

**Wash Pond (Sunset Lake)  
2021 Aquatic Vegetation and  
Water Quality Report**  
Hampstead, New Hampshire

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### **Appendix A:**

Maps  
Raw Field Data

### **Appendix B:**

Aquatic Macrophyte Library  
Northeast Laboratory report



In accordance with the existing aquatic vegetation survey contract between SŌLitude Lake Management and the Sunset Lake Association, the following document serves to provide 2021 survey and algal results.

## 1.0 INTRODUCTION

Sunset Lake in Hampstead, NH, also known as Wash Pond, is 151 acres and is a mile long and a half mile wide. The center of the lake is 30 to 35 feet deep. The town of Hampstead maintains a beach on Sunset Lake which is open to all town residents.<sup>1</sup>

The Sunset Lake Association hired SOLitude Lake Management to perform a vegetation survey and collect an algal sample. The vegetation survey was performed by two SOLitude biologists. A 10-foot jon boat was used to tour the littoral zone. At irregular intervals, a throw-rake was used to collect vegetation in depths between 1-20 feet. Visual observations of vegetation were also documented. Vegetation collected were speciated when possible and provided a density. Maps of the distribution and density of vegetation are included in Appendix A.

## 2.0 VEGETATION SURVEY RESULTS

### 2.1 Methods

On August 31, 2021, a SŌLitude Biologist performed a vegetation survey at Wash Pond. The objective of the survey was to assess the vegetation composition with a special regard for exotic, invasive species. GPS points were collected in-situ, at random, during the survey. The GPS points were then uploaded to Arc-GIS to develop maps displaying the distribution of aquatic vegetation collected during the survey. Maps are provided in Appendix A.

The rake toss method, based on protocols developed by Cornell University, was used to retrieve submersed aquatic vegetation from either side of the survey vessel. Each species found on the rake will be identified and recorded. Plant species observed in the immediate area, but not found on the rake toss was also recorded. The abundance scale, developed by the US Army Corps of Engineers and modified by Cornell, was used to categorize total growth.

Notation	Description
Z	Zero: no plants on rake
T	Trace: fingerful on rake
S	Sparse: handful on rake
M	Moderate: rakeful of plants
D	Dense: difficult to bring into boat

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<sup>1</sup> [Sunset Lake Association \(slahampstead.org\)](http://SunsetLakeAssociation(slahampstead.org))



The identified species are split into categories: submersed, emergent, floating-leaf, and macro-alga. Submersed plants include those that remain completely submersed and grow below the water (Ex. waterweed). Emergent plants grow in shallow water (less than 5 feet), where part of the plant often is observed growing above the surface (ex. Pickerelweed). Macro-alga is technically not a plant, but is a larger form of algae. Macro-alga has structure that makes it appear like it's a plant and is often misidentified as such, but is a simple life form and is not complex like plants. Floating-leaf plants have a submersed form as a basal rosette, but grows a leaf structure that floats on the surface (ex. white waterlily). Macro-alga is naturally occurring in lakes and is not typically a threat to aquatic systems.

## 2.2 Results

A total of thirty (30) species were identified at this time, including seventeen (17) submersed species, seven (7) emergent species, four (4) floating-leaf species, and two (2) macro-alga species (Table 1) (Appendix B - Macrophyte Library). Two non-native, invasive species were also identified at this time: purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*). These two species are considered emergent, or found on the shoreline. On average, four (4) species were collected at each GPS point.

The most common species identified was Robbin's Pondweed, followed by tape-grass and variable-leaf pondweed. There were several species of pondweed, bladderwort, and macro-alga found scattered in varying densities within the littoral area (1-16 feet). Filamentous algae was also found at the west end of the pond. The wetland on the eastern shoreline held the most diverse and abundant assemblage of species (16+ species). Both common reed and purple loosestrife were identified in this area.



**Table 1:** Species frequency of occurrence (in order of abundance)

#	COMMON NAME	SCIENTIFIC NAME	% FOO
1	Robbin's Pondweed	<i>Potamogeton robbinsii</i>	53.66
2	Tapegrass	<i>Vallisneria americana</i>	53.66
3	Variable-leaf Pondweed	<i>Potamogeton gramineus</i>	34.15
4	Clasping-leaf Pondweed	<i>Potamogeton perfoliatus</i>	29.27
5	Spikerush	<i>Eleocharis spp.</i>	19.51
6	Slender Naiad	<i>Najas flexilis</i>	14.63
7 & 8	Macroalga	<i>Chara/Nitella</i>	14.63
9	Thin-leaf Pondweed	<i>Potamogeton pusillus</i>	12.20
10	Waterweed	<i>Elodea canadensis</i>	12.20
11	Arrowhead	<i>Sagittaria spp.</i>	12.20
12	Burreed	<i>Sparganium spp.</i>	12.20
13	Water Marigold	<i>Megaladonta beckii</i>	12.20
14	Southern Naiad	<i>Najas Guadalupensis</i>	9.76
15	Pickerelweed	<i>Pontedaria cordata</i>	9.76
16	Yellow Waterlily	<i>Nuphar variegata</i>	9.76
17	White waterlily	<i>Nymphaea odorata</i>	7.32
18	Purple Loosestrife	<i>Lythrum salicaria</i>	7.32
19	Big-leaf Pondweed	<i>Potamogeton amplifolius</i>	4.88
20	Floating Pondweed	<i>Potamogeton natans</i>	4.88
21	Ribbon-leaf Pondweed	<i>Potamogeton epihydrus</i>	4.88
22	Common Bladderwort	<i>Utricularia vulgaris</i>	4.88
23	Humped Bladderwort	<i>Utricularia gibba</i>	4.88
24	Rush	<i>Juncus spp.</i>	4.88
25	Common Reed	<i>Phragmites australis</i>	4.88
26	Spiral-fruited Pondweed	<i>Potamogeton spirillus</i>	2.44
27	Ivy-leaved Duckweed	<i>Lemna trisulca</i>	2.44
28	Spiny Hornwort	<i>Ceratophyllum echinatum</i>	2.44
29	Watershield	<i>Brasenia schreberi</i>	2.44
30	Cattail	<i>Typha latifolia</i>	2.44

\*n=41

Submersed species include the pondweed species (8), bladderwort species (2), naiad species (2), spiny hornwort, water marigold, waterweed, tapegrass, and spikerush. Emergent species include arrowhead, burreed, cattail, pickerelweed, rush, purple loosestrife, and common reed. Floating-leaf species include white waterlily, yellow waterlily, watershield, and duckweed.



### 3.0 WATER QUALITY RESULTS

During the visit, a single algal sample was collected from the middle of the pond. At this time, algal cell counts were extremely low to negligible. Cyanobacteria was present, however, no cyanobacteria species were detected that can produce toxins (Ex. microcystis, anabaena). Cyanobacteria are naturally occurring and 'when' present, does not declare a waterbody to be in poor health. The lab report is included in Appendix B.

Genus	Cell Count
Cyanophyta	430
Diatoms	10
Chlorophytes	58

### 4.0 CONCLUSION

Wash Pond can be considered an oligotrophic to mesotrophic waterbody with a healthy assemblage of native plants. No non-native, invasive submersed species were identified, which is a positive sign that the Sunset Lake Association's diligent proactive efforts display continued success at keeping nearby invasive submersed species out of Wash Pond.

Two invasive, emergent species were identified during the survey, purple loosestrife and common reed. The identification of purple loosestrife is not a new one. This species was identified in a 2012 vegetation survey and has been monitored since then. However, the identification of Common Reed (*Phragmites australis*) is likely a new development, unless the Sunset Lake Association is already aware of its presence. There are several management options available for Common Reed, including herbicide applications and mechanical removal.

If the Sunset Lake Association is interested in hearing more about management techniques for the invasive species, feel free to contact us again.

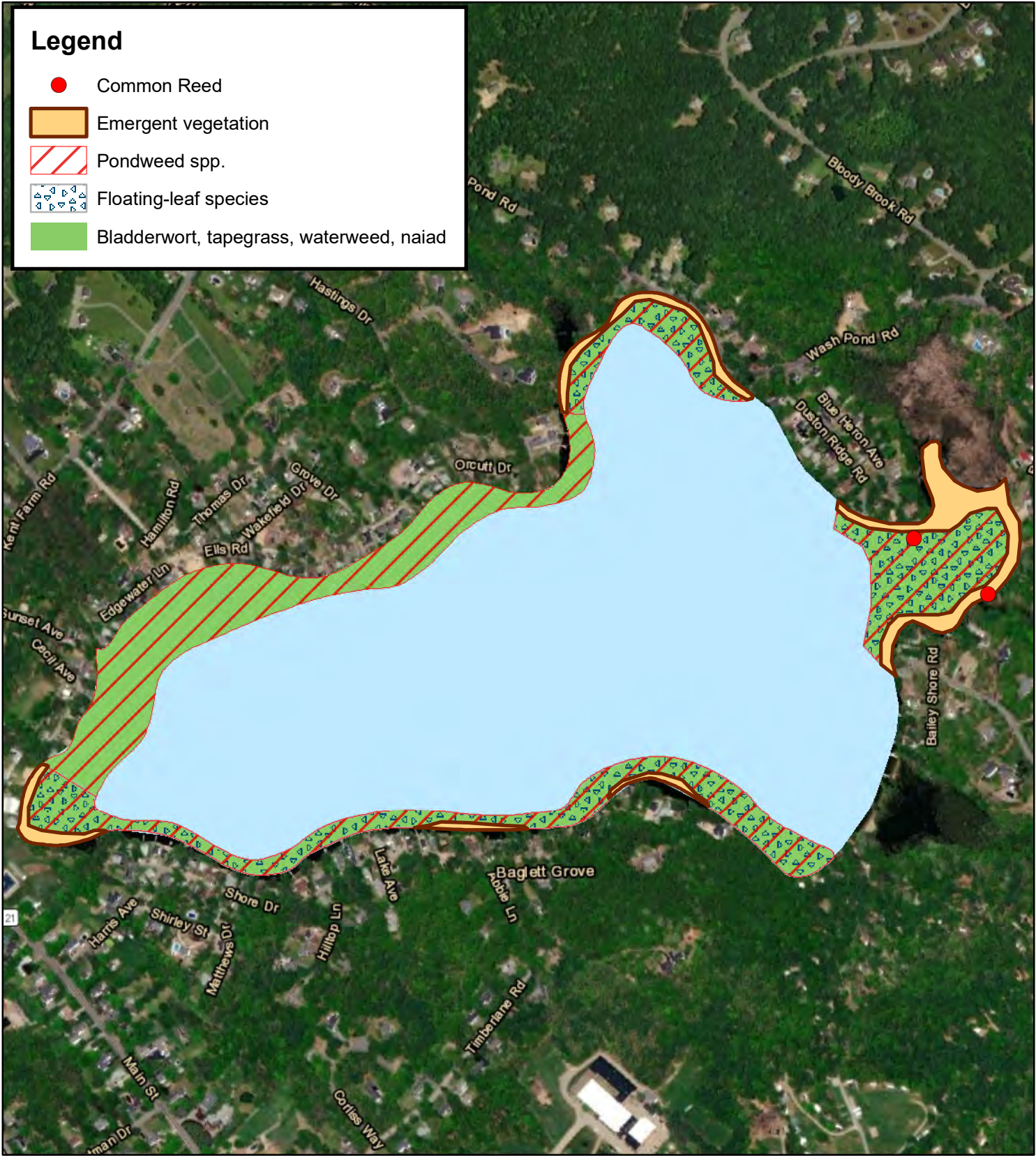
Sincerely,

Amanda Mahaney  
Senior Biologist





FIGURE 1: Distribution of Aquatic Vegetation at Wash Pond



**Legend**

- Common Reed
- Emergent vegetation
- Pondweed spp.
- Floating-leaf species
- Bladderwort, tapegrass, waterweed, naiad

