

**Lake Shirley
Lunenburg/Shirley, Massachusetts
2024 Year-End Treatment Report**

November 18, 2024

Report Prepared by: SOLitude Lake Management
590 Lake Street
Shrewsbury, MA 01545

Report Prepared for: Ms. Joanna Bilotta, President
Lake Shirley Improvement Corporation (LSIC)
PO Box 567
Shirley, MA 01464
jobilotta@comcast.net

Dear Joanna:

In accordance with the aquatic plant management contract between SOLitude Lake Management (SOLitude) and the Lake Shirley Improvement Corporation (LSIC) for Lake Shirley, the following document serves to provide this year's treatment and survey results, as well as management recommendations for next season. The continued objective of the program is to manage non-native and nuisance aquatic vegetation as well as potentially harmful cyanobacteria (blue-green algae) blooms. Monitoring events, herbicide/algaecide treatments and reporting are key tasks of the project.

All management activities were consistent with the Order of Conditions [DEP File #284-0474 (Shirley), DEP File #208-1168 (Lunenburg)] and the License to Apply Chemicals issued by MA DEP (#WM04-0001644).

2024 Management Program Summary

Program Task	Date Completed
Received Approved License to Apply Chemicals	June 1, 2024
Early Season Survey	June 24, 2024
Herbicide Treatment	July 17, 2024



Pre-Treatment Survey

The pre-treatment survey, conducted on June 24th, incorporated a combination of SLM's historical qualitative assessment and Geosyntec's quantitative procedures, similar to surveys of prior years. Data on species composition, plant growth density, and plant biomass was collected at 66 different points throughout the lake. These points are identical to the point #'s associated with Geosyntec data in the past. A pre-treatment survey is conducted to determine the growth of all target species, such as fanwort (*Cabomba caroliniana*), curly-leaf pondweed (*Potamogeton crispus*), Eurasian milfoil (*Myriophyllum spicatum*) and variable milfoil (*Myriophyllum heterophyllum*). The survey also identifies any potential nuisance species based on native plant density.

Non-native fanwort (*Cabomba caroliniana*) and native leafy pondweed (*Potamogeton foliosus*) were the most common plants observed in this year's survey at 56% and 35% occurrence, respectively. Other target non-native species included curlyleaf pondweed (*Potamogeton crispus*), variable milfoil (*Myriophyllum heterophyllum*) and spiny naiad (*Najas minor*). This was the first time that variable watermilfoil has been observed at Lake Shirley in many years.

Aside from leafy pondweed, the only other common (>10% occurrence) native species observed this year was bladderwort (*Utricularia sp.*). A number of other native species were observed at less than 10% occurrence including tapegrass (*Vallisneria americana*), naiad (*Najas flexilis* & *Najas gracillima*), variable leaf pondweed (*Potamogeton gramineus*), largeleaf pondweed (*Potamogeton amplifolius*), clasping leaf pondweed (*Potamogeton perfoliatus*) and water lilies.

Per the Lake Management Plan, areas of the lake that exhibit either density or biomass factors of 3 or greater (>50%) are candidates for management. Additionally, any growth of non-native species, in this case curlyleaf pondweed, fanwort, variable milfoil and spiny naiad, can also be treated. Some candidate areas were not designated for treatment due to their proximity to undeveloped shorelines and/or the presence of non-nuisance species (ex. Stonewort/Chara, waterlilies). Additionally this year, we've also designated areas for treatment based on last year's fall survey where points exhibited density/biomass indices of 3 or greater. This was done to capture areas that did not meet management thresholds in June, but did later in the summer.

Approximately 58.7 acres were designated for treatment. The pre-treatment report, which includes plant survey data and the proposed treatment map, is **attached**. The Lunenburg Conservation Commission approved this treatment plan at their July 10th meeting and the Shirley Conservation Commission approved the plan at their July 9th meeting.

Areas designated for diquat herbicide were treated with Tribune at a rate of 1.0-1.5 gallons per acre, areas designated as diquat/flumi were treated with Tribune at a rate of 1.0 gallon per acre and Flumigard SC at a rate of 0.25 gallons/acre, and those designated as diquat/copper were treated with Tribune at a rate of 1.0 gallons per acre and Nautique at a rate of 3 gallons per acre.

