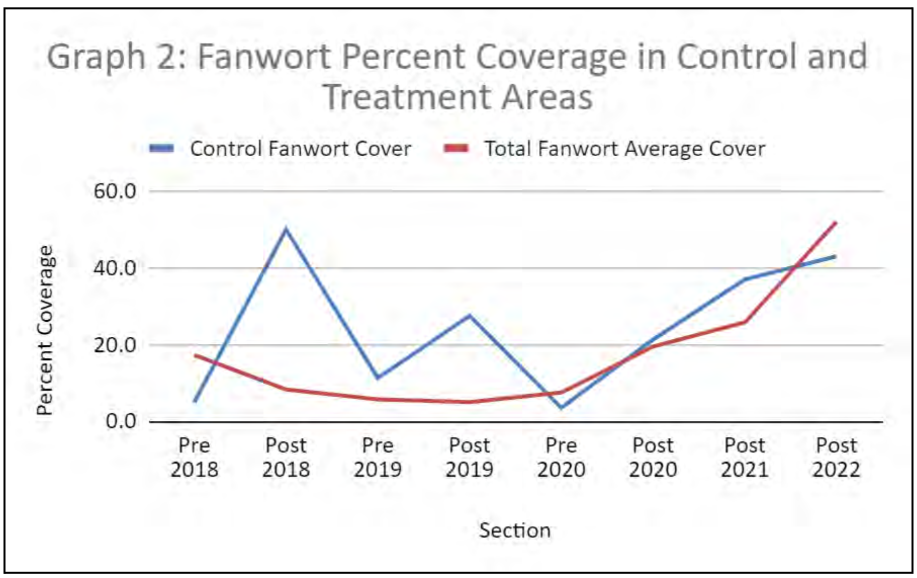
Overall, the Total Percent Cover appeared to decrease from post-2021, and the Control section also decreased (Raw Data Table 1, Appendix A), likely due to the fact that some areas required treatment this year. The following native species experienced an increase in percent coverage: tapegrass, bladderwort spp., watershield, slender naiad, ribbon-leaf pondweed, and both white and yellow water lilies (Raw Data Table 1, Appendix A).

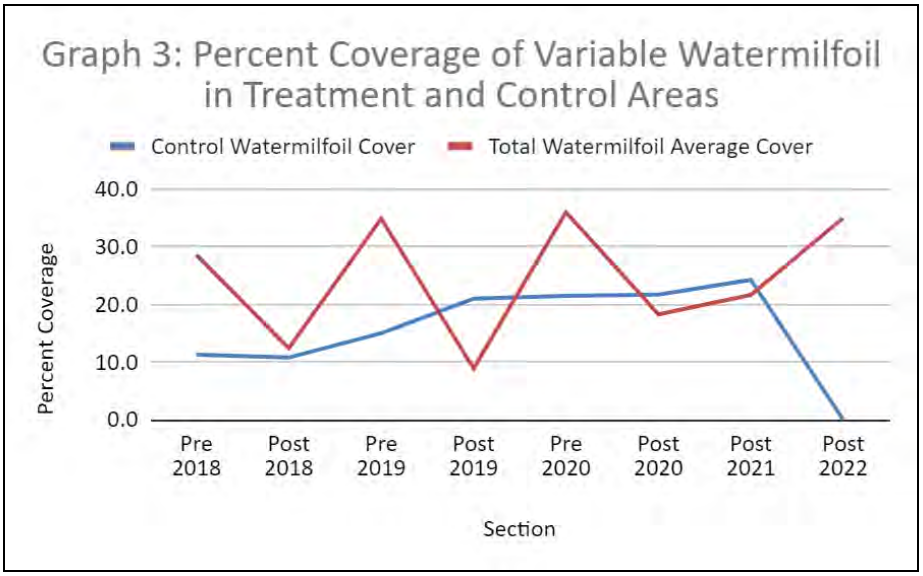
While results for this study generally show an average reduction of both fanwort and variable watermilfoil over the 5 years of the study, both fanwort and variable watermilfoil displayed a slight to moderate increase in and outside the study areas in 2022 (see Graphs 2 & 3 below). Moreover, percent cover of an area varies within the season depending on the species life cycles present. The consecutive years of flumioxazin treatments however clearly did not provide lasting control of fanwort as hoped.

