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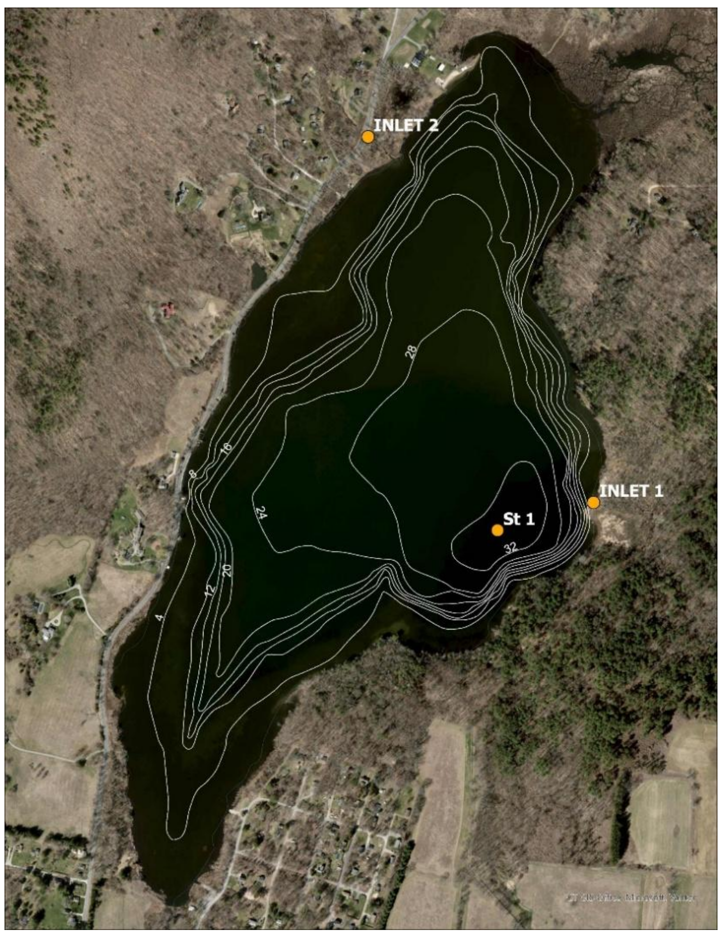
March 3, 2026

To: Mudge Pond Association & Town of Sharon, CT
CC: Andrew Cahill
Re: Mudge Pond 2025 Water Quality and Aquatic Plant Results

Background

Northeast Aquatic Research (NEAR) visited Mudge Pond for water quality monitoring monthly from April through November, except for October. Mudge Pond has a surface area of 207 acres, a total volume of 3,300 acre-feet and a mean depth of 4.9 meters (16 feet). Monitoring was conducted at the deepest location in the pond (32ft/10m), labeled Station 1 on **Map 1**. When flowing, water from Inlets 1 and 2 (also shown in **Map 1**) were sampled.

Map 1. Locations of Mudge Pond sampling stations.



Sampling Methodology

During each monitoring visit, water clarity was measured using a Secchi disk and view scope, and water temperature and dissolved oxygen were measured at one-meter increments from the surface to the lake bottom. Water samples were collected from the top, middle, and bottom of the water column (1 meter, 5 meters, 10 meters) for analysis of total phosphorus, total nitrogen, and ammonia. The April, September, and November samples were also tested for nitrate nitrogen (NOX). Additionally, phytoplankton and zooplankton samples were collected for identification and enumeration.

The water quality parameters evaluated in this report are primarily assessed using the Connecticut Department of Energy and Environmental Protection (CT DEEP) lake trophic classification system (**Table 1**). The management goal for Mudge Pond is to maintain conditions consistent with the oligo-mesotrophic category.

NEAR also conducted two aquatic plant surveys 2025. On May 28th, NEAR searched for Water Chestnut (*Trapa natans*) and Curly-leaf Pondweed (*Potamogeton crispus*). On September 30th, NEAR searched for Hydrilla (*Hydrilla verticillata*) infestations and assessed the populations of several invasive species previously documented in Mudge Pond. No new invasive species were found.

Table 1. Connecticut DEEP trophic categories and ranges of indicator parameters.

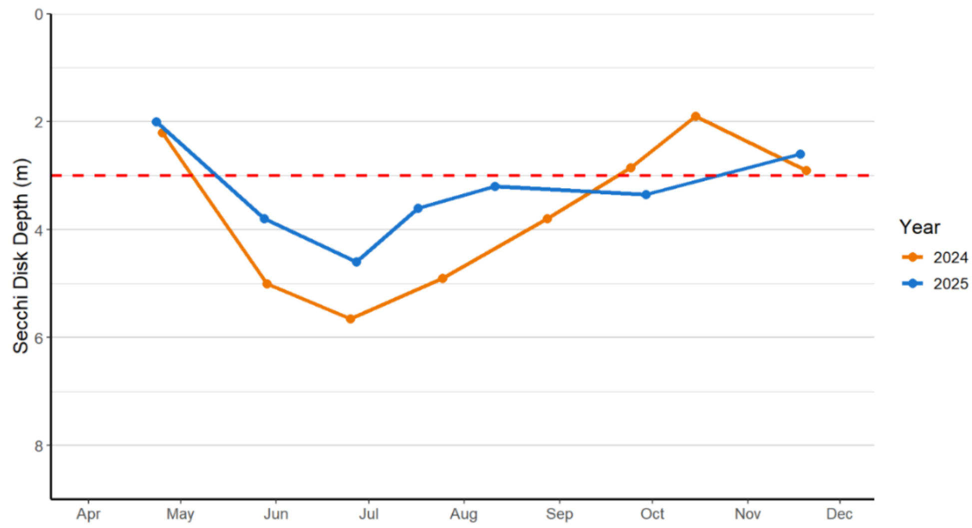
Category	T. Phosphorus (ppb)	T. Nitrogen (ppb)	Secchi Depth (m)	Chlorophyll *a* (ppb)
Oligotrophic	0 -- 10	2 -- 200	6 +	0 -- 2
Oligo-mesotrophic	10 -- 15	200 -- 300	4 -- 6	2 -- 5
Mesotrophic	15 -- 25	300 -- 500	3 -- 4	5 -- 10
Meso-eutrophic	25 -- 30	500 -- 600	2 -- 3	10 -- 15
Eutrophic	30 -- 50	600 -- 1000	1 -- 2	15 -- 30
Highly Eutrophic	50 +	1000 +	0 -- 1	30 +

2025 Water Quality Results

Water Clarity

The average clarity declined slightly from 3.7 meters in 2024 to 3.3 meters in 2025. The lowest Secchi values occurred during the first and last visits, measuring 2 meters in April and 2.6 meters in November (**Figure 1**). The dashed red line in **Figure 1** represents the minimum recommended clarity of 3m for Mudge Pond, while the oligo-mesotrophic range for lakes in Connecticut is 4 meters to 6 meters. The April and November values were the only sampling dates above the target minimum of 3 meters. The best clarity was observed in late June at 4.6m. Overall, clarity followed the same seasonal pattern observed in 2024, but with poorer visibility in early spring and fall.