Herbicide Treatment

The herbicide treatment was conducted on July 17th, for target species as specified in the pre-treatment report. Treatment was conducted with Tribune (diquat), Flumigard SC (flumioxazin) and Nautique (copper). As with all treatments, the lake community and the two towns were notified prior to treatment by LSIC. Several means of notification were utilized: placement of a written notice in the newspaper(s); placement of large, printed signs at major



road intersections/locations around the lake and posting of numerous 8.5 inch by 11-inch orange colored, printed signs around the lake shoreline and other means of communication/notification.

The treatment was performed with a 20-foot airboat equipped with a tank, pump, and subsurface injection system. By injecting the diluted herbicide sub-surface, it eliminates the potential for aerial drift. GPS guidance was used to monitor the position of the boat and its relation to the treatment areas. The treatment proceeded smoothly and without any issues, **Figure 1** shows the final treatment areas and GPS recorded treatment tracks. A summary of the treatment specifications is as follows.

Table 1 – Herbicide Treatment Specifications

Treatment Date	July 17 th
Product	Tribune (diquat) & Nautique (copper)
Treatment Area	58.7 acres
Quantity	75 gallons – Tribune 26.75 gallons - Nautique 7.75 gallons - Flumigard SC
GPS Tracks	See Figure 1
Applicator name	Rocco Notaro, MA Certification #AL-0053966
Site Conditions	Weather: Fair/Mostly Cloudy, winds 7-10 MPH SW, High 80's°F Water Temp: 25.8°C at surface, 23.8°C near bottom Dissolved Oxygen: 8.1 mg/l at surface; 3.75 mg/l near bottom (9-feet) Water clarity: 5'9"

No algacide treatments were required this year.

Anticipated Management in 2025

With the increased and consistent presence of fanwort throughout the lake in recent years, and based on preliminary discussions with the LSIC, the 2025 program will center around conducting a whole-lake Sonar (fluridone) treatment program. In previous years, fanwort was partially controlled with the winter drawdown but due to less favorable weather conditions in recent years, the fanwort has increasingly become the most significant issue facing the lake. Whole lake treatment will provide a significant reduction in fanwort for multiple years and also provide at least seasonal control of curlyleaf pondweed and variable milfoil. During the year of treatment, the herbicide will also slow down the growth of most native plants in the lake.

Fluridone herbicide works best when exposure starts early in the growing season (mid-late April). For this reason, there will not be a need to conduct a pre-treatment survey. The need for treatment is established by the distribution of fawnwort in 2023 & 2024. A combination of liquid and granular formulations will be employed to help maintain a consistent concentration of fluridone in the water for 60+ days and multiple applications will be conducted over the



course of the summer. Herbicide concentration sampling and interim inspections will also be used to help guide the timing, dose and formulation of the follow up applications. The following is a tentative plan for the 2025 season.

Table 2 – Proposed Plan for 2025

	Schedule	Notes/Criteria
Initial Fluidone Application	mid/late April	Application of liquid & pellet formulations of Sonar (fluridone) herbicide to all littoral areas
Interim inspection/sampling	early May	Inspect plant condition & collect sample for herbicide testing
Follow-Up Application	early/mid May	Application of liquid & pellet formulations of Sonar (fluridone) herbicide to all littoral areas
Interim inspection/sampling	late May	Inspect plant condition & collect sample for herbicide testing
Follow-Up Application	early/mid June	Application of liquid & pellet formulations of Sonar (fluridone) herbicide to all littoral areas
Interim inspection/sampling	late June	Inspect plant condition & collect sample for herbicide testing
Late Season Survey (conducted by ARC)	Late September/early October	Full data point survey

Monitoring of water clarity and algal populations (as necessary) provides timely information to guide algaecide treatments should such treatments be warranted. It continues to be of paramount importance to ensure that the water clarity monitoring is conducted on a regular basis (weekly or bi-weekly depending on general observation) from May-October and that results are provided to SOLitude and other project partners so that algaecide treatments are scheduled in a timely manner. Should treatment of the algae be required in 2025, copper sulfate is again proposed for use.

We recommend LSIC continue to pursue an integrated approach to manage nuisance plants and algae utilizing drawdown and herbicide/algaecide as required. To address overall lake management and long-term goals, the LSIC should continue the investigation and implementation of alternative in-lake methods, watershed management, public education and diagnostic assessments.