Species richness varies between each survey within the study sections but overall was calculated at 1.52 species/point. Similar to percent cover, some species may not be captured during the survey periods due to growth habit and life cycle. The Control (X) species richness was reduced in 2022 compared to 2021, 1.7 species/point and 4.5 species/point, respectively. Spikerush, fanwort, and white waterlily were some of the dominant species within the control

(X) area. Please see Graphs 1 & 4 for comparisons of native and invasive species, as well as species richness, within the control and treatment areas. Graph 4 only displays the post-management survey data for each year and compares native and invasive species in the control and treatment areas.







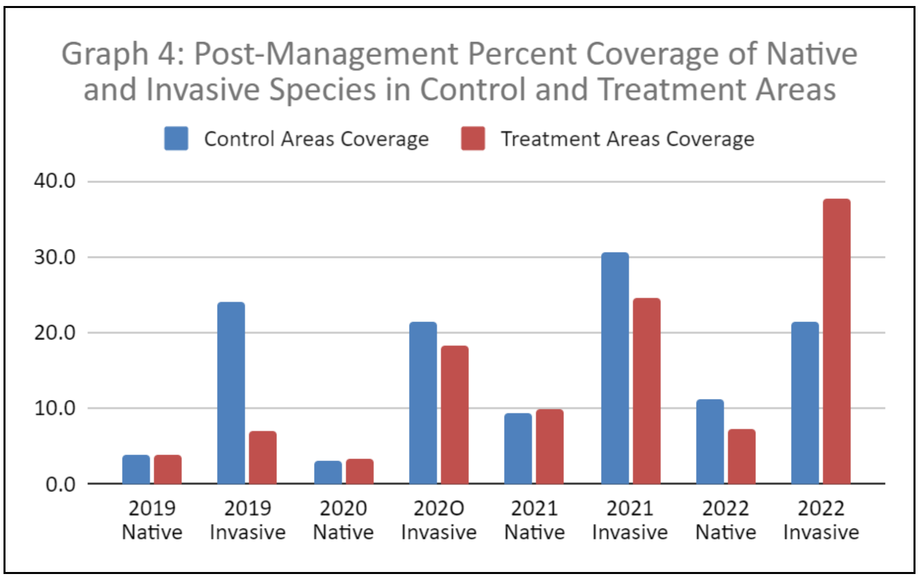


Table 2: 2018-2022 Clipper Study Sections Dominant Species								
	Year 1		Year 2		Year 3		Year 4	Year 5
Section	Pre 2018	Post 2018	Pre 2019	Post 2019	Pre 2020	Post 2020	Post 2021	Post 2022
A	Stonewort Variable watermilfoil	Creeping bladderwort Common bladderwort	Large-leaf pondweed Grassy bulrush	Grassy bulrush Purple bladderwort	Stonewort Spikerush	Spikerush Large-leaf pondweed	Variable watermilfoil Spikerush	Fanwort Spikerush
B	Stonewort Variable watermilfoil	Aquatic moss Variable watermilfoil	Variable watermilfoil Stonewort	White waterlily Grassy bulrush	Variable watermilfoil Spikerush	Spikerush Fanwort	Fanwort White waterlily	Tapegrass Fanwort
C	Stonewort Variable watermilfoil	Filamentous algae Variable watermilfoil	Variable watermilfoil Stonewort	Grassy bulrush Stonewort	Spikerush Variable watermilfoil	Spikerush Tapegrass	Fanwort Spikerush	Spikerush White waterlily

D	Variable watermilfoil Ribbon-leaf pondweed	Filamentous algae Variable watermilfoil	Variable watermilfoil Purple bladderwort	Filamentous algae White waterlily	Variable watermilfoil Water starwort	Variable watermilfoil White waterlily Fanwort	Fanwort Variable watermilfoil	Fanwort White waterlily
E	Variable watermilfoil White waterlily	Purple bladderwort Variable watermilfoil	Variable watermilfoil Robbins' pondweed	White waterlily Robbins' pondweed Variable watermilfoil	Variable watermilfoil White waterlily	Fanwort White waterlily	Fanwort Variable watermilfoil	Fanwort White waterlily
F	Water starwort Stonewort	White waterlily Water starwort	Stonewort Yellow waterlily	White waterlily Stonewort	Variable watermilfoil Stonewort	Spikerush White waterlily	Fanwort White waterlily	Fanwort Variable watermilfoil
Control	Southern naiad Variable watermilfoil	Fanwort Stonewort	Stonewort Large-leaf pondweed Variable watermilfoil	Tapegrass Fanwort	Large-leaf pondweed Slender naiad	Large-leaf pondweed Variable watermilfoil	Fanwort Variable watermilfoil	Spikerush Fanwort White waterlily