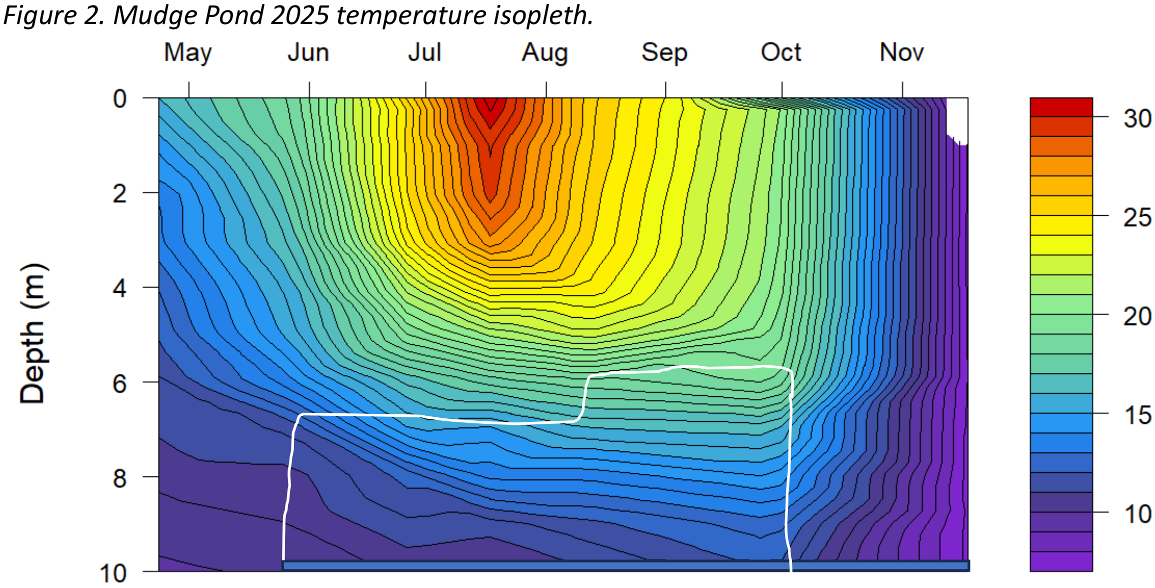
Figure 1. Mudge Pond Secchi disk depths, April through November 2025.



Water Temperature and Dissolved Oxygen

Water temperature profile data is presented as an isopleth **Figure 2**. The isopleth shows lines of equal temperature. Where temperature lines are vertical, the lake is mixing at those depths, where the lines are horizontal, the lake is stratified at those depths. As the season progressed, surface water temperatures rose, reaching a maximum of 31°C in July, while bottom water temperature remained at approximately 10°C. Through late June into August, a thermocline was present around 4 meters to 6 meters. The thermocline is the layer where temperature decreases most rapidly with depth, creating a density difference that separates warmer surface waters from the cooler bottom waters and limits mixing between them. By September, the thermocline began weakening as surface waters cooled. By the November 18th visit, the pond had fully mixed, with nearly unform temperatures throughout the water column (7.3°C - 7.4°C).

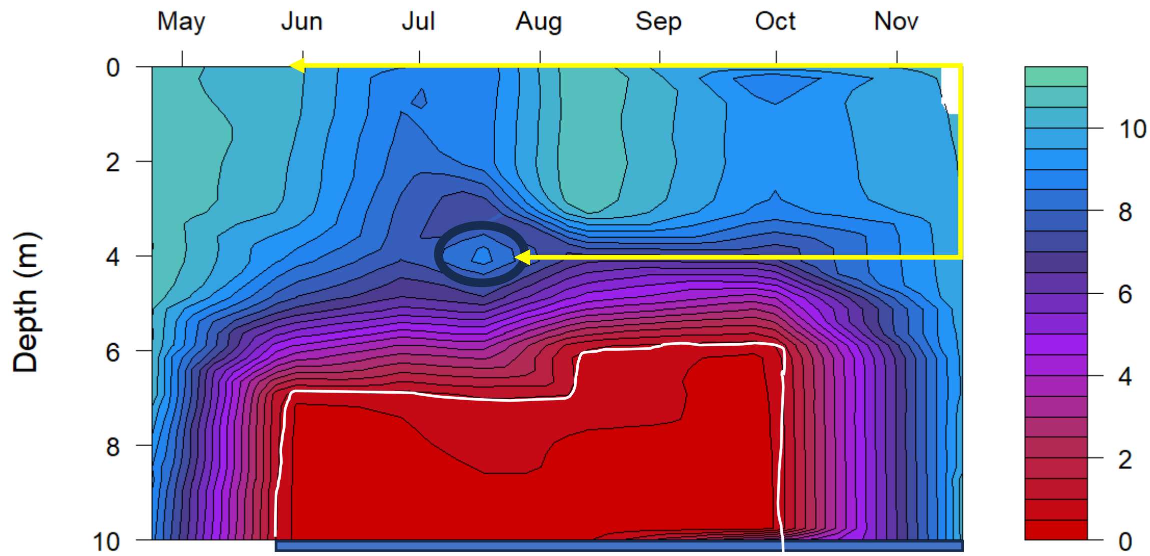
Figure 2. Mudge Pond 2025 temperature isopleth.



The 2025 dissolved oxygen concentrations are shown in isopleth form in **Figure 3**. In April, dissolved oxygen concentrations were high throughout the water column. By late May, all water below about 7 meters had become anoxic. The water volume below 7 meters is approximately 400 acre-feet, and 655 acre-feet of water below 6 meters, 20% of the total volume of the lake. The anoxic boundary remained at about 7 meters until jumping up to 6 meters in early August. The anoxic boundary was forced to the bottom quickly in October when the lake was mixed the bottom. Whole lake mixing continued through October and by mid-November, the entire water column was fully saturated.

In July, a mid-depth dissolved oxygen maximum occurred at 4 meters, where DO concentration was 9ppm. DO at 3m was 7 ppm, while DO at 5 meters was 6.7 ppm. This indicates deep water phytoplankton at that time and depth.