**Wash Pond**  
Hampstead, NH  
42.8888956, -71.17786

**Wash Pond**

0                      770                      1,540

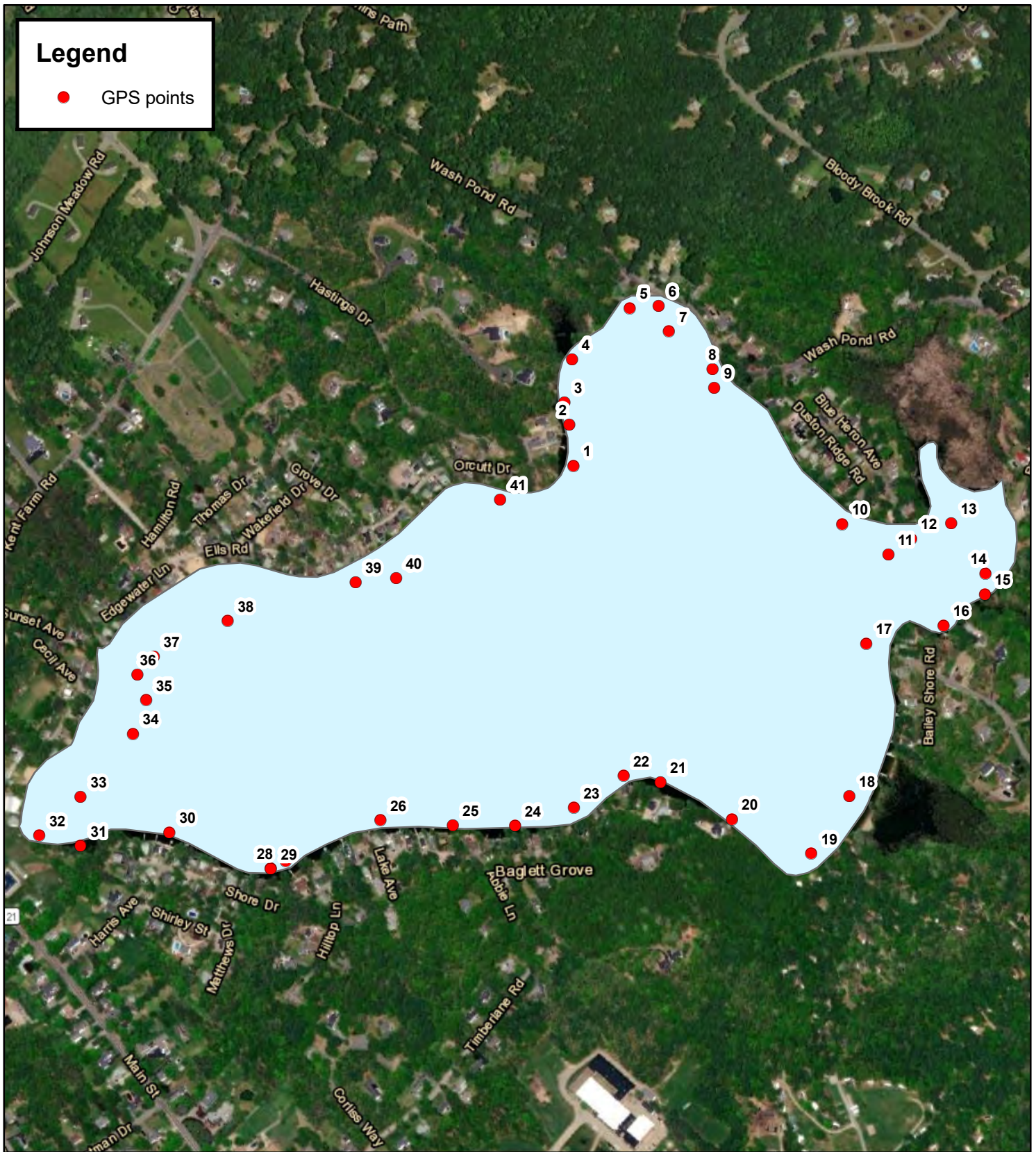
1:8,000                      Feet

N

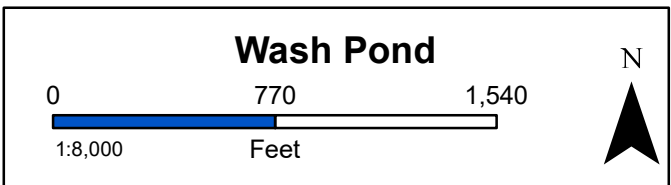

Map Date: 11/15/2021  
Prepared by: ALM  
Office: SHREWSBURY, MA




FIGURE 2: GPS points



**Wash Pond**  
Hampstead, NH  
42.8888956, -71.17786



N



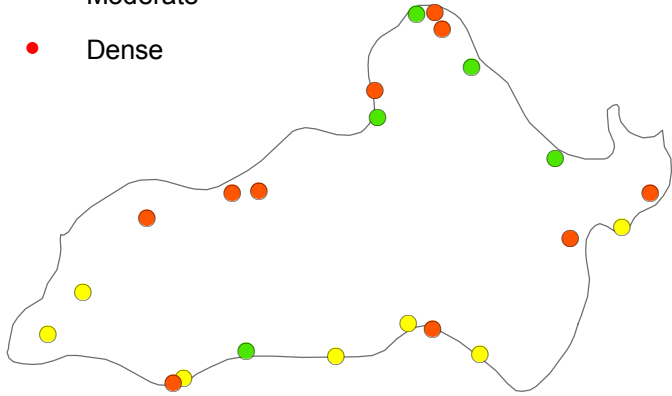
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Prepared by: ALM  
Office: SHREWSBURY, MA



Figure 3.1: Native Vegetation Distribution

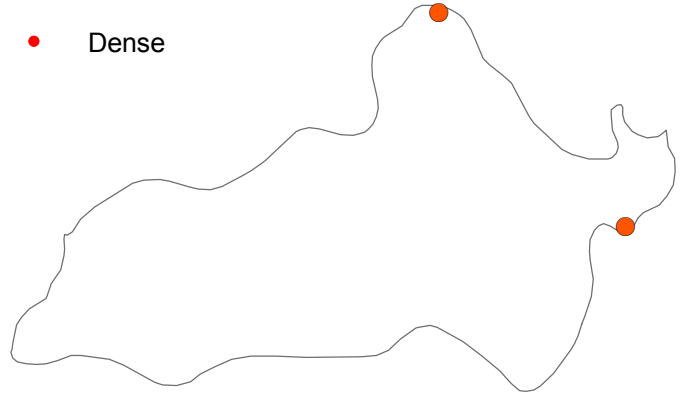
**Robbin's Pondweed**  
*Potamogeton robbinsii*

- Trace
- Sparse
- Moderate
- Dense



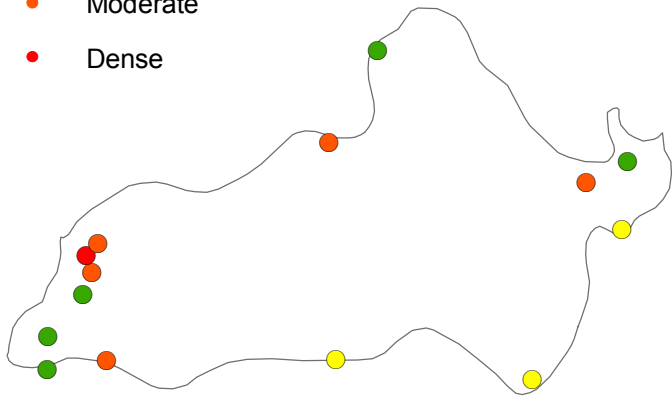
**Big-leaf Pondweed**  
*Potamogeton amplifolius*

- Trace
- Sparse
- Moderate
- Dense



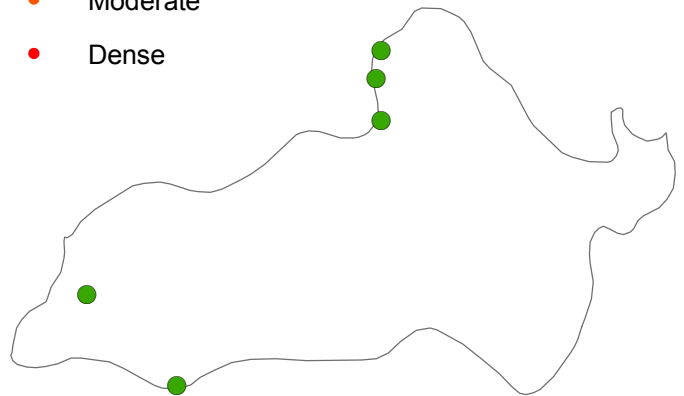
**Grassy Pondweed**  
*Potamogeton gramineus*

- Trace
- Sparse
- Moderate
- Dense



**Thin-leaf Pondweed**  
*Potamogeton pusillus*

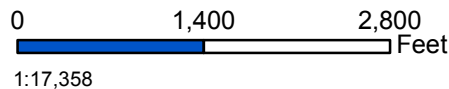
- Trace
- Sparse
- Moderate
- Dense



**Wash Pond**  
Hampstead, NH



**Wash Pond**

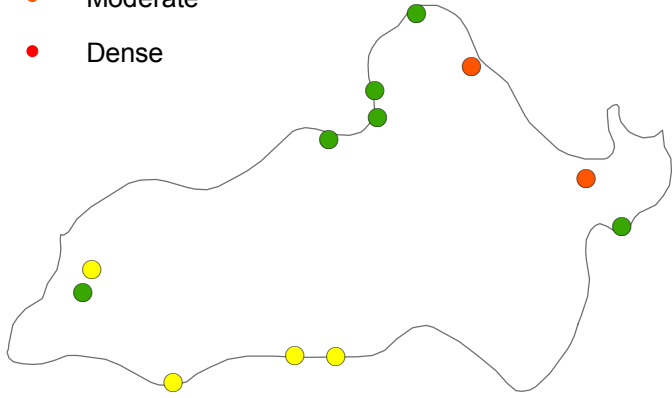


Map Date: 12/7/21  
Prepared by: AM  
Office: Shrewsbury, MA

Figure 3.2: Native Vegetation Distribution

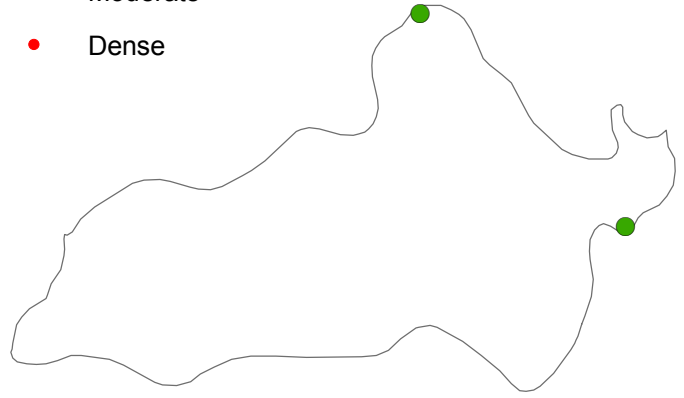
**Clasping-leaf Pondweed**  
*Potamogeton perfoliatus*