Summary of Findings

- During the 2022 season, the littoral zone of Webster Lake was systematically surveyed for growth of variable watermilfoil and fanwort.
- Based on these surveys, herbicide treatments were conducted in June, July and September to control target species.
- Target species growth was generally controlled within the management areas but some regrowth was present especially in diquat/flumioxazin areas.
- This year was the fifth and final year of a 5-year monitoring/management program studying the efficacy of consecutive flumioxazin applications to control variable watermilfoil and fanwort.
- Study results showed little to no carry of control of fanwort by the 2nd year after treatments were completed.
- Variable watermilfoil and fanwort were present in all Clipper study sections.

Management Recommendations

Management Program

Based on the extent of non-native vegetation and regrowth in managed areas, we recommend that the Webster Lake Association budget for continued maintenance spot-treatments of invasive fanwort and variable watermilfoil growth. Diquat herbicide is still the most common and least costly herbicide for variable watermilfoil control at this time, but a new herbicide, ProcellaCOR, has been registered and should be considered for use at Webster Lake. ProcellaCOR is a fast-acting, systemic herbicide that will provide multiple years of watermilfoil control, although at a significantly higher cost than diquat. We recommend considering the use of ProcellaCOR on a pilot basis in 2023, possibly with treatment of one or two areas of dense watermilfoil growth based on consultation with the WLA. Flumioxazin and/or Sonar herbicide is recommended for continued spot-treatment of fanwort.

As with previous years, there continue to be state restrictions on the use of Clipper that only allow for a maximum of 25% of the waterbody to be treated during any year and requires rotating treatment areas within a four-year period. It should be manageable to rotate use of Clipper and Sonar herbicides for fanwort control under the current regulations and the 4-year cycle will allow for retreatment of areas previously treated in 2019 in the coming years. Through the recentClipper Study, MassDEP lifted these regulations for the study areas, however the three consecutive years of treatment were completed in 2020 and the study concluded with surveys only in 2021 & 2022.

Ongoing monitoring (vegetation, water quality, sediment sampling, algae, etc.) is the life-blood of successful lake management and should therefore be a part of any responsible long-term management plan. Annual surveys for target species distribution should be maintained.

We hope you find this information helpful in making your lake management decisions. Thank you for your continued collaboration, and we look forward to working with you again next season. If you have any questions or need anything further, please contact our office.