Figure 3. Mudge Pond 2025 dissolved oxygen isopleth. Anoxic boundary is shown by white line. Black circle is mid-depth oxygen maximum,



Nutrients

Total Phosphorus

Based on the CT DEEP trophic classification shown in **Table 1,** total phosphorus (TP) concentrations of approximately 10ppb - 15ppb within the top of the water column (1 meter depth) are consistent with oligo-mesotrophic conditions in lakes and ponds.

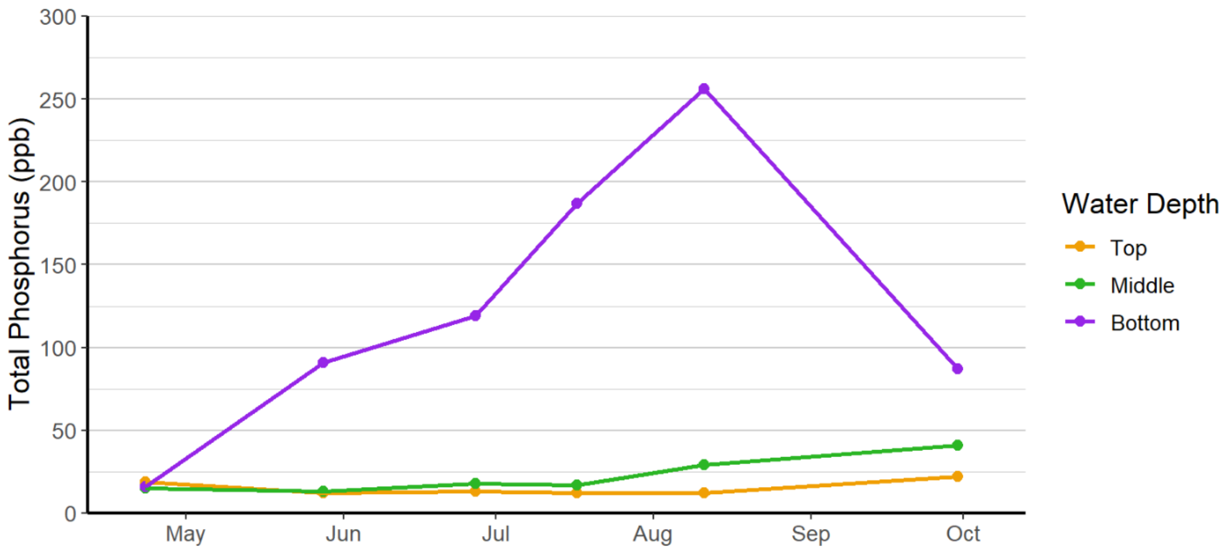
TP concentrations at Station 1 are shown in **Table 2**. Top TP concentrations were within this target range for much of the sampling period, however slightly elevated values were observed in April (19ppb) and September (22ppb). TP concentrations in the bottom waters increased over the course of the season as the water column became stratified and oxygen levels dropped in the deepest layer. The highest TP concentration was measured in bottom waters during the August visit (256ppb) (**Figure 4**). All bottom TP concentrations, except for April and November, were consistently elevated.

Low oxygen conditions near the sediments can promote internal nutrient loading, a process in which phosphorus and nitrogen are released from sediments into the overlying water.

Table 2. Total phosphorus concentrations (ppb), April to November 2025.

Sample Depth	4/23	5/28	6/27	7/17	8/11	9/30	11/18
Top	19	12	13	12	12	22	15
Middle	15	13	18	17	29	41	17
Bottom	16	91	119	187	256	87	13

Figure 4. Total phosphorus concentrations (ppb), April to November 2025.



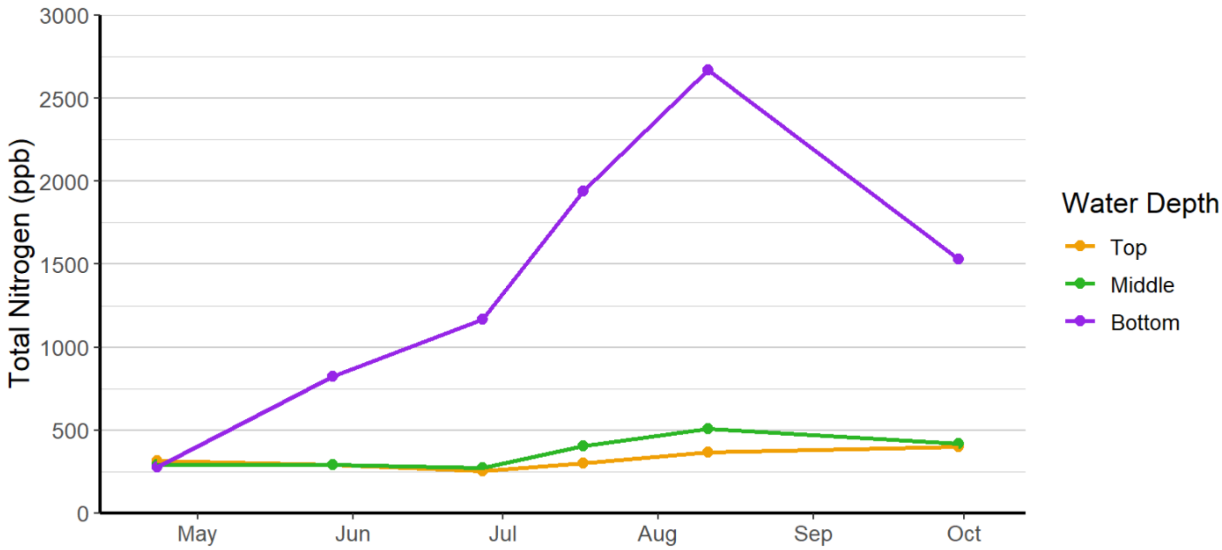
Nitrogen

Total nitrogen (TN) concentrations in the bottom waters increased through the summer, showing a pattern similar to TP (**Table 3, Figure 5**). These higher values coincide with periods when the deepest water remained low in oxygen, which can result in nutrients being retained in the bottom layer. The highest TN concentration was measured at the bottom on August 11th, reaching 2,669ppb.

Table 3. Total nitrogen concentrations (ppb), April to November 2025.

Sample Depth	4/23	5/28	6/27	7/17	8/11	9/30	11/18
Top	315	290	254	302	366	399	574
Middle	294	290	274	403	508	421	582
Bottom	280	824	1,170	1,939	2,669	1,530	566

Figure 5. Total nitrogen concentrations (ppb), April to November 2025.