- Trace
- Sparse
- Moderate
- Dense



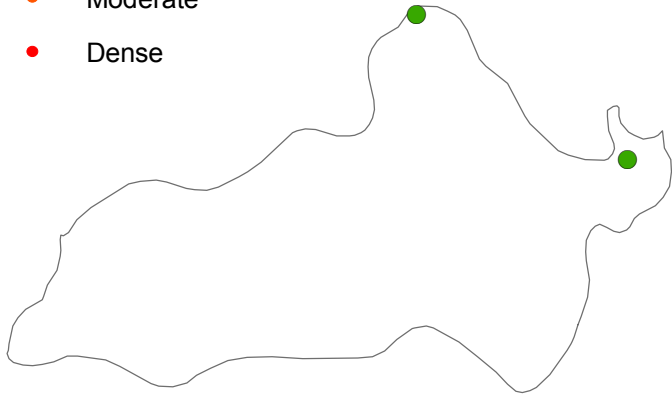
**Floating Pondweed**  
*Potamogeton natans*

- Trace
- Sparse
- Moderate
- Dense



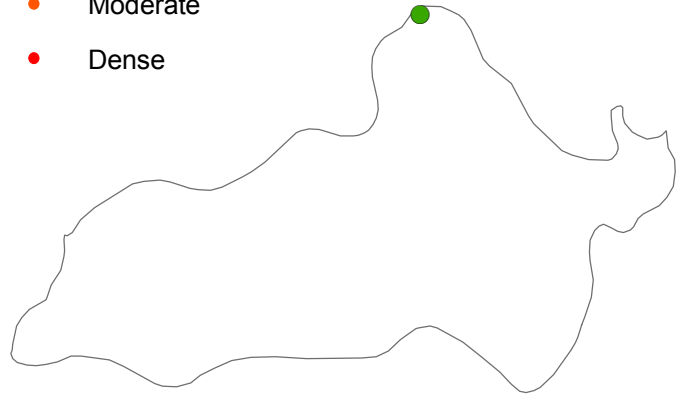
**Ribbon-leaf Pondweed**  
*Potamogeton epihydrus*

- Trace
- Sparse
- Moderate
- Dense



**Spiral-fruited Pondweed**  
*Potamogeton spirillus*

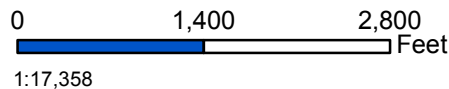
- Trace
- Sparse
- Moderate
- Dense



**Wash Pond**  
Hampstead, NH



**Wash Pond**

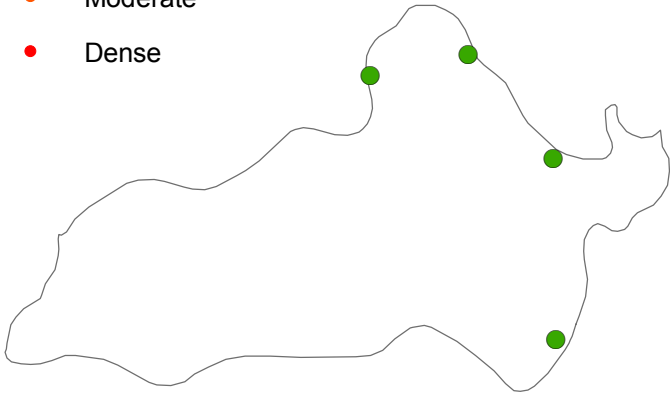


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Prepared by: AM  
Office: Shrewsbury, MA

Figure 3.4: Native Vegetation Distribution

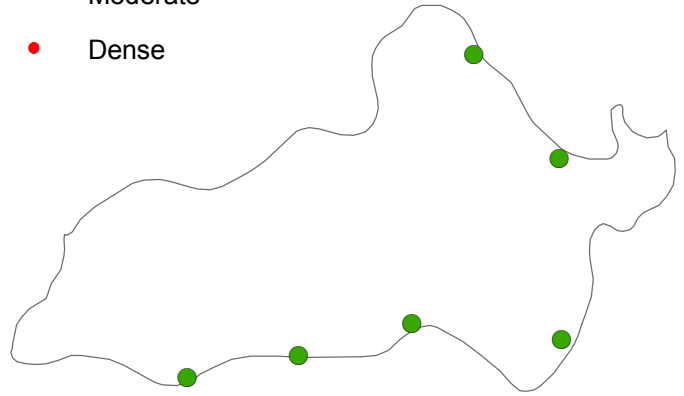
**Southern Naiad**  
*Najas guadalupensis*

- Trace
- Sparse
- Moderate
- Dense



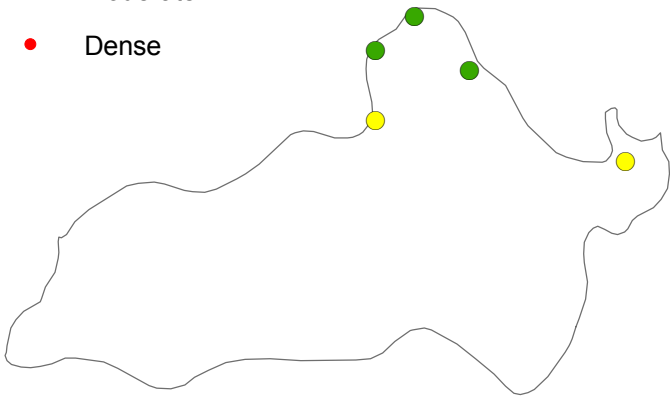
**Slender Naiad**  
*Najas flexilis*

- Trace
- Sparse
- Moderate
- Dense



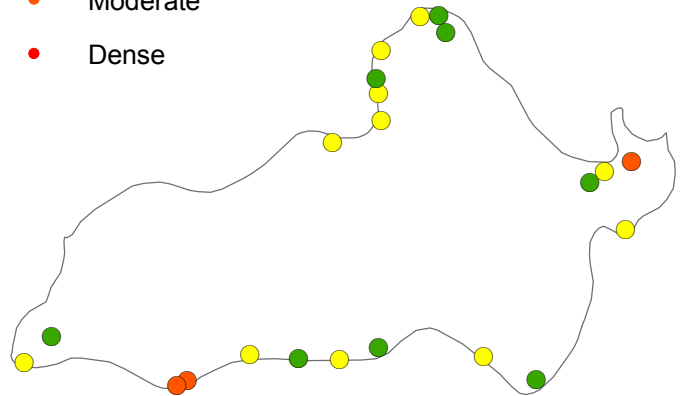
**Waterweed**  
*Elodea spp.*

- Trace
- Sparse
- Moderate
- Dense



**Tapegrass**  
*Vallisneria americana*

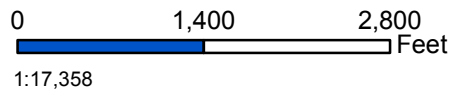
- Trace
- Sparse
- Moderate
- Dense



**Wash Pond**  
Hampstead, NH



**Wash Pond**



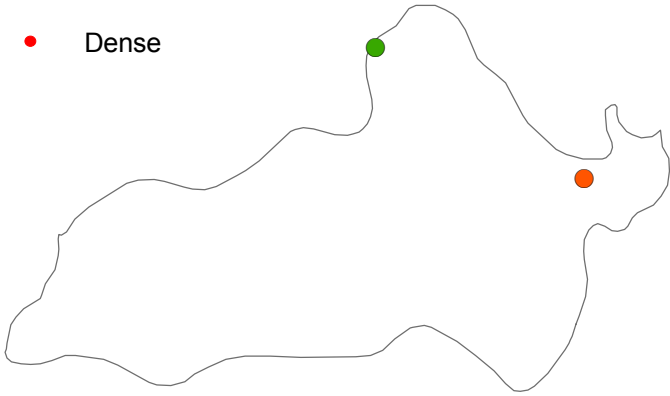
Map Date: 12/7/21  
Prepared by: AM  
Office: Shrewsbury, MA

Figure 3.4: Native Vegetation Distribution

**Humped Bladderwort**

*Utricularia gibba*

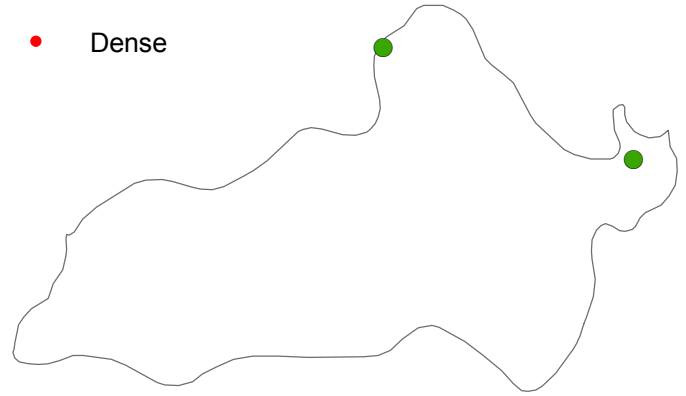
- Trace
- Sparse
- Moderate
- Dense



**Common Bladderwort**

*Utricularia vulgaris*

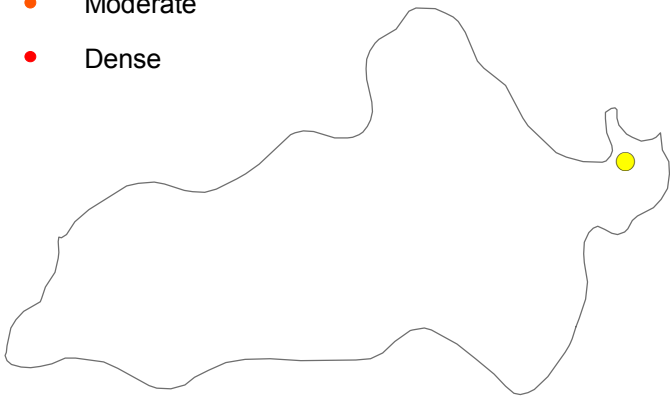
- Trace
- Sparse
- Moderate
- Dense



**Spiny Hornwort**

*Ceratophyllum echinatum*

- Trace
- Sparse
- Moderate
- Dense



**Water Marigold**

*Megaladonta beckii*

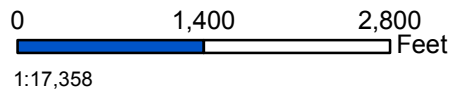
- Trace
- Sparse
- Moderate
- Dense



**Wash Pond**  
Hampstead, NH



**Wash Pond**



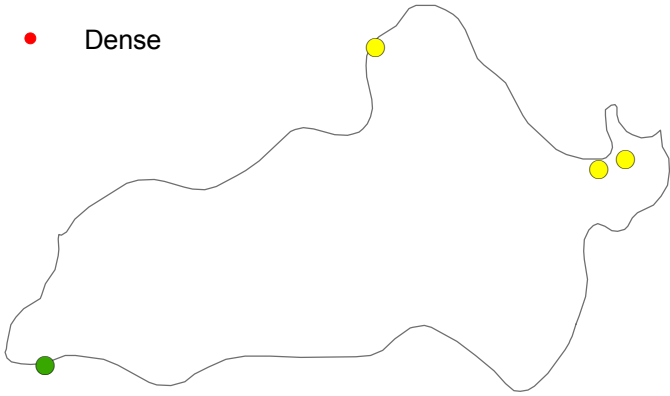
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Figure 3.5: Native Vegetation Distribution