Appendix A: Macrophyte Distribution Maps and Survey Data

Figure 1. Clipper Study Point-Intercept Sections 2018-2022

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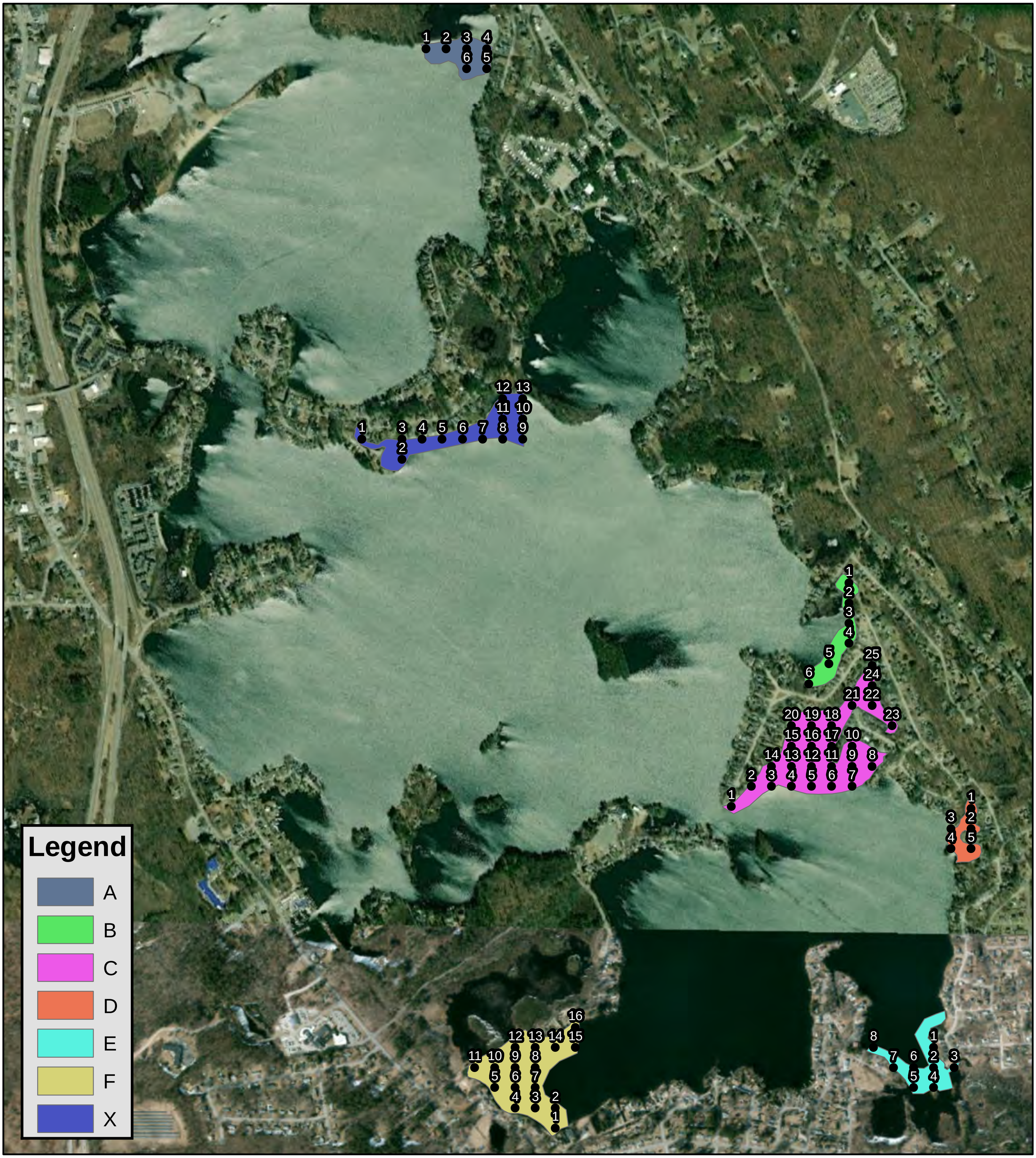
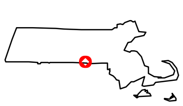