Ammonia and Nitrate Nitrogen

Ammonia concentrations in the bottom waters were very low in April (6ppb) but increased sharply over the summer, peaking at 1,995ppb in mid-August (**Table 4**). Low to very low oxygen conditions over bottom sediments in lakes allow sediments to release ammonia, which is stable as long as the water remains anoxic. Ammonia is quickly oxidized to nitrate in the presence of dissolved oxygen, shown by low concentrations in the upper oxygen rich waters throughout the season until November. By mid-November, ammonia concentrations were virtually identical in the top, middle, and bottom samples, as mixing distributed nutrients throughout the water column.

Nitrate nitrogen (NOX) concentrations in the pond were generally low throughout 2025, with a small increase observed in November (**Table 5**).

Table 4. Ammonia concentrations (ppb), April to November 2025.

Sample Depth	4/23	5/28	6/27	7/17	8/11	9/30	11/18
Top	3	4	4	3	3	6	151
Middle	<3	<3	4	6	6	5	152
Bottom	6	381	708	1,571	1,995	891	153
TN ppb	280	824	1,170	1,939	2,669	1,530	566
% NH_3	*2*	*46*	*61*	*81*	*74*	*58*	*27*
Non NH_3 N	*278*	*461*	*462*	*368*	*674*	*639*	*413*

Table 5. Nitrate nitrogen (NOX) concentrations (ppb) in 2025.

Sample Depth	4/23	9/30	11/18
Top	<3	<3	30
Middle	<3	<3	30
Bottom	<3	<3	32

Inlet Nutrients

Very low total phosphorus (TP) concentrations were measured entering the pond from either inlet in May, with 9ppb from Inlet 1 and 0.5ppb from Inlet 2 (**Table 6**). In contrast, a substantial amount of total nitrogen (TN) entered from Inlet 1 (1,315 ppb), while TN from Inlet 2 was low (48ppb). Elevated TN concentrations in Inlet 1 were also observed in 2024, however NEAR has been unable to investigate upstream of this inlet in 2024 and 2025 due to lack of landowner permission. Ammonia in both inlets were below detection in May. Sampling was limited later in the season due to dry conditions.

Table 6. Mudge Pond Inlet 1 and Inlet 2 nutrient concentrations

Total Phosphorus (ppb)						
	4/23	**5/28**	**6/27**	**7/17**	**8/11**	**11/18**
Inlet 1		12	dry	dry	dry	dry
Inlet 2		9	dry	dry	dry	dry

Total Nitrogen (ppb)						
	4/23	**5/28**	**6/27**	**7/17**	**8/11**	**11/18**
Inlet 1		1,253	dry	dry	dry	dry
Inlet 2		71	dry	dry	dry	dry

Ammonia Nitrogen (ppb)						
	4/23	**5/28**	**6/27**	**7/17**	**8/11**	**11/18**
Inlet 1		<1	dry	dry	dry	dry
Inlet 2		<1	dry	dry	dry	dry

Phytoplankton

Cyanobacteria were the dominant phytoplankton group in samples collected from July through November (**Figure 6**). The cyanobacteria genera identified in these samples are shown in **Figure 7**. Several of these genera, including *Dolichospermum*, *Chrysosporum*, *Lyngbya,* and *Planktothrix*, are known toxin producers (U.S. Environmental Protection Agency, 2025). The highest cyanobacteria count in 2025 was 35,160 cells/mL in the August sample, which was composed primarily of *Chrysosporum* and *Planktothrix*. The management goal is to maintain chlorophyll-a (algal biomass) concentrations within 2–5ppb, corresponding to approximately 10,000–25,000 cells/mL. Additionally, this cyanobacteria density indicates a moderate probability of adverse health effects following exposure, according to World Health Organization guidelines (**Table 7**).

Figure 6. Phytoplankton counts at Station 1 in 2025.

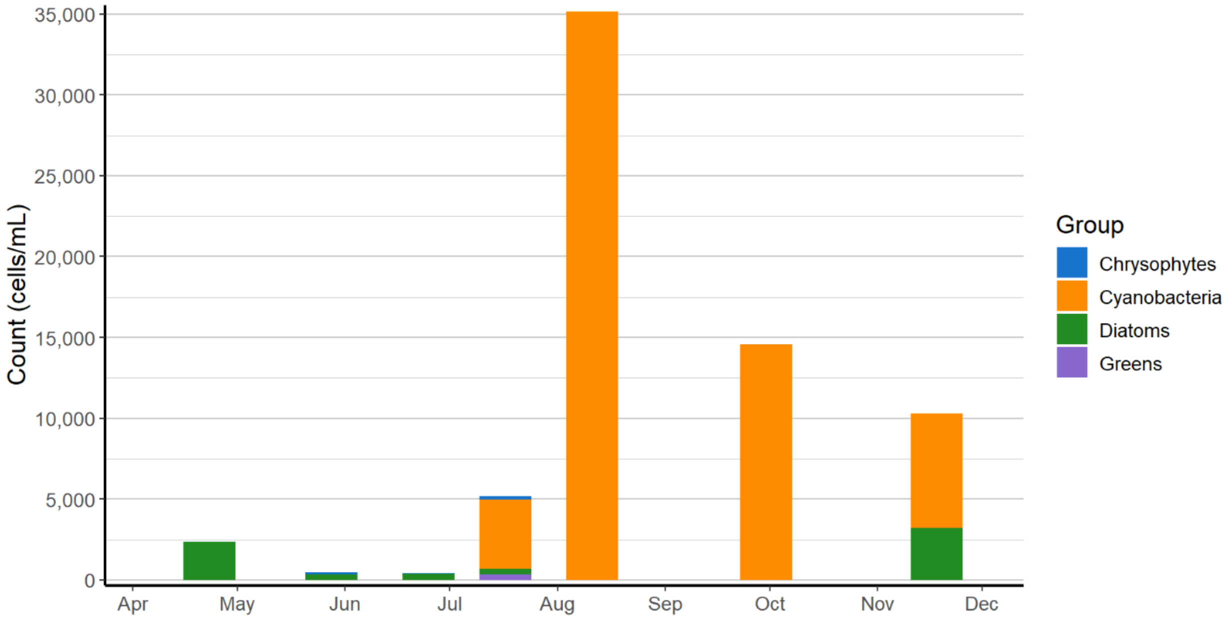


Figure 7. Cyanobacteria counts by genera at Station 1 in 2025.