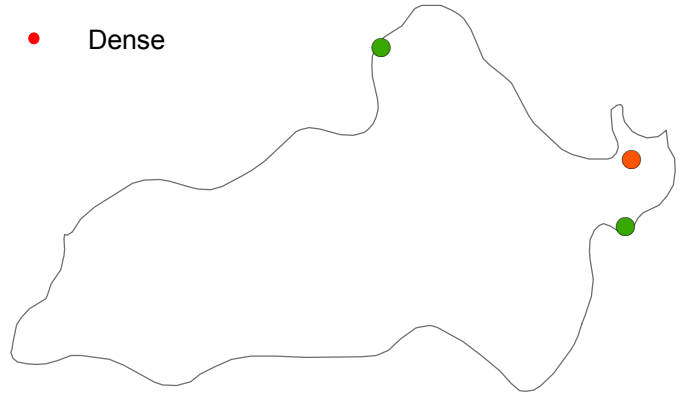
**Yellow Waterlily**  
*Nuphar variegata*

- Trace
- Sparse
- Moderate
- Dense



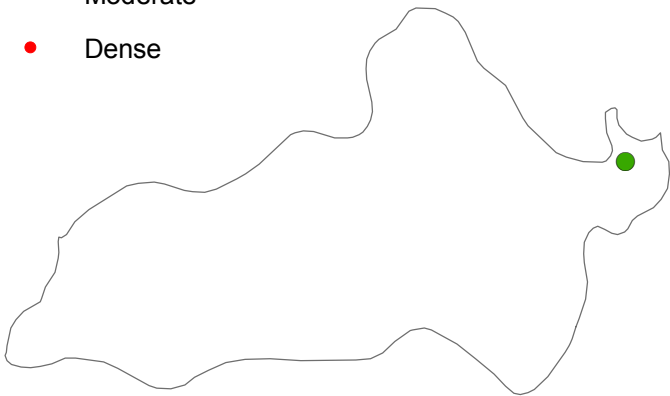
**White Waterlily**  
*Nymphaea odorata*

- Trace
- Sparse
- Moderate
- Dense



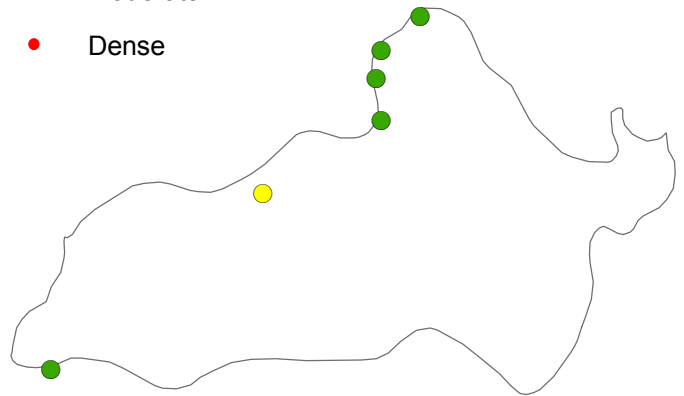
**Watershield**  
*Brasenia schreberi*

- Trace
- Sparse
- Moderate
- Dense



**Stonewort/Muskgrass**  
*Nitella/Chara spp.*

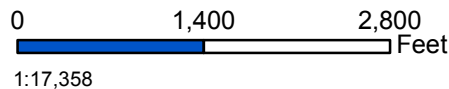
- Trace
- Sparse
- Moderate
- Dense



**Wash Pond**  
Hampstead, NH



**Wash Pond**

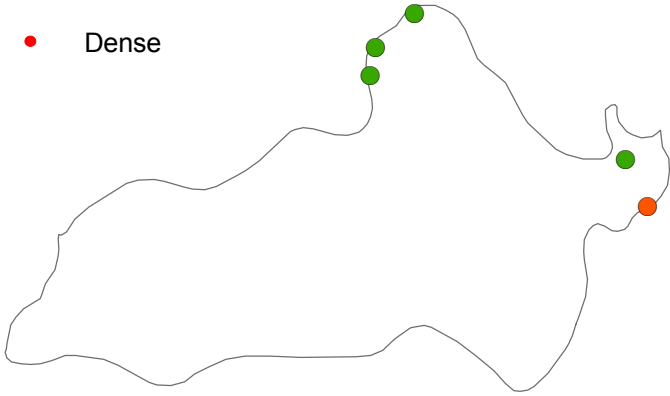


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Figure 3.6: Native Vegetation Distribution

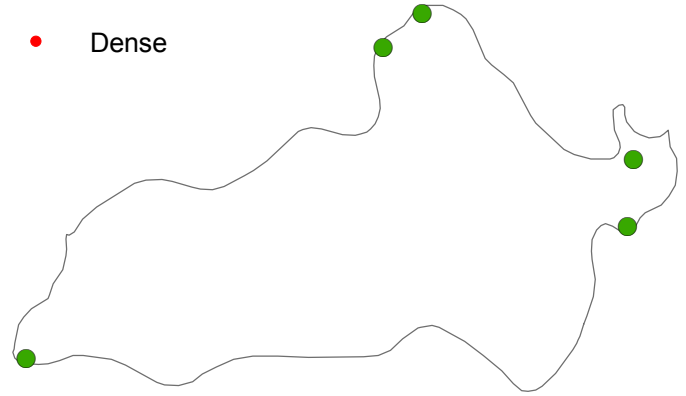
**Arrowhead**  
*Sagittaria sp.*

- Trace
- Sparse
- Moderate
- Dense



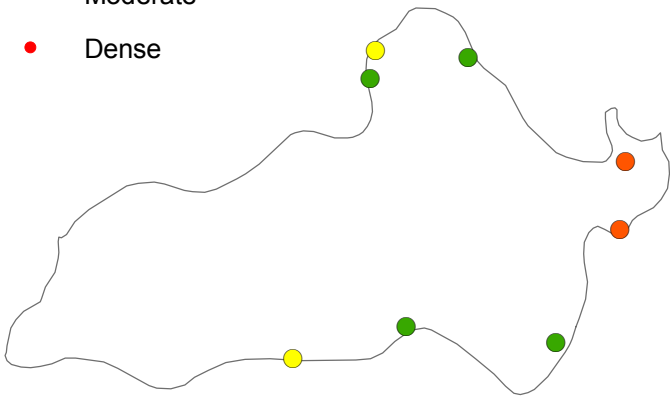
**Burreed**  
*Sparganium sp.*

- Trace
- Sparse
- Moderate
- Dense



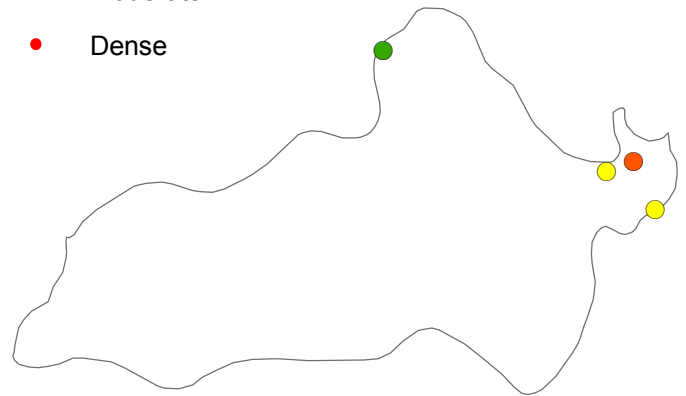
**Spikerush**  
*Eleocharis sp.*

- Trace
- Sparse
- Moderate
- Dense



**Pickerelweed**  
*Pontedaria cordata.*

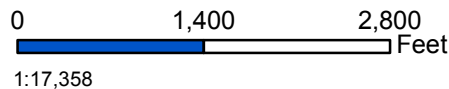
- Trace
- Sparse
- Moderate
- Dense



**Wash Pond**  
Hampstead, NH



**Wash Pond**



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Figure 3.7: Native Vegetation Distribution