Webster Lake
Webster, MA
Worcester County



Webster Lake

0 1,500 3,000 Feet

N

1:17,000

Map Date: 12/17/2021
Prepared by: ALM
Office: SHREWSBURY, MA

Figure 2: Pre-treatment Survey Results
May 26, 2022

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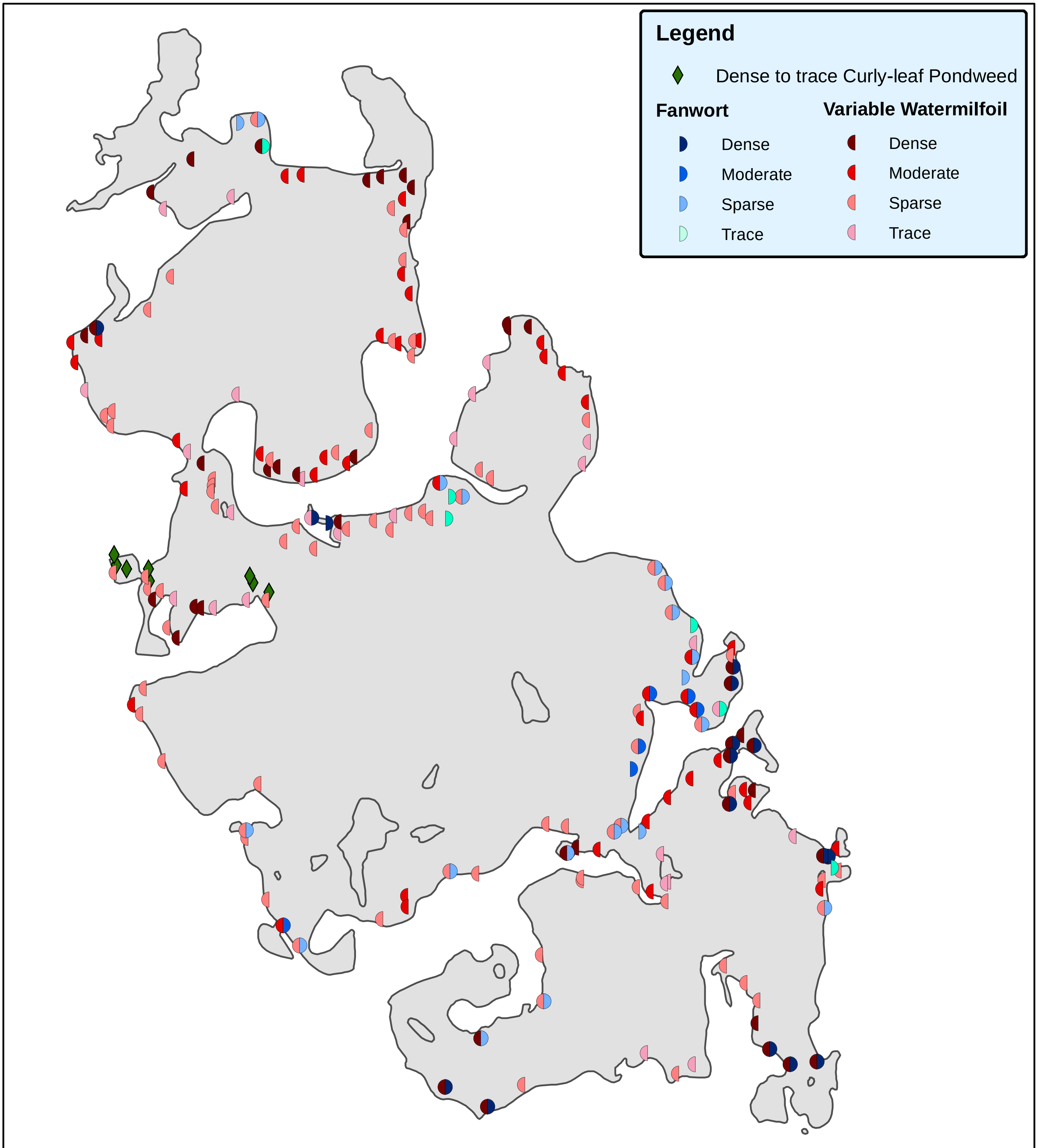
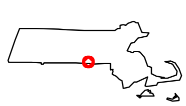


Webster Lake
Webster, MA
Worcester County



Webster Lake

0 1,750 3,500
1:19,669 Feet

N

Map Date: 05/27/2022
Prepared by: ALM
Office: SHREWSBURY, MA

FIGURE 3: 2022 Proposed Treatment Areas (REV 6/15/22)