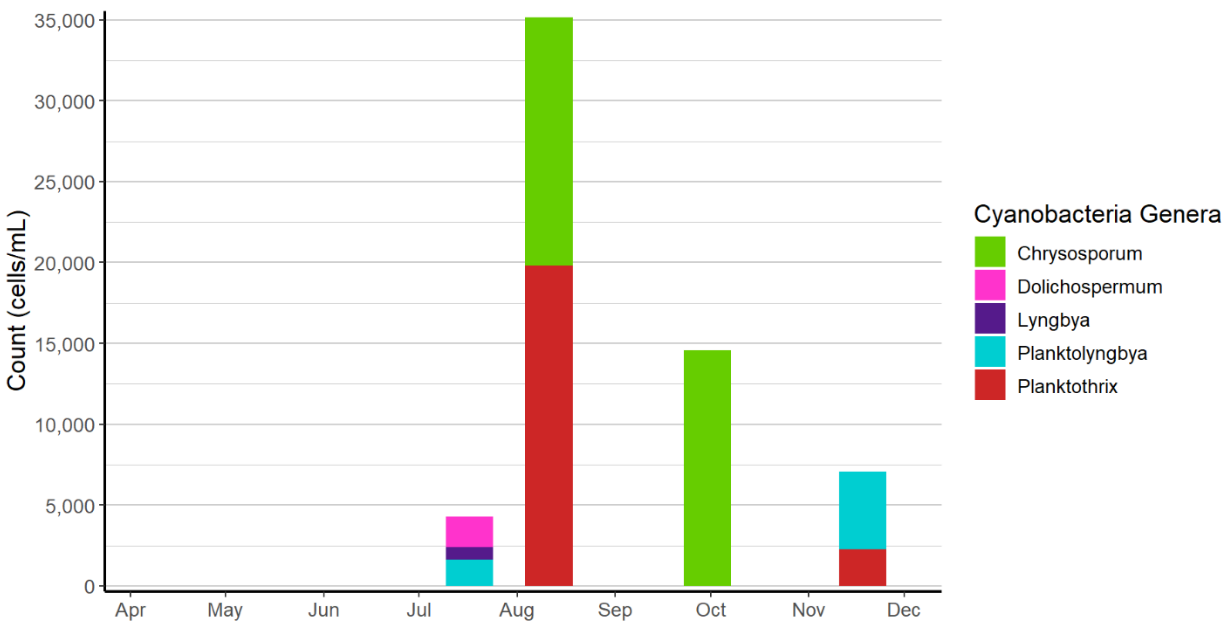


Table 7. WHO guidance values for the relative probability of health effects resulting from exposure to cyanobacteria.

Relative Probability of Acute Health Effects	Cyanobacteria Density (Cells/mL)
Low	< 20,000
Moderate	20,000-100,000
High	100,000-10,000,000
Very High	> 10,000,000

Zooplankton

Five zooplankton samples were collected from Station 1 in 2025. In April, the zooplankton community was dominated by smaller-bodied organisms, particularly Cyclopoids and Cladocera (**Figure 8**). Larger-bodied zooplankton were observed only in the April, June, and July samples (**Figure 9**). As the season progressed, the community shifted toward predominantly smaller-bodied individuals, with reduced size diversity in late summer and early fall. Copepod nauplii were most abundant in early season samples and declined over time, while small rotifers were present in all samples at relatively low population levels.

Figure 8. Zooplankton counts at Station 1 in 2025.

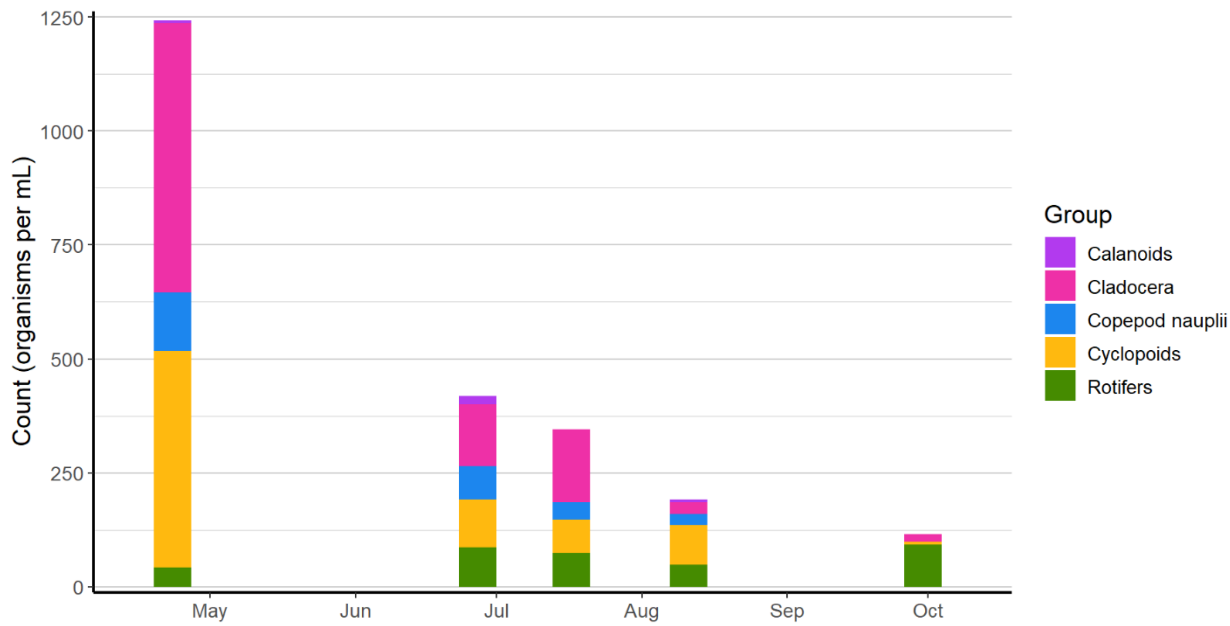
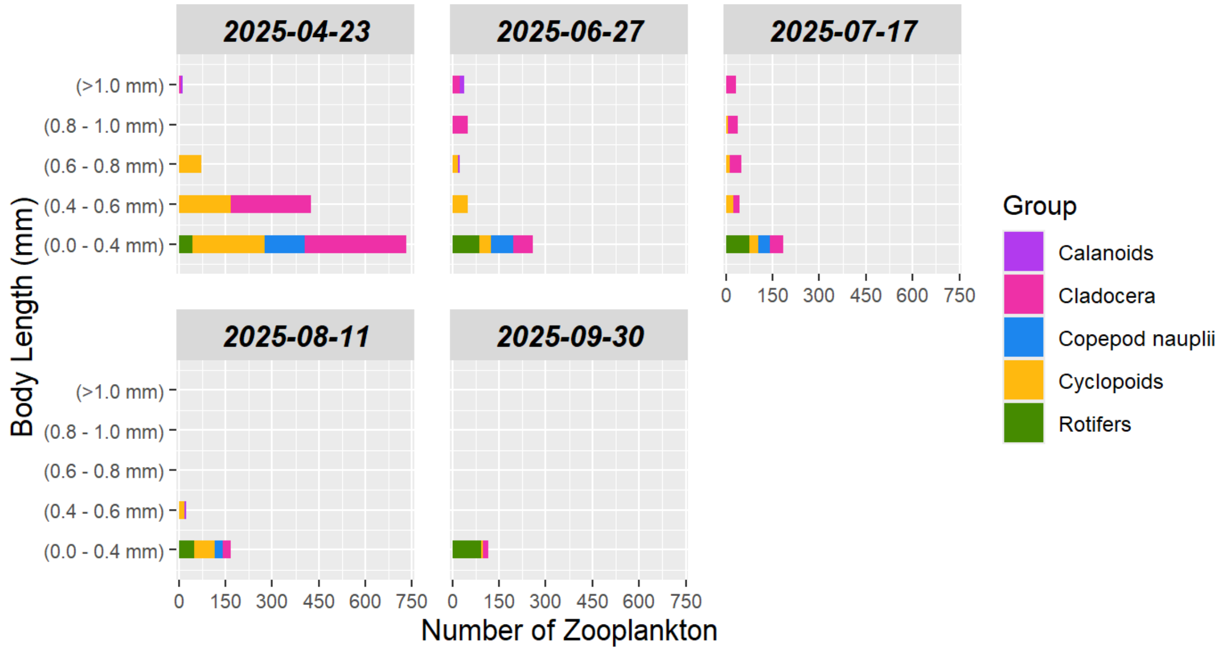