**Cattail**

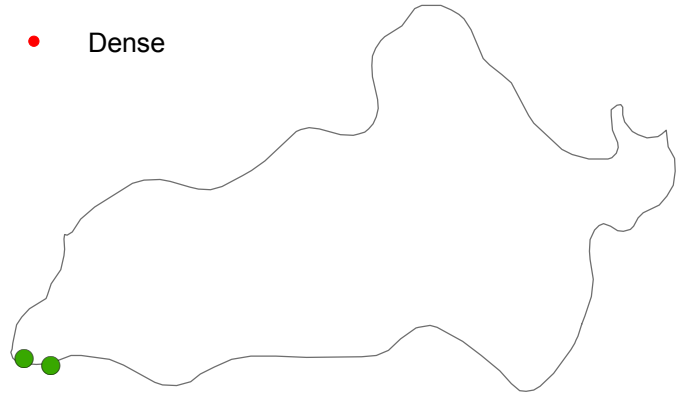
*Typha latifolia*

- Trace
- Sparse
- Moderate
- Dense



**Filamentous Alga**

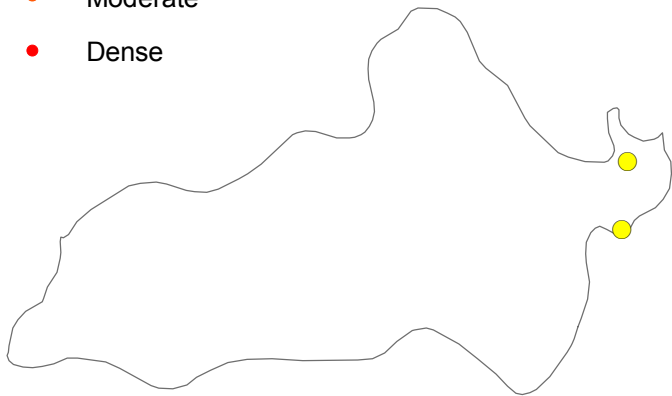
- Trace
- Sparse
- Moderate
- Dense



**Rush**

*Juncus sp.*

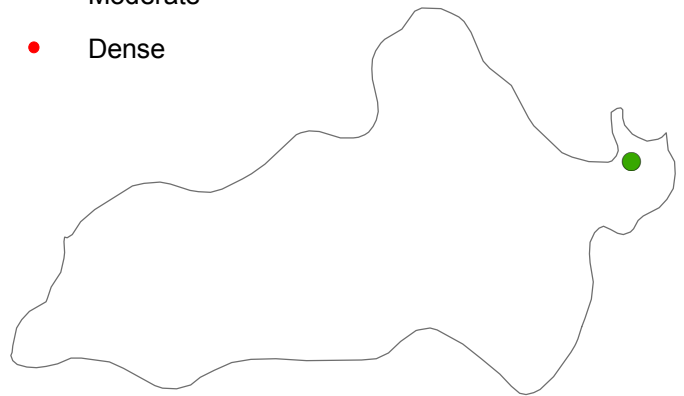
- Trace
- Sparse
- Moderate
- Dense



**Duckweed**

*Lemna spp.*

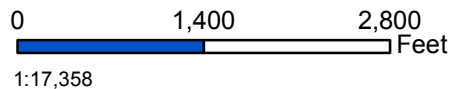
- Trace
- Sparse
- Moderate
- Dense



**Wash Pond**  
Hampstead, NH



**Wash Pond**

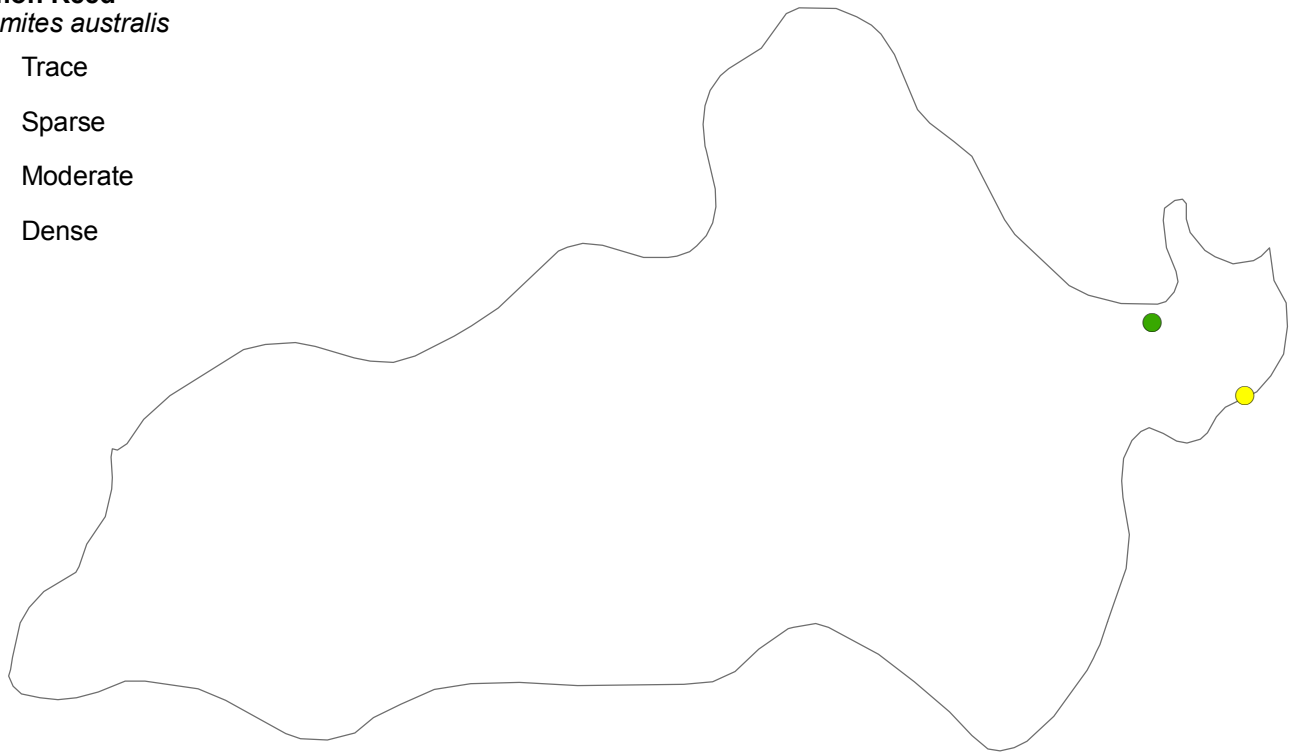


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Prepared by: AM  
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Figure 3.8: Invasive, Emergent Vegetation Distribution

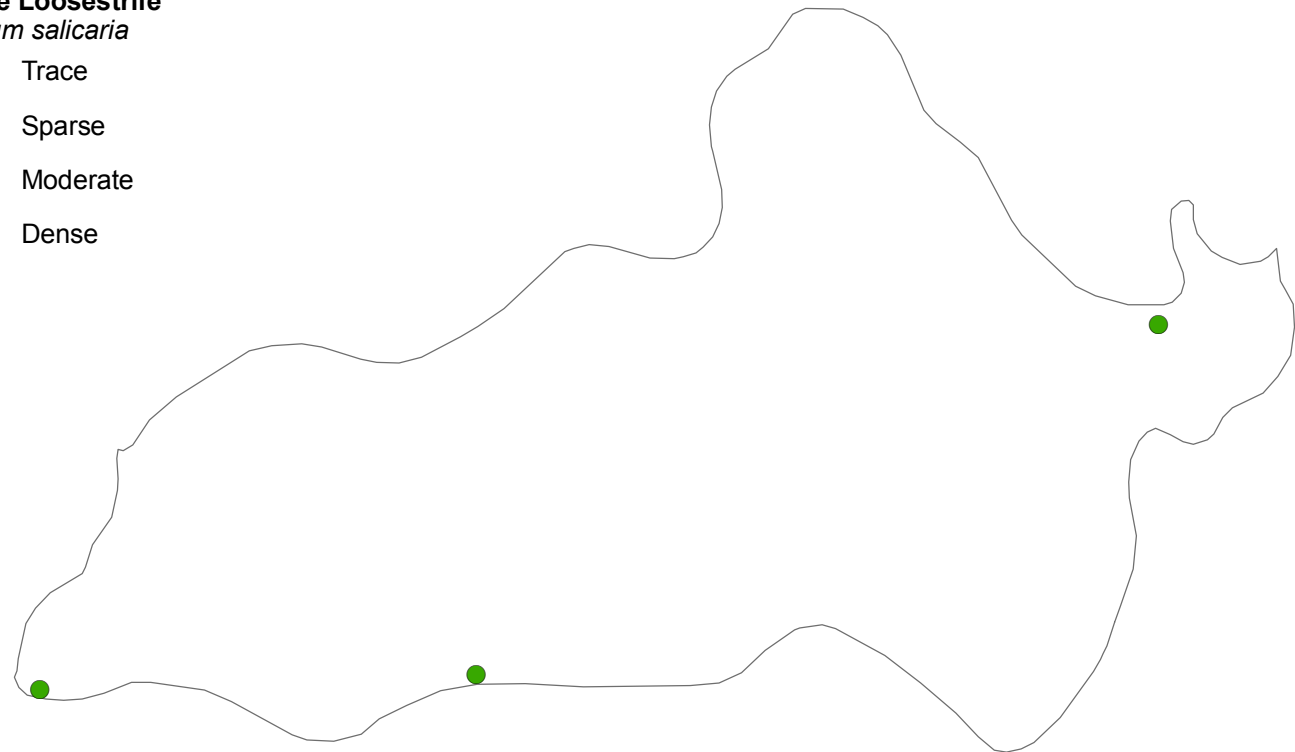
**Common Reed**  
*Phragmites australis*