We hope this report will be of help to LSIC in planning for 2025 and beyond. If you have any questions regarding this report, please feel free to contact me. We look forward to working with you again in the future.

590 Lake Street
Shrewsbury, MA 010545

Phone: (508) 865-1000
FAX: (508) 865-1220
e-mail: info@solitudelake.com
Internet: www.solitudelakemanagement.com



Date: July 3, 2024

To: Lunenburg Conservation Commission
Shirley Conservation Commission

From: Dominic Meringolo, Senior Project Manager/Environmental Engineer

Re: Lake Shirley – Survey and Treatment Plan

Dear Commissioners,

Based on a survey conducted by our Biologists on June 24th, we are recommending treatment to approximately 58.7-acres of Lake Shirley to manage nuisance weed growth. Non-native fanwort (*Cabomba caroliniana*) and native leafy pondweed (*Potamogeton foliosus*) were the most common plants observed in this year's survey at 56% and 35% occurrence, respectively. Other target non-native species include curlyleaf pondweed (*Potamogeton crispus*), variable milfoil (*Myriophyllum heterophyllum*) and spiny naiad (*Najas minor*). This was the first time that variable watermilfoil has been observed at Lake Shirley in many years.

Aside from leafy pondweed, the only other common (>10% occurrence) native species observed this year was bladderwort (*Utricularia sp.*). A number of other native species were observed at less than 10% occurrence including tapegrass (*Vallisneria americana*), naiad (*Najas flexilis* & *Najas gracillima*), variable leaf pondweed (*Potamogeton gramineus*), largeleaf pondweed (*Potamogeton amplifolius*), clasping leaf pondweed (*Potamogeton perfoliatus*) and water lilies.

Per the Lake Management Plan, areas of the lake that exhibit either density or biomass factors of 3 or greater (>50%) are candidates for management. Additionally, any growth of non-native species, in this case curlyleaf pondweed, fanwort, variable milfoil and spiny naiad, can also be treated. Some candidate areas were not designated for treatment due to their proximity to undeveloped shorelines and/or the presence of non-nuisance species (ex. Stonewort/Chara, waterlilies). Additionally this year, we've also designated areas for treatment based on last year's fall survey where points exhibited density/biomass indices of 3 or greater. This was done to capture areas that did not meet management thresholds in June, but did later in the summer.

Based on recommendation from Aquatic Restoration Consulting, the following areas will be checked again prior to treatment for the presence of coontail (*Ceratophyllum demersum*) and

Robbins Pondweed (*Potamogeton robbinsii*), both of which are plants that we would like to see expand in the lake. If specimens of either species are observed, that area would not be treated.

Areas in the vicinity of points 1-7; 9; 17, 21, 24a, 31, 35-37; 44, 53-54 & 64.

As was approved last year, we ask the Commission to allow us to make field changes on the day of treatment if we observe any additional areas of non-native plants or topped-out, problematic vegetation in other areas of the lake not depicted on the map.

The proposed treatment areas are categorized on the map by treatment type. Areas designated for diquat herbicide will be treated with Tribune at a rate of 1.0-1.5 gallons per acre, areas designated as diquat/flumi will be treated with Tribune at a rate of 1.0 gallon per acre and Flumigard SC at a rate of 0.25 gallons/acre, and those designated as diquat/copper will be treated with Tribune at a rate of 1.0 gallons per acre and Nautique at a rate of 3 gallons per acre.

Treatment is tentatively scheduled for July 17th.

A map of the recommended treatment areas is attached as well as the June 24th survey data table. On the map of the proposed treatment areas, the data points that meet management criteria are included (points with density/biomass >3, areas with non-native species, and areas which met management thresholds during the latter part of the summer in 2023). The LSIC & SOLitude Lake Management will be attending upcoming meetings of the Conservation Commissions to discuss this plan and answer any questions.