Figure 9. Zooplankton body lengths at Station 1 in 2025



Aquatic Plants

Mudge Pond has a littoral zone of about 80 acres, roughly the surface area out to about 10 feet, about 40% of the total area of the lake. NEAR conducted an aquatic plant survey on May 28th, 2025 focusing primarily on the invasive Water Chestnut (*Trapa natans*) and Curly-leaf Pondweed (*Potamogeton crispus*) (**Map 2**, **Map 3a, Map 3b**). Several other invasive species were observed during the survey including Eurasian Milfoil (*Myriophyllum spicatum)* and Fanwort (*Cabomba caroliniana*). Most Curly-leaf Pondweed plants had grown to the water surface, with an average density of 57% across waypoints. One low-growing, dense patch of Fanwort was observed growing just above the sediment. Water Chestnut was found near the boat launch and along a portion of the eastern shoreline, where individual plants measured roughly 2-3 inches in diameter. These plants were actively growing and were observed from the mid-water column to the surface.

The September 29th, 2025 survey focused on searching for invasive plant species, including Hydrilla (*Hydrilla verticillata*), a highly aggressive species found in nearby lakes. No Hydrilla was detected. NEAR also did not locate the invasive Brittle Naiad (*Najas minor*) nor the Connecticut state-listed endangered species Straight-leaved Pondweed (*Potamogeton strictifolius*) and Flat-stalked Pondweed (*Potamogeton friesii*). Flat-stalked Pondweed was found in Mudge Pond in 2024.

Table 8 presents the species observed during the September aquatic plant survey, listed in order of abundance. The dominant invasive species Eurasian Milfoil (*Myriophyllum spicatum)* (**Map 4**) and Fanwort *(Cabomba caroliniana)* (**Map 5**) were recorded at 34% and 25% of sampling locations, respectively. Two uncommon invasive species, Curly-leaf Pondweed and Water Chestnut, were found at 3% and 1% respectively. The most frequently found native species were Tapegrass (*Vallisneria americana*) at 41% (**Map 6**), Large leaf Pondweed (*Potamogeton amplifolius*) (**Map 7**), and Yellow Water Lily (*Nuphar* *variegata*) (**Map 8**). The three floating-leaf species, Yellow Water Lily, Illinois Pondweed (*Potamogeton illinoensis*), and Water Chestnut, together occupied nearly all areas from the shore to ~7-8 feet water depth.

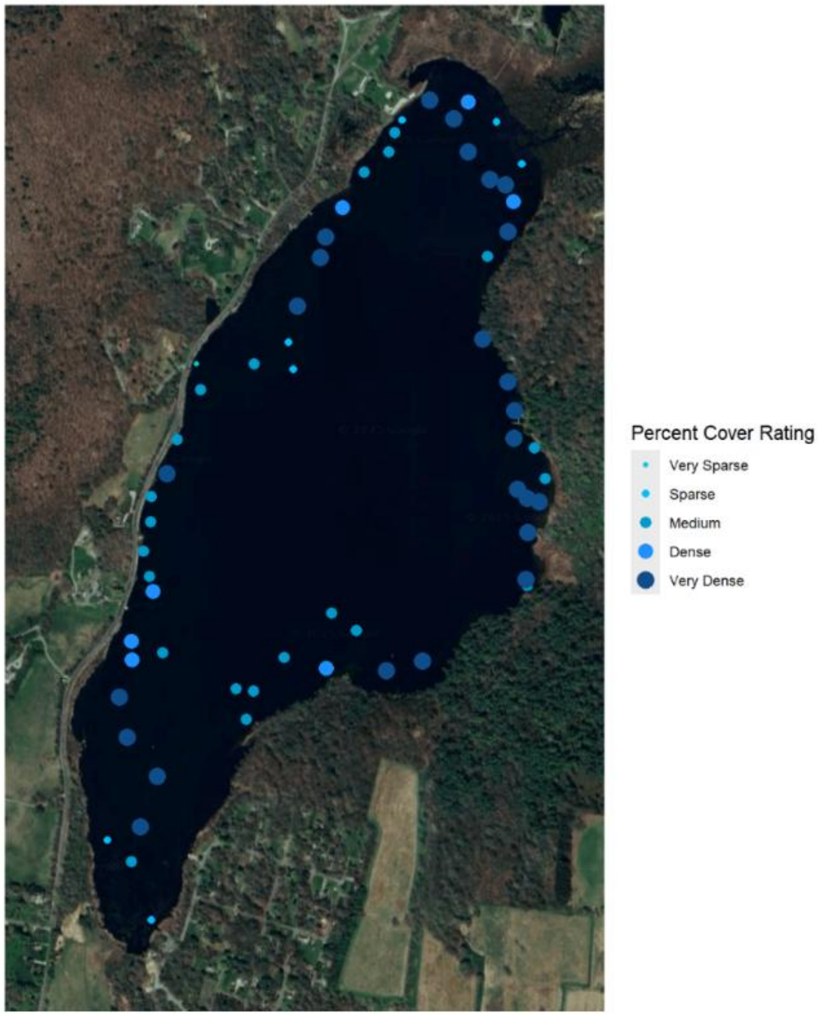
The majority of very dense Fanwort patches were observed primarily within the mid-water column. Dense patches occurred near the town boat launch and extended through the navigation channel among the lilies, as well as offshore near Inlet 1 and in the northern area of the pond off Sharon Town Beach. Where present, Fanwort was typically dense, with an average density of 63%. Fanwort was observed in many of the same locations documented in 2024.