- Trace
- Sparse
- Moderate
- Dense

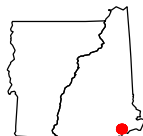


**Purple Loosestrife**  
*Lythrum salicaria*

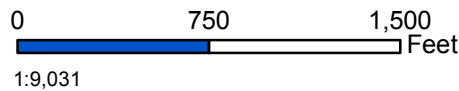
- Trace
- Sparse
- Moderate
- Dense



**Wash Pond**  
Hampstead, NH



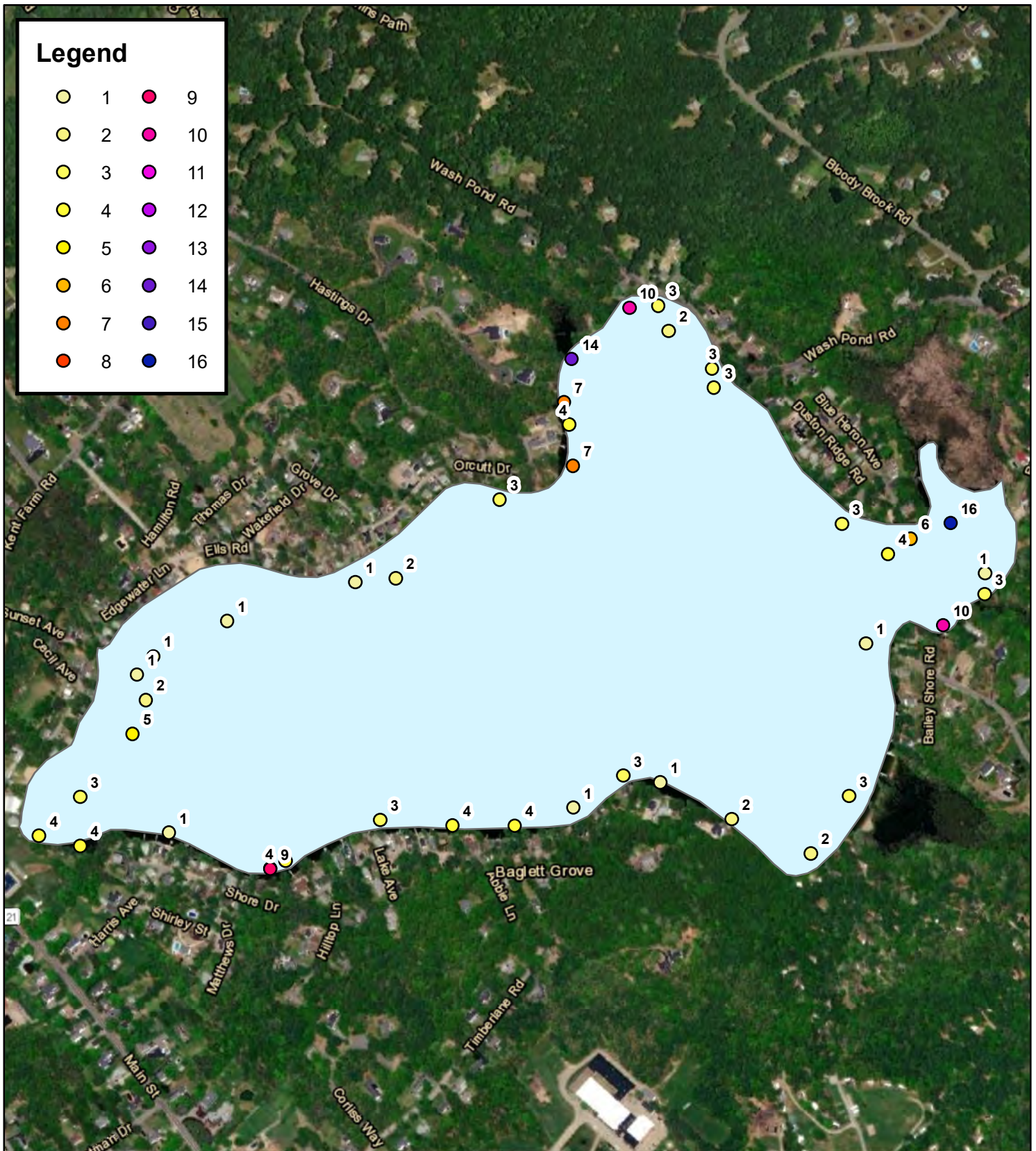
**Wash Pond**



Map Date: 12/7/21  
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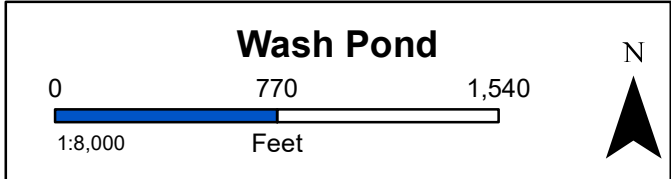
FIGURE 4: Species Richness



**Legend**

1	9
2	10
3	11
4	12
5	13
6	14
7	15
8	16

**Wash Pond**  
Hampstead, NH  
42.8888956, -71.17786

Map Date: 12/7/21  
Prepared by: ALM  
Office: SHREWSBURY, MA

Data Point	Latitude	Longitude	Robbin's Pondweed	Big-leaf Pondweed	Grassy Pondweed	Thin-leaf Pondweed	Clasping-leaf Pondweed	Floating-leaf Pondweed	Ribbon-leaf Pondweed	Spiral-fruited Pondweed	Southern Naiad	Slender Naiad	Waterweed	Arrowhead	Burreed	Duckweed	Spikerush	Common Bladderwort	Humped Bladderwort	Spiny Hornwort	Tapegrass	Water Marigold	Pickrelweed	JUNCUS	Yellow Waterlily	White Waterlily	Watershield	Cattail	Purple Loosestrife	Common Reed	Filamentous Alga	Macro-alga	
001	42.88895558	-71.17786042	T			T	T						S								S											T	
002	42.88952043	-71.17791859	M				T														S												
003	42.88982486	-71.17800283				T					T			T			T				T											T	
004	42.89041495	-71.17784475			T	T							T	T	T		S	T	T			S	T		S	T						T	
005	42.89110210	-71.17675393	T				T	T	T	T			T	T	T							S										T	
006	42.89112800	-71.17621455	M	M																		T											
007	42.89077797	-71.17602655	M																			T											
008	42.89024723	-71.17523261									T	T					T																
009	42.88998848	-71.17520068	T				M						T																				
010	42.88808813	-71.17286364	T								T	T																					
011	42.88766200	-71.17200801			M		M												M			T											
012	42.88786744	-71.17158246																				S		S		S			T	T	T		
013	42.88807087	-71.17083379			T				T				S	T	T	T	M	T		S	M	T	M	S	S	M	T						
014	42.88737249	-71.17020741	M																														
015	42.88708566	-71.17022811												M										S							S		
016	42.88667419	-71.17101006	S	M	S		T	T								T		M				S			S		T						
017	42.88644293	-71.17245703	M																														
018	42.88435257	-71.17282273									T	T					T																
019	42.88357850	-71.17355355			S																												
020	42.88406658	-71.17502047	S																														
021	42.88458911	-71.17634078	M																														
022	42.88469086	-71.17702751	S								T						T																
023	42.88426389	-71.17796604																															
024	42.88402936	-71.17906700	S		S		S																										
025	42.88404931	-71.18022689					S					T					S																
026	42.88414512	-71.18157973	T																														
027	42.88360281	-71.18335560	S									T																					
028	42.88350441	-71.18364410				T	S															M	T										
029	42.88349669	-71.18363874	M																			M	T										
030	42.88402291	-71.18551746			M																												
031	42.88386340	-71.18717926			T																											P	T
032	42.88401201	-71.18794478													T							S								T		P	
033	42.88453211	-71.18716350	S		T																	T											
034	42.88538715	-71.18616446	S		T	T	T																T										
035	42.88584849	-71.18590403			M		S																										
036	42.88619701	-71.18606170			D																												
037	42.88644293	-71.18574939			M																												
038	42.88690880	-71.18435950	M																														
039	42.88741314	-71.18196169	M																														
040	42.88745756	-71.18120396	M																														S
041	42.88850857	-71.17923556			M		T															S											

# APPENDIX B:

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- Aquatic Macrophyte Library
- Northeast Laboratory Report



# Wash Pond

## Aquatic Macrophyte Picture Library & Summary

(In no particular order)

### Waterweed (Submersed)

**Native** (*Elodea* spp. Common Names: common waterweed & Nuttall's waterweed ): Waterweed has slender stems that can reach a meter in length, and a shallow root system. The stem is adorned with lance-like leaves that are attached directly to the stalk that tend to congregate near the stem tip. The leaves are populated by a variety of aquatic invertebrates. Male and female flowers occur on separate plants, but it can also reproduce via stem fragmentation. Since waterweed is disease resistant, and tolerant to low-light conditions, it can reach nuisance levels, creating dense mats that can obstruct fish movement, and the operation of boat motors.



### Tape-grass (Submersed)

**Native** (*Vallisneria americana*. Common Names: Wild celery, tape-grass.): Tape-grass has long flowing ribbon-like leaves that have a basal arrangement from a creeping rhizome. The leaves can be up to two meters long, have a cellophane-like texture, with a prominent center stripe and finely serrated edges. The leaves are mostly submersed, although they can reach the surface allowing the tips to trail. Male and female flowers are produced on separate plants, but reproduction is usually via over wintering rhizomes and tubers. Tape-grass usually inhabits hard substrate bottoms in shallow to deep water. It can tolerate

a wide variety of water chemistries. Tape-grass is the premiere food source for waterfowl, which greedily consume all parts of the plant. Canvasback ducks (*Aythya valisneria*) enjoy a strong relationship with tape-grass, going so far to alter their migration routes based on tape-grass abundance. Extensive beds of tape-grass are considered good shade, habitat and feeding opportunities for fish.

### Large-leaf Pondweed (Submersed)

**Native** (*Potamogeton amplifolius*. Common Names: Large-leaf Pondweed, Bass Weed.): Bass weed has robust stems that originate from black-scaled rhizomes. The submersed leaves of bass weed are among the broadest in the region. The submersed leaves are arched and slightly folded, attached to stems via stalks, and possess many veins. Floating leaves are produced on long stalks (8-30 cm). Stipules are large, free and taper to a sharp point. Flowers, and late season fruit are densely packed onto a





## Aquatic Macrophyte Picture Library & Summary

spike. Bass weed prefers soft sediments in water one to 4 meters deep. This plant is sensitive to increased turbidity and also has difficulty recovering from top-cutting, from such devices as boat propellers and aquatic plant harvesters. As its name implies the broad leaves of this submersed plant provides abundant shade, shelter and foraging opportunities for fish. The high number of nutlets produced per plant makes it an excellent waterfowl food source.

### Spiny Hornwort (Submersed)

**Native** (*Ceratophyllum echinatum*. Common Names: coontail, spiny hornwort.): Coontail has long trailing stems that lack true roots, although it can become loosely anchored to sediment by modified leaves. The leaves are stiff, and arranged in whorls of 5-12 at each node. Each leaf is forked once or twice (only), and has teeth along the margins. The whorls of leaves are spaced closer at the end of the stem, creating a raccoon tail appearance. Coontail is tolerant of low light conditions, and since it is not rooted, it can drift into different depth zones. Coontail can also tolerate cool water and can over winter as a green plant under the ice. Typically, it reproduces via fragmentation. Bushy stems of coontail provide valuable habitat for invertebrates and fish (especially during winter), and the leaves are grazed on by waterfowl.



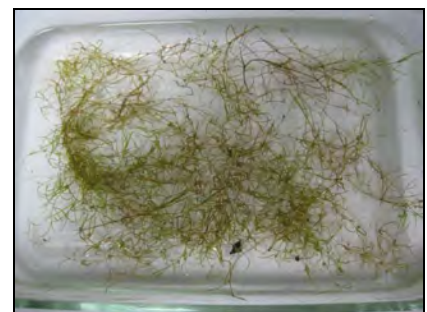
### Robbin's Pondweed (Submersed)

**Native** (*Potamogeton robbinsii*. Common Name: Fern Pondweed.). Robbins pondweed has robust stems that emerge from spreading rhizomes. The leaves are strongly ranked, creating a fern-like appearance most clearly seen while still submerged. Its distinct closely-spaced fern-like leaves give it a unique appearance among the pondweeds of our region. Each leaf is firm and linear, with a base that wraps around the stem. At the stem it has ear-like lobes fused with a fibrous stipule. No floating leaves

are produced. Robbins pondweed thrives in deeper water, and under some circumstances, it can over winter green. Robbins pondweed creates suitable invertebrate habitat, and cover for lie-in-wait predaceous fish, such as pickerel and pike.

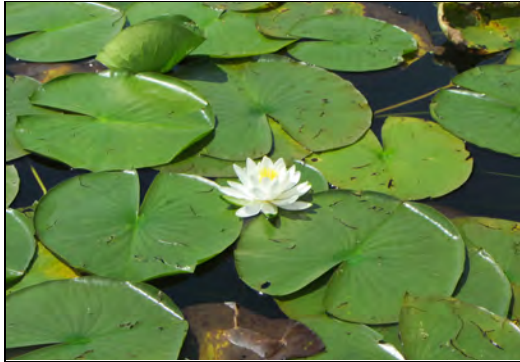
### Spiral-fruited Pondweed (Submersed)

**Native** (*Potamogeton spirillus*. Common Name: Spiral-fruited pondweed.): Spiral-fruited pondweed has slender stems that originate from a delicate, spreading rhizome. The stems tend to be compact and have numerous branches. Submersed leaves are linear with a curved appearance. Floating leaves are delicate, ellipse-shaped and range from 7 to 35 mm long and



## Aquatic Macrophyte Picture Library & Summary

two to 13 mm wide. Stipules are fused to the leaf blade for more than half of their length. Nut-like fruits are produced on stalks of various lengths. Shorter stalks tend to be on lower axils with fruit arranged in a compact head, while longer stalks tend to appear on upper axils, with fruit arranged in a cylindrical head. The fruit itself is a flattened disc with a sharply-toothed margin. Its smooth sides appear like a tightly coiled embryo, a distinguishing characteristic. Spiral-fruited pondweed prefers shallow water with sandy substrate, but can inhabit a wide range of bottom substrates. It serves as an important stabilizer and cover for fish fry and invertebrates.