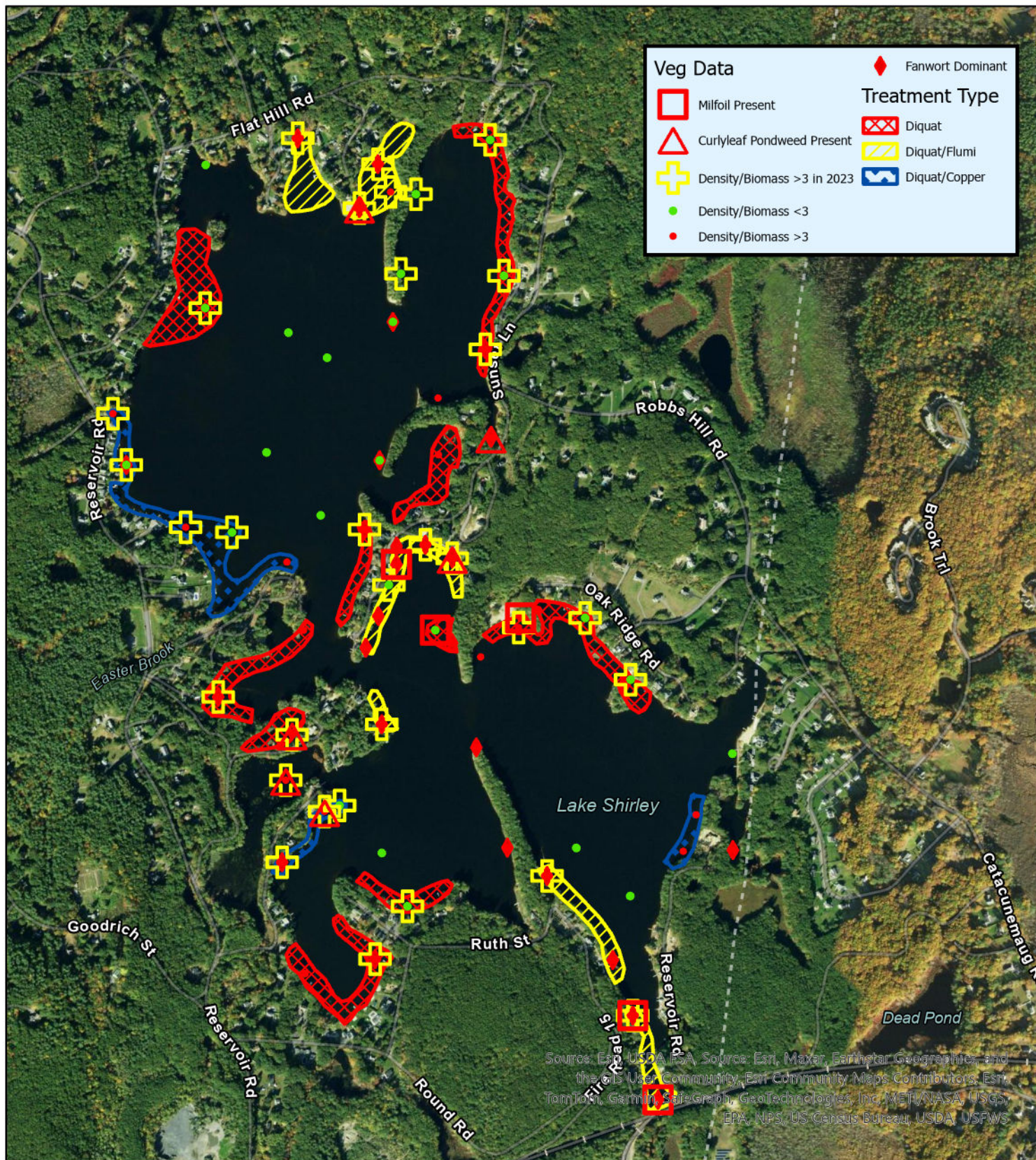
Regards,

SOLitude Lake Management

A handwritten signature in black ink that reads "Dominic Meringolo". The signature is written in a cursive, flowing style.

Dominic Meringolo
Senior Environmental Engineer/Project Manager

Figure: Lake Shirley 2024 Proposed Treatment Areas (58.7 acres)