Table 8. Aquatic plant species observed in Mudge Pond during September 29th, 2025 aquatic plant survey, with associated percent frequency and average density. Red lettering indicates invasive species.

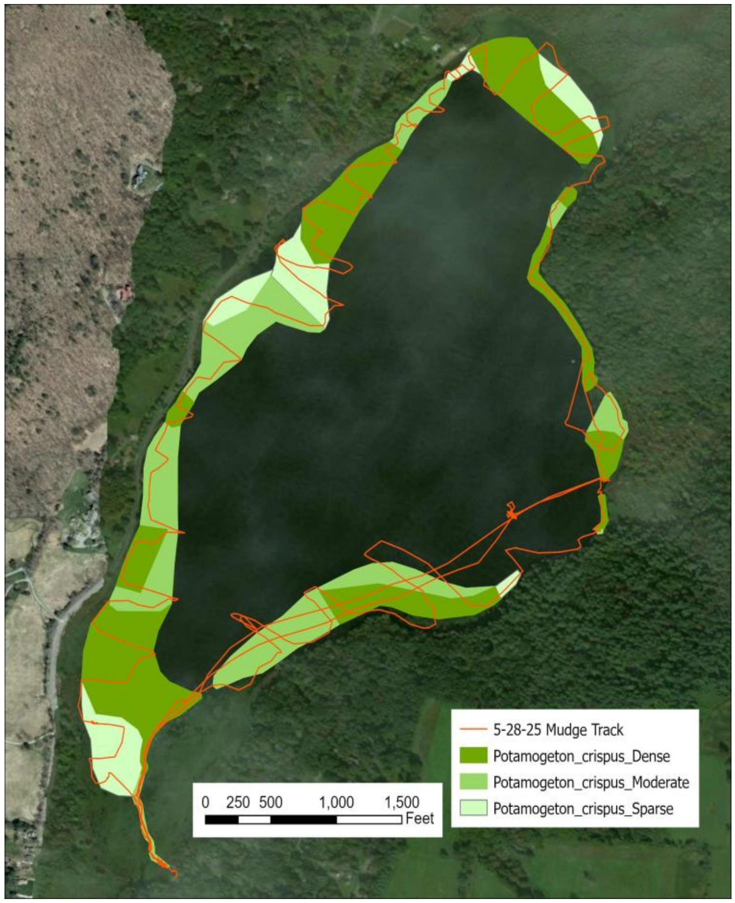
Scientific Name	Common Name	9/29/2025	
		% Frequency	Avg. Density
Vallisneria americana	Tapegrass	41	85
Myriophyllum spicatum	Eurasian Milfoil	34	23
Potamogeton amplifolius	Large-leaf Pondweed	27	86
Cabomba caroliniana	Fanwort	25	63
Nuphar variegata	Yellow Water Lily	20	100
Ceratophyllum demersum	Coontail	6	37
Potamogeton illinoensis	Illinois Pondweed	4	100
Utricularia geminiscapa	Hidden-fruit Bladderwort	4	100
Potamogeton crispus	Curly-leaf Pondweed	3	NA
Trapa natans	Water Chestnut	1	30
Utricularia macrorhiza	Common Bladderwort	1	30

Map 2. Locations of Water Chestnut in May 2025.

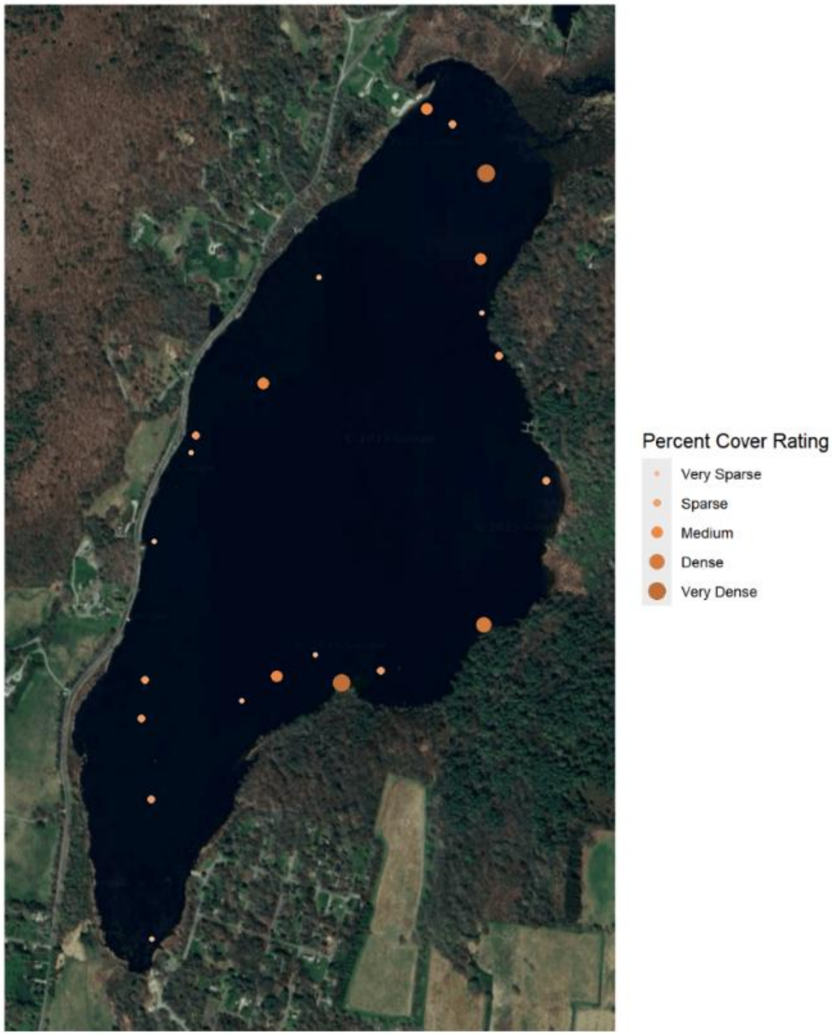
Map 3a. Locations of Curly-leaf Pondweed in May 2025.