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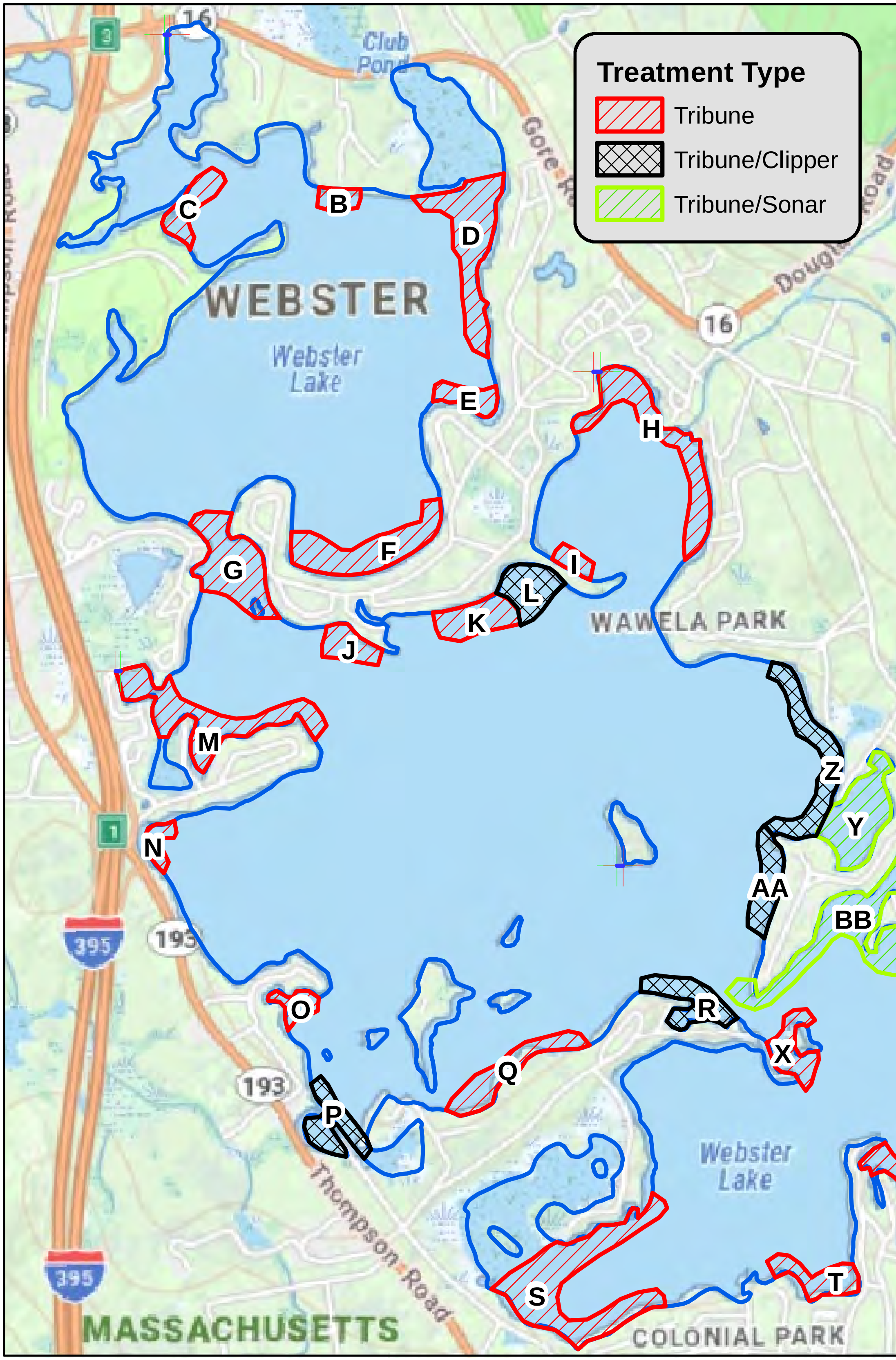

Name	Chem Type	Acres
B	T	2
C	T	4.2
D	T	13.2
E	T	3
F	T	11
G	T	11.5
H	T	12.2
I	T	1.8
J	T	3.7
K	T	5.7
L	TC	5.6
M	T	13.4
N	T	2.1
O	T	2.3
P	TC	5.5
Q	T	7
R	TC	5.9
S	T	19.6
T	T	4.7
U	T	4.8
V	TS	5.9
W	T	5.2
X	T	4.7
Y	TS	10.6
Z	TC	9.6
AA	TC	5.2
BB	TS	18.9