### White Water Lily (Floating-leaf)

**Native** (*Nymphaea odorata*, Common Name: white water lily, fragrant water lily.): White water lily leaf stalks emerge directly from a submerged fleshy rhizome. White water lilies have round floating leaves. Flowering occurs during the summer, and the flowers open during the day, and close during the night. Water lilies typically inhabit quiet water less than two meters deep, such as ponds, shallow lakes and slow-moving streams. The leaves offer shade and

protection for fish, and the leaves, stems, and flowers are grazed upon by muskrats, beaver, and sometimes even deer.

### Water Marigold (Submersed)

**Native** (*Bidens beckii* = *Megalodonta beckii*). Common Name: Water marigold. ): Water marigold stems emerge from a buried rootstalk. Submersed leaves are most commonly encountered, and are finely divided into thread-like divisions. These divisions are situated in a whorled pattern attached directly to the stem, and characteristic which can be used to distinguish this plant from fanwort (alternate pattern with a short stalk) and water crowfoot (alternate pattern). When an aerial portion develops, the emergent lance-like leaves have a toothed margin, and daisy-like yellow flowers are produced. However, water marigold usually reproduces via rootstalks. Water marigold prefers soft sediments and clear water lakes. It is an indicator species of good water quality, and often is one of the first plants to disappear when overall conditions decline. When it flowers, water marigold blooms attract a myriad of passing insects. The submersed plant produces suitable shade, cover and food for fish.



### Naiad spp. (Submersed)

**Native** (*Najas flexilis* & *Najas guadalupensis*; Common Names: slender naiad & southern naiad.): Slender naiad has fine-branched stems that can taper to lengths of one meter, originating from delicate root stalks. Plant shape varies;

## Aquatic Macrophyte Picture Library & Summary

sometimes compact and bushy, other times long and slender, depending on growing conditions. The leaves are short (1-4 cm long) and finely serrated, tapering to a point. It is found in a variety of habitats, and can colonize sandy or gravelly substrates. If conditions are ideal, it can reach nuisance densities. It is a true annual, and dies off in the fall, relying on seed dispersal to return the next year. It is an important food source for waterfowl.

### Watershield (Floating-leaf)

**Native** (*Brasenia schreberi*. Common Names: common water shield, water target): Watershield is a floating-leaf aquatic plant similar to water lilies. Its stem and leaves are elastic, and are attached to a rooted rhizome that acts as an anchor and source of stored nutrients. The leaf stalks are attached to the middle of the leaf, creating a bull's eye effect, hence its name water target. The leaves are green on the upper surface, and purple underneath. Maroon to purple flowers peak above the water's surface on short, stout stalks. Watershield is usually coated with a clear gelatinous slime on the stem and underside of the leaves. Watershield prefers soft-water lakes and ponds in sediments containing decomposing organic matter. The whole plant is consumed by waterfowl, and the floating leaves provide shade and cover for fish.



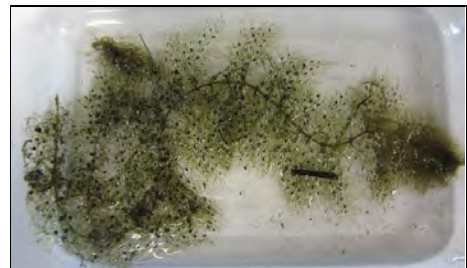
### Yellow Waterlily (Floating-leaf)

**Native** (*Nuphar variegata*. Common Name: bullhead pond lily, spatterdock.): Spatterdock leaf stalks emerge directly from a submerged fleshy rhizome. Spatterdock has heart-shaped leaves with a prominent notch. Depending on the habitat, these leaves can be held aloft via erect stems. A distinguishing characteristic of spatterdock is the leaf stalk, which bears a winged margin. Flowering occurs in the summer and, the flowers open during the day and close at night. Spatterdock typically inhabits quiet water less than two

meters deep with a soft substrate, such as ponds, shallow lakes and slow-moving streams. The leaves offer shade and protection for fish, and the leaves, stems, and flowers are grazed upon by muskrats, beaver, and sometimes, even deer.

### Common Bladderwort (Submersed)

**Native** (*Utricularia vulgaris*: Common Names: common bladderwort, great bladderwort.): Common bladderwort is a free-floating plant that can reach 2-3 meters in length. Since they are free-floating, they can grow in areas with very loose sediment. Along its stem are finely divided leaf-like branches, forked 3-7 times. Scattered about the





## Aquatic Macrophyte Picture Library & Summary

branches are numerous bladders, used to capture prey ranging from the size of unicellular protozoans (such as *Euglena*), to mosquito larvae. Prey is slowly digested inside the bladders by enzymes. Common bladderwort produce small yellow flowers that protrude above the water. Stems of common bladderwort provide food and cover for fish.



### Thin-leaf Pondweed (Submersed)

**Native** (*Potamogeton pusillus*. Common Name: Small Pondweed.): Thin-leaf pondweed has slender stems and a slight rhizome that branches repeatedly near the ends. Only submersed leaves are produced, and these are linear, attaching directly to the stem of the plant. The leaves have three veins and the mid-vein is usually bordered by several rows of lacunar (hollow) cells. There is usually a pair of raised glands at the base of the leaf attachment. Membranous stipules are wrapped around the stem in early growth, but as the plant ages,

these tend to break down and becoming shredded in appearance and free. Flowers and fruits are produced in 1 to 4 whorls on a slender stalk. The fruit is plump with a smooth back and a short-hooked beak. Small pondweed can tolerate turbid environments and inhabits shallow zones to a depth of 3 meters. Small pondweed is grazed upon by waterfowl, muskrat, deer, beaver, and even moose. Locally, it can be a very important link in the ecological balance of a lake system. It also provides suitable grazing opportunities and cover for numerous fish.

### Macro-alga

**Native** (*Nitella* sp. & *Chara* sp. Common Names: stonewort & muskgrass.): Stonewort/muskgrass is actually a multi-branched algae that appears as a higher plant. It lacks conductive tissue and roots, using simple anchoring structures called rhizoids. Stem lengths can reach 0.5 meters, and leaves are arranged in whorls. Although similar in appearance to muskgrass, stonewort has smooth stems and branches, and lacks the distinct musky odor. *Nitella* inhabits soft sediments in the deeper water of lakes. It can be found as deep as 10 meters. Fish and waterfowl graze on Stonewort.



### Bur-reed (Emergent)

**Native** (*Sparganium* sp). Bur-reed is an emergent plant that reaches heights of 1.5 meters. It prefers the moist soil of lake margins, to a depth of one meter. The leaves (6 to 12 mm wide) are spongy with a compressed triangular cross-section. Ribbon-like floating and submersed leaves may also be present. Rhizomes are shallow, intricate networks. The zig-zag flower stalks are covered with gumball-like spherical blooms. The individual fruits mature with outward facing beaks that can be used for positive

## Aquatic Macrophyte Picture Library & Summary

identification to species. Common bur-reed has two stigmas on each nutlet and a wide flat top. Common bur-reed is a perennial that overwinters with hardy rhizomes. Common bur-reed has many beneficial ecological traits, such as sediment stabilization, providing nesting sites for waterfowl. The whole plant is consumed by deer and muskrat.

### Variable-leaf Pondweed (Submersed)

**Native** (*Potamogeton gramineus*. Common Names: Variable pondweed, grassy pondweed.): Variable pondweed has stems that arise from a sprawling rhizome with numerous branching. Submersed lance-like leaves have 3 to 7 veins, lack a stalk, and slightly taper where they attach to the stem. Floating leaves are shaped like an ellipse, with 11 to 19 veins, and are attached to the stem via a stalk usually longer than the blade. The appearance of variable pondweed depends on where it is growing. This variability, along with its tendency to hybridize with other pondweeds makes it difficult to identify. It prefers hard sediments, and usually inhabits water less than one meter deep. Waterfowl graze on its tubers and fruits, and its dense underwater foliage provides suitable macroinvertebrate and fish habitat.



### Floating-leaf Pondweed (Submersed)

**Native** (*Potamogeton natans*: Common Name: floating-leaf pondweed): Floating-leaf pondweed has stems that emerge from a red-spotted rhizome. Submersed leaves are stalk like, with no obvious leaf blade. Floating leaves are heart-shaped at their base and appears like someone pinched the stalk and bent it, which allows the leaf blade and stalk to form a right angle for floating leaves. The pinched region is usually lighter in color than the rest of the stalk. Floating-leaf pondweed can tolerate a variety of sediment types and water chemistries. New stems develop in spring



from buds located on the rhizome. Flowering occurs in early summer and fruit are produced by mid-growing season. In the fall, the upper portion of the stems die back. This plant is considered good fish habitat because it provides shade and foraging opportunities.

### Clasping-leaf Pondweed (Submersed)

**Native** (*Potamogeton perfoliatus*: Common Names: Redhead pondweed, heart pondweed, perfoliate pondweed.): Heart pondweed is similar to other clasping-leaf pondweeds. The alternate leaves of heart pondweed tend to be shorter (ranging from 1 to 6 cm), somewhat rounded, and completely wrap around the base of the stem, the latter being a distinguishing characteristic. Leaves typically have 7-15 veins. Stipules are present, but tend to disintegrate later into the season. Floating leaves are not produced,





## Aquatic Macrophyte Picture Library & Summary

but cylindrical flower spikes adorned with fruit are produced. Fruits have a short beak and 3 indistinct dorsal ridges. Heart pondweed prefers clear soft water, but can occur in shallow or deep water, with a preference for sandy substrates.



### Spikerush (Submersed)

**Native** (*Eleocharis* sp.): Spikerush are sedges with unbranched stems. Sheaths are present at base of the stem. Inflorescence is a single spikelet found on the stem tip. Spikelets between species are of varying sizes with overlapping scales. Spikerush can be found completely submersed or found on shorelines of lakes, ponds, rivers, or wetlands. They may be encountered as tangled mats, dense clumps, or green spikes emerged from the water. Some species are major food sources for birds and other animals.

### Arrowhead (Emergent)

**Native** (*Sagittaria* sp. Common Name: Arrowhead.): This plant is the submersed rosette of a species of arrowhead. The submersed rosette lacks both flowers and seeds, so further identification is not possible. Arrowhead has emergent leaves, and usually inhabits shallow waters at pond or lake edges, or along sluggish streams. It can tolerate a wide variety of sediment types and pH ranges. Arrowhead is very suitable for constructed wetland development due to its tolerance of habitats, and ability to act as a nutrient sink for phosphorous. Typical arrowhead reproduction is via rhizomes and tubers although seed production is possible if conditions are ideal. Arrowhead has high wildlife value, providing high-energy food sources for waterfowl, muskrats and beavers. Arrowhead beds provide suitable shelter and forage opportunities for juvenile fish as well.