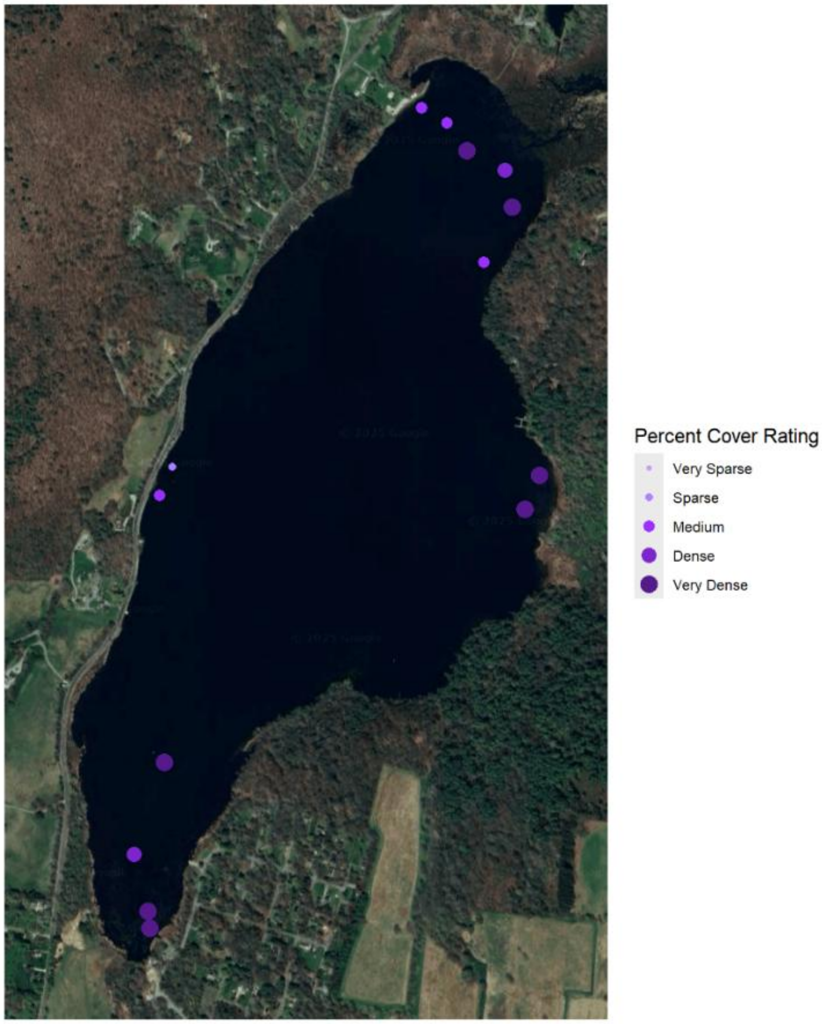
Map 3b. Locations of Curly-leaf Pondweed in May 2025.



Map 4. Locations of Milfoil in September 2025.



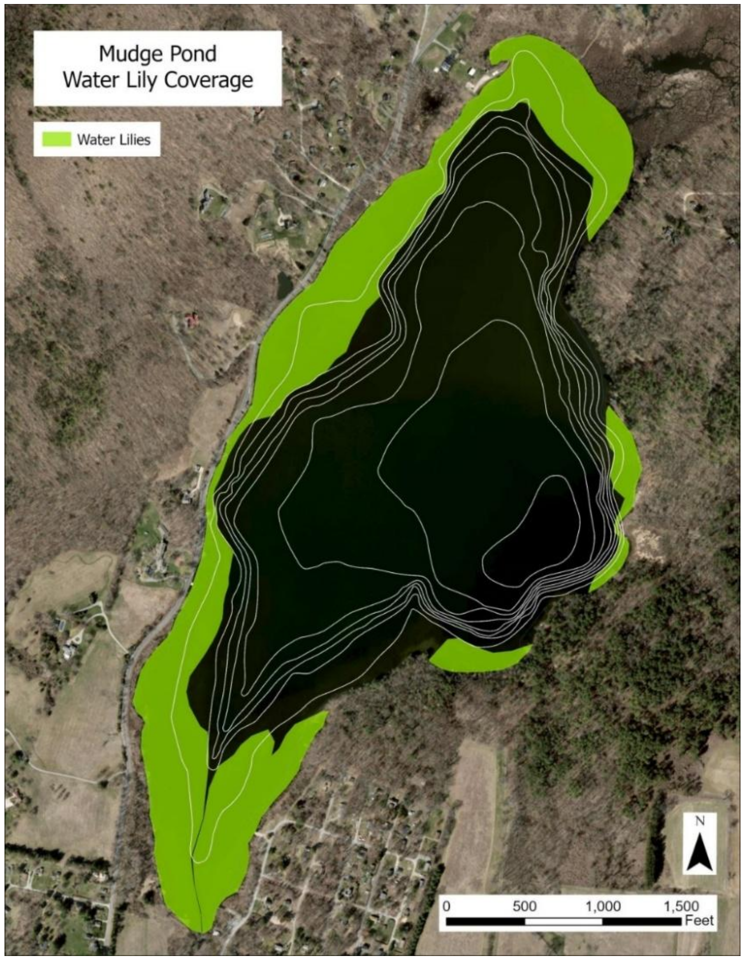
Map 5. Locations of Fanwort in September 2025.



Map 6. Locations of Tapegrass in September 2025.

Map 7. Locations of Large-leaf Pondweed in September 2025.

Map 8. Locations of floating-leaved plants in September 2025.



Recommendations for 2026

NEAR recommends considering the following treatment options to help manage the abundant plant growth in Mudge Pond. In the spring, Diquat can be applied to control Curly-leaf Pondweed, while Fluridone or ProcellaCOR treatments in June/July are recommended to reduce the growth of Eurasian Milfoil. Water Chestnut can be managed through hand-pulling or herbicide application in July, with a potential second removal event in October to address any regrowth.

Two aquatic plant surveys should be conducted in 2026. The first survey, in late spring to early summer, should focus on assessing Water Chestnut and Curly-leaf Pondweed populations and can serve as a pre-treatment survey if management actions are undertaken. A second survey in late summer would evaluate Eurasian Milfoil, Fanwort, and any Brittle Naiad populations. This second survey would serve as a post-treatment survey if herbicide or removal efforts have been carried out.

Monthly in-lake monitoring and inlet sampling should continue in 2026. Summer increases in TP and TN concentrations appear to be driven primarily by internal loading from the pond bottom, although watershed inputs also contribute, particularly at Inlet 1 which showed elevated TN in 2024 and 2025. Early in 2026, efforts should be made to obtain permission to access private property near Inlet 1 to investigate potential sources of excessive nitrogen discharge.

References

U.S. Environmental Protection Agency. (2025, October 17). *Common toxins produced by cyanobacteria, dinoflagellates, and diatoms*. U.S. EPA. Retrieved January 22, 2026, from https://www.epa.gov/habs/common-toxins-produced-cyanobacteria-dinoflagellates-and-diatoms