Webster Lake
Webster, MA

Webster Lake

0 1,800 3,600
1:18,899 Feet
N

Map Date: 06/15/2022
Prepared by: DM
Office: SHREWSBURY, MA

Figure 4: Post-Treatment Clipper Study and Visual Survey Results

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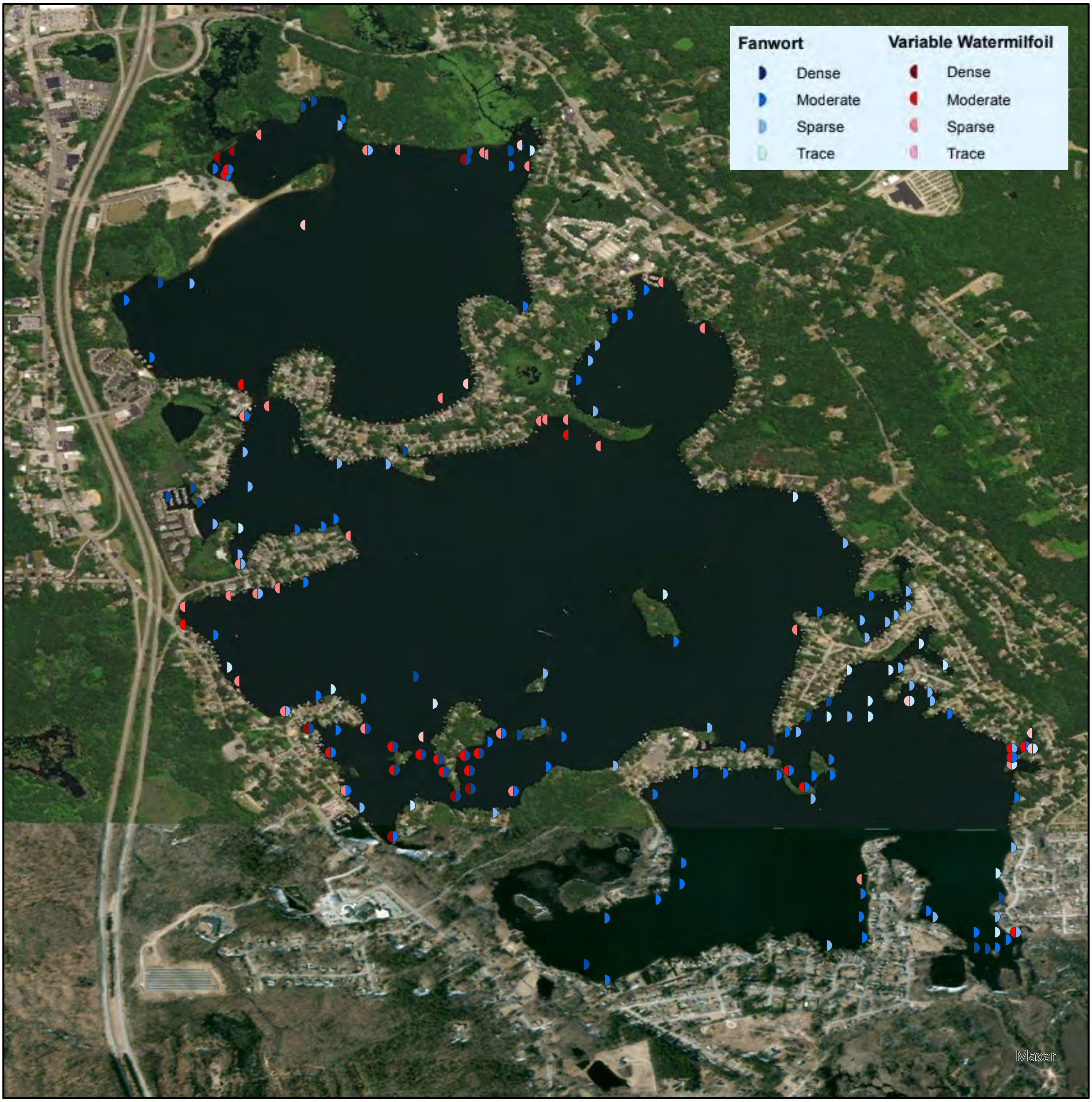

Webster Lake
Webster, MA

N

0 2,000 4,000 Feet

Survey Date: 09/01-02/2022
Map Creator: KV
Office: Shrewsbury, MA

Section	Station	Depth (ft)	Biovolume (1-4)	Total Cover (%)	eleo	VA	Nite	Ugib	Upurp	Urad	Nodo	Uvul	VM	CC	FA	Pcord	Nflex	Pfol	Prob	BS	Sag	Nvar	Calli	Pepi	Pspir	Pbic	MACRO	Species Richness
A	1	6.0	2	85				15					15	90														3
A	2	3.0	4	55	65			15																				2
A	3	1.5	3	80	30									90														2
A	4	1.0	2	80	90				15			15		20														4
A	5	2.5	3	35									30															1
A	6	4.5	2	40				15	15			15		70														4
X	1	2.0	0	0																								0
X	2	2.5	0	0																								0
X	3	2.5	2	30	30									40														2
X	4	6.5	2	30										40														1
X	5	7.0	2	50				30	30			15		40														4
X	6	5.0	4	55				15	15		60	15		40								30					30	7
X	7	8.0	3	50					15					70					15									3
X	8	8.0	3	75										90														1
X	9	10.0	2	15										15														1
X	10	10.0	2	30										35														1
X	11	10.0	2	10										15														1
X	12	5.0	0	0																								0
X	13	5.5	2	10		15																						1
B	1	3.0	3	60		60						15		30	30													4
B	2	8.0	2	15									15	15														2
B	3	6.0	2	60		60			15					35	30													4
B	4	4.0	0	0																								0
B	5	10.0	2	15								15		15														2
B	6	9.5	0	0																								0
C	1	8.0	3	80				15						90														2
C	2	3.0	0	0																								0
C	3	9.0	0	0																								0
C	4	1.5	0	0																								0
C	5	1.5	2	55	60									15														2
C	6	8.0	2	30															30								15	2
C	7	6.0	2	10										15														1
C	8	3.5	4	10							15																	1
C	9	1.8	0	0																								0
C	10	2.0	0	0																								0
C	11	1.5	4	100							70																	1