Lake Shirley
Lunenburg/Shirley, MA



0 850 1,700
Feet

1:12,500

N



Map Date: 07/01/2024
Prepared by: DMM
Office: SHREWSBURY, MA

Lake Shirley - June 24, 2024

X= Present

D = Dominant

Plant Species	# stations present	# stations dominant	% stations present	% stations dominant	Monitoring Locations																																								
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	24a	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Scientific Name																																													
<i>Cabomba caroliniana</i>	37	28	56%	42%	D	D		D	D	D	D		D				X			D		D	X	X	D	D	D			D			D		D		X	D	D	X	X				
<i>Myriophyllum heterophyllum</i>	5	0	8%	0%			X				X						X							X	X																				
<i>Elodea canadensis</i>	0	0	0%	0%																																									
<i>Vallisneria americana</i>	6	2	9%	3%																				D			D			X				X											
<i>Eleocharis</i> sp.	0	0	0%	0%																																									
<i>Utricularia</i> spp.	8	1	12%	2%								D				X				X																			X	X	X				
<i>Chara</i> sp.	0	0	0%	0%																																									
<i>Nitella</i> sp.	0	0	0%	0%																																									
Macroalgae	2	1	3%	2%																																								D	
<i>Potamogeton bicupulatus</i>	0	0	0%	0%																																									
<i>Najas flexilis</i>	1	0	2%	0%																																									
<i>Potamogeton gramineus</i>	5	0	8%	0%																X																					X	X			
<i>Najas minor</i>	1	0	2%	0%												X																													
<i>Najas gracillima</i>	3	1	5%	2%												D																												X	
<i>Potamogeton crispus</i>	6	0	9%	0%							X																																		
<i>Potamogeton amplifolius</i>	1	0	2%	0%																						X																			
<i>Potamogeton epihydrus</i>	0	0	0%	0%																																									
<i>Potamogeton perfoliatus</i>	2	0	3%	0%																						X																			
<i>Potamogeton foliosus</i>	23	11	35%	17%	X			X	X				D	D	D	D					X																								
<i>Ceratophyllum demersum</i>	0	0	0%	0%				X	X																																				
<i>Potamogeton zosteriformis</i>	1	1	2%	2%																	D																								
<i>Nuphar variegata</i>	6	1	9%	2%																																									
<i>Nymphaea odorata</i>	4	1	6%	2%																																									
<i>Fontinalis</i> sp.	0	0	0%	0%																																									
<i>Zosterella dubia</i>	0	0	0%	0%																																									
<i>Stuckenia pectinata</i>	1	1	2%	2%																																									
<i>Potamogeton pusillus</i>	0	0	0%	0%																																									
<i>Potamogeton</i> sp. (thin)	2	0	3%	0%																	X																								
<i>Potamogeton robbinsii</i>	0	0	0%	0%																																									
Species Richness					2	1	0	2	1	2	3	2	1	1	1	2	2	0	3	1	0	4	3	2	3	3	2	1	0	2	1	1	0	0	2	1	4	1	6	1	3	8	4	3	0
Plant density index					2	4	0	4	4	4	4	2	4	4	4	4	4	0	2	4	0	3	4	4	4	4	4	1	0	3	3	3	0	0	3	3	3	3	3	4	4	4	4	3	0
Plant biomass index					4	3	0	3	3	3	4	2	2	4	4	4	4	0	2	3	0	3	4	4	3	4	3	1	0	2	2	0	0	4	3	3	4	4	3	4	4	4	4	3	0