Section	Station	Depth (ft)	Biovolume (1-4)	Total Cover (%)	eleo	VA	Nite	Ugib	Upurp	Urad	Nodo	Uvul	VM	CC	FA	Pcord	Nflex	Pfol	Prob	BS	Sag	Nvar	Calli	Pepi	Pspir	Pbic	MACRO	Species Richness
C	12	1.5	4	15							15					15												2
C	13	0.5	3	10									15		30													2
C	14	1.5	4	35							35		15	15										15				4
C	15	2.5	4	85							90		70	30								30					30	5
C	16	4.0	2	40					30				30	15			15											4
C	17	1.5	1	5											15													1
C	18	6.0	4	30					15		15			30														3
C	19	8.0	2	15					15					15														2
C	20	2.0	4	75	60						70	15	70	30														5
C	21	2.5	2	75										70														1
C	22	2.5	2	85										90														1
C	23	8.0	2	65										70														1
C	24	7.0	0	0																								0
C	25	5.0	2	30										30														1
D	1	6.5	3	75										70														1
D	2	9.0	0	0																								0
D	3	7.0	3	85										90														1
D	4	3.0	4	90							15			90														2
D	5	5.0	4	90							15			90														2
E	1	7.0	4	15					15		15																	2
E	2	8.5	0	0																								0
E	3	8.3	0	0																								0
E	4	6.5	2	10					15																			1
E	5	2.0	4	80							60			70			30											3
E	6	NA	0	0																								0
E	7	2.0	0	0																								0
E	8	6.0	0	0																								0
F	1	5.0	2	75										70														1
F	2	9.0	0	0																								0
F	3	2.0	0	0																								0
F	4	1.0	4	90							30			90		30				30								4
F	5	3.0	0	0																								0
F	6	1.5	0	0																								0
F	7	2.0	1	10		20																						1
F	8	3.0	0	0																								0
F	9	3.0	0	0																								0

Section	Station	Depth (ft)	Biovolume (1-4)	Total Cover (%)	eleo	VA	Nite	Ugib	Upurp	Urad	Nodo	Uvul	VM	CC	FA	Pcord	Nflex	Pfol	Prob	BS	Sag	Nvar	Calli	Pepi	Pspir	Pbic	MACRO	Species Richness
F	10	3.0	1	10													15											1
F	11	4.5	0	0																								0
F	12	10.5	0	0																								0
F	13	6.5	2	80		15						70	70															3
F	14	5.0	1	10																							15	1
F	15	4.0	2	45		35						15	30						30									4
F	16	5.5	2	45		40						15	30						30									4
Average A		3	2.7	63	62	0	0	15	15	0	0	15	23	68	0	0	0	0	0	0	0	0	0	0	0	0	0	2.7
Average X		6	1.8	27	30	15	0	23	20	0	60	15	0	43	0	0	0	0	15	0	0	30	0	0	0	0	30	1.7
Average B		7	1.5	25	0	60	0	0	15	0	0	15	15	24	30	0	0	0	0	0	0	0	0	0	0	0	0	2.0
Average C		4	2.1	34	60	0	0	15	20	0	44	15	40	40	23	15	15	0	30	0	0	30	0	15	0	0	23	1.6
Average D		6	2.8	68	0	0	0	0	0	0	15	0	0	85	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2
Average E		6	1.3	13	0	0	0	0	15	0	38	0	0	70	0	0	30	0	0	0	0	0	0	0	0	0	0	0.8
Average F		4	0.9	23	0	28	0	0	0	0	30	33	43	80	0	30	15	0	30	30	0	0	0	0	0	0	15	1.2
ge (Excluding Control)			2	33	61	38	0	15	17	0	37	22	35	52	26	23	20	0	30	30	0	30	0	15	0	0	20	1.52