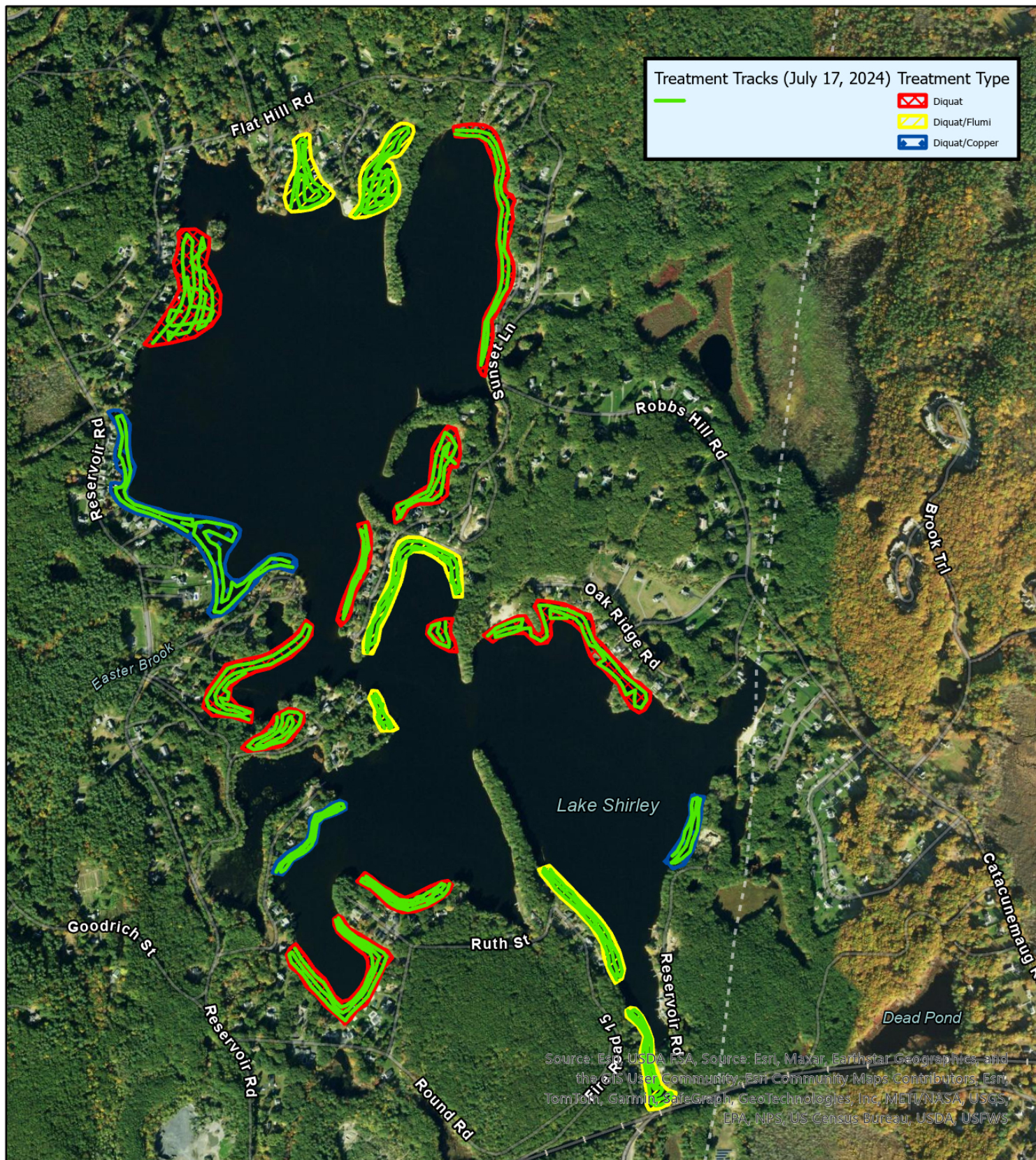
Key to Density and Biomass Indices		
Value	Density (% cover)	Biomass
0	Absent: 0%	No growth
1	Sparse: 1-25%	Scattered plant growth; or primarily at lake bottom
2	Moderate: 26-50%	Less abundant growth; or in less than half of water column
3	Dense: 51-75%	Substantial growth through majority of water column
4	Very Dense: 76-100%	Abundant growth throughout water column to surface

X= Present																																
Plant Species	# stations present	# stations dominant	% stations present	% stations dominant																												
Scientific Name					41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	62a	63	64	65	66	
<i>Cabomba caroliniana</i>	37	28	56%	42%		D	X		D	D	D	X					D	D		D	X	D					D					
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<i>Potamogeton sp. (thin)</i>	2	0	3%	0%																												
<i>Potamogeton robbinsii</i>	0	0	0%	0%																												
Species Richness					1	1	3	1	4	3	3	2	0	0	1	0	1	4	2	1	2	5	0	0	0	0	1	0	0	0	0	
Plant density Index					3	2	3	2	3	3	4	4	0	0	2	0	3	4	2	2	2	3	0	0	0	0	1	0	0	0	0	
Plant biomass index					2	2	4	2	2	3	4	4	0	0	2	0	2	4	4	2	3	2	0	0	0	0	1	0	0	0	0	
					1.676470588																											
					2.367647059																											
					2.235294118																											

Figure: Lake Shirley 2024 Treatment Areas (58.7 acres) & Treatment Tracks

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LAKE MANAGEMENT

888.480.5253
solitudelakemanagement.com



Lake Shirley
Lunenburg/Shirley, MA



0 850 1,700
Feet

1:12,500



Map Date: 11/18/2024
Prepared by: DMM
Office: SHREWSBURY, MA