### Creeping Bladderwort (Submersed)

**Native** (*Utricularia gibba*. Common Names: creeping bladderwort, humped bladderwort, cone-spur bladderwort.). Creeping bladderwort is a small (usually less than 10 cm long), delicate, free-floating stem. It often forms tangled mats in quiet shallow waters, often associated with bogs, or stranded on soil. It is sometimes mistaken for algae. It has short side branches that fork once or twice, a defining characteristic. Small bladders, used to capture live prey, are situated on these side branches. Small yellow snap-dragon-like flowers are produced on a short stalk. Mats of creeping bladderwort offer limited cover and foraging opportunities for fish.



# Aquatic Macrophyte Picture Library & Summary

## Ribbon-leaf Pondweed (Submersed)

**Native** (*Potamogeton epihydrus*: Common Name: ribbon-leaf pondweed): Ribbon-leaf pondweed has flattened stems and two types of leaves. The submersed leaves are alternate on the stem, lack a leaf stalk, and are long tape-like in shape. Each leaf, which can reach lengths up to 2 meters long, has a prominent stripe of pale green hollow cells flanking the midvein, and 5 to 13 other veins. Stipules are not fused to the leaf. Floating leaves are egg or ellipse-shaped, and supported by a leaf stalk about as long as the leaf itself. Fruiting stalks are located at the top of the stem and packed with flattened disk-shaped fruits. It is typically found growing in low alkalinity environments, and in a variety of substrates. Seeds are highly sought after by all manner of waterfowl.



## Forked Duckweed (Floating-leaf)



**Native** (*Lemna trisulca*. Common Names: Forked duckweed, ivy-leaf duckweed, star duckweed.): Forked duckweed has a simple flattened leaf body that is long-stalked with three faint nerves and a single root. The olive green lateral fronds are often hooked to the parent frond, creating the “rowboat and oars” shape that distinguishes this duckweed from other species. The angular fronds become hooked together to form a tangled mass. Forked duckweed is a floating macrophyte, so its distribution is not limited to sediment type. Instead, it is at the whim of water and wind currents. But unlike other duckweeds, forked duckweed is usually found just beneath the water’s surface, and can often go unnoticed, or shaded out by other floating macrophytes. Its reproduction is similar to other duckweeds in that it produces winter buds. Forked duckweed is an excellent source of food for waterfowl.

## Filamentous Algae

Filamentous algae is a chain or series of similar algae cells arranged in an end to end manner. Benthic filamentous algae is attached to a hard substrate, such as logs, rocks, a lake bottom, or even other aquatic plants. When growing in heavy densities, benthic filamentous algae can appear as brown or green mats of vegetation that can reach the surface. When large pieces break off the bottom substrate they become floating filamentous algae patches. Benthic filamentous algae can comprise an entire range of morphologies, but flagellated taxa are far less common.





## Aquatic Macrophyte Picture Library & Summary

### Cattail (Emergent)

**Native** (*Typha latifolia*., Common Name: Broad-leaved Cattail). Native to New England, cattails are often found in wet soils (rivers, lakes, fens, ditches, wetlands). It grows tall (3-10 feet) and produces a recognizable terminal seed stalk. Broadleaf cattail stems are stout, cylindrical, and are unbranched. Cattail colonizes it's habitat quickly by extensive rhizome systems. These colonies provide food and shelter to wildlife. Broad-leaved cattails often hybridize with other North American cattail species (*T. angustifolia* & *T. domingensis*).



### Common Reed (Emergent)

**Non-native** (*Phragmites australis*, Common Name: Common reed, danube grass, Roseau cane). Common reed is one of the most widely distributed flowering plants and is widely distributed throughout North America. Common Reed grows in both estuarine and palustrine emergent wetlands, forming monotypic stands because of dense, robust rhizomes. Common Reed produces inflorescence from a terminal stem. Leaves of Common Reed are long and slender. The non-native type (*Phragmites australis*) replaced native types in New England and southeastern United States. Common Reed is very tall and can grow up to 20 feet in height. Once established, it is very difficult to remove and requires

mechanical techniques to remove the roots from the soil.

### Purple Loosestrife (Emergent)

**Non-native** (*Lythrum salicaria*, Common Name: purple loosestrife). Native to Eurasia, purple loosestrife occurs throughout North America. It's preferred habitat includes wetlands, ditches, and disturbed wet areas and can tolerate a wide range of soils. Purple loosestrife is an erect perennial herb that grows 2 to 6 feet tall. The root system consists of a taproot and spreads by lateral roots. Seedlings germinate in the spring and produces purple floral spikes. Leaves are narrow and long and occur in opposite pairs or whorls that attach closely to the stem. Control includes herbicidal and mechanical management techniques. Dense colonies can displace native vegetation and wildlife.



## Aquatic Macrophyte Picture Library & Summary

### Pickerelweed (Emergent)



**Native** (*Pontedaria cordata*. Common names: Pickerel weed.) Pickerelweed is a native emergent plant that inhabits lake margins and sluggish streams from ankle deep to several meters deep. It has glossy heart-shaped leaves that originate from a sprawling rhizome. The leaf blade is adorned with numerous parallel veins. The flower spike is crammed with small blue flowers, a distinguishing characteristic. Pickerelweed is very common in the Northeast. Reproduction is by rhizome spread and late season seed dispersal. The flowering stalk plays host to a myriad of insect species, while the seeds are often consumed by waterfowl. The rhizomes and stems offer shade and habitat for fish. Another ecological benefit of pickerelweed is shoreline stabilization and established beds help to dampen wave action.

### Rush (Emergent)

**Native** (*Juncus spp.*. Common names: Rush.) Rush is a wetland, perennial grass found in bogs, marshes, and swamps. This genus has over 200 species, all native to North America but can be invasive in some instances. Rushes are found in clumped colonies, spread by rhizomes, and can grow several feet tall depending on species. Rushes grow in both fresh and saltwater. Stems are cylindrical, and the interior of the stem is pithy that allow it to survive in aquatic habitats while also tolerating periods of drought. Rushes develop inflorescence that are often open and branched, but can also be found unbranched. Rushes are difficult to identify without the inflorescence, but similarities between species, even with the inflorescence present, can become difficult. Rushes are great shoreline stabilizers and are an excellent food source and habitat for wildlife. Rushes are very common in the aqua-horticulture industry and provide aesthetic value to aquatic gardens.





SOLitude Lake Management
590 Lake Street
Shrewsbury, MA 01545

EMAIL ADDRESS: amahaney@solitudelake.com

Table with 2 columns and 3 rows containing report metadata: Report Date (9/09/2021), Date Sampled (8/31/2021), Laboratory ID# (N2185229-01), Date Received (9/02/2021), Date Tested (9/09/2021). Includes a summary row for Sample Site: SURFACE WATER WASH POND @ SUNSET LAKE - HAMPSTED, NH.

Table listing Cyanophyta: Unicellular & Colonial Forms. Includes species like Anabaena, Aphanocapsa (count 290), and Snowella (count 96). Section for Filamentous Non-Nitrogen Fixers includes Arthrospira, Limnospira, and Pseudanabaena/Kromvophoron (count 48).

Table listing Filamentous Nitrogen Fixers. Includes species like Anabaenopsis, Aphanizomenon, Calothrix/Rivularia, Chrysochloridium, and Nostoc.

Total Cell Count: 430 / ml

Approved by: [Signature]





Solitude Lane Management  
Attn: Amanda Mahaney  
590 Lake St.  
Shrewsbury, MA 01545

Email: amahaney@solitudelake.com

Report Date:	9/09/2021	Date Sampled:	8/31/2021
Laboratory ID#:	N2185229-01	Date Received:	9/02/2021
		Date Tested:	9/09/2021
Sample Site: SURFACE WATER <b>WASH POND @ SUNSET LAKE - HAMPSTED, NH</b>			

**MICROSCOPIC EXAMINATION == Expanded Algae List (Other Species)**

<u>ORGANISM</u>	<u>#/ml</u>	<u>ORGANISM</u>	<u>#/ml</u>	<u>ORGANISM</u>	<u>#/ml</u>
<b><u>Diatoms: Centric Diatoms</u></b>		<b><u>Flagellated Chlorophytes</u></b>		<b><u>Filamentous Chlorophytes</u></b>	
Acanthoceras		Chlamydomonas		Bulbochaete	
Aulacoseira*		Coccomonas		Chaetophora (#)	
Cyclotella* (#)		Eudorina		Cladophora (#)	
Melosira	10	Pandorina		Draparnaldia (#)	
Stephanodiscus (#)		Pyramichlamys		Hydrodictyon	
Other centric		Tetraselmis (#)		Microspora	
		Volvox (#)		Oedogonium	
<b><u>Araphid Pennate Diatoms</u></b>		Olther Flagelated Greens		Pithophora (#)	
Asterionella (#)				Rhizoclonium	
Diatoma		<b><u>Cocoid/Colonial Chlorophyta</u></b>		Stigeoclonium	
Fragilaria (#)		Actinastrum		Ulothrix	
Meridion		Ankistrodesmus		Other Filamentous Greens	
Synedra* (#)		Botryococcus			
Tabellaria		Chlorella (#)		<b><u>Biraphid Pennate</u></b>	
Other Araphid Pennates		Chlorococcum		Amphipleura	
		Closteriopsis		Amphora (#)	
Monoraphid Pennate		Coelastrum		Cymtopleura	
Achnanthydium		Crucigenia		Cymbella	
Cocconeis		Desmodesmus (#)		Entomoneis	
		Dictyosphaerium (#)		Epithemia	
<b><u>Pyrrhophyta</u></b>		Elakatothrix		Eunotia	
Ceratium		Golenkinia		Frustulia	
Gymnodinium		Kirchneriella		Gomphonema (#)	
Peridinium		Lagerheimia		Gyrosigma	
Other Dinofilagtes		Micractinium		Navicula (#)	
		Monoraphidium		Nitzschia (#)	
<b><u>Euglenophyta</u></b>				Pinnularia	
Euglena				Rhoicosphenia	
Eutrepti				Rhopalodia	
Lepocinlis				Stauroneis	
Phacus				Surirella	
Trachelomonas				Other Biraphid Pennate	
Strombomonas					
Others					




Solitude Lane Management  
 Attn: Amanda Mahaney  
 590 Lake St.  
 Shrewsbury, MA 01545

Email: amahaney@solitudelake.com

Report Date:	9/09/2021	Date Sampled:	8/31/2021
Laboratory ID#:	N2185229-01	Date Received:	9/02/2021
		Date Tested:	9/09/2021
Sample Site: SURFACE WATER WASH POND @ SUNSET LAKE - HAMPSTED, NH			

**MICROSCOPIC EXAMINATION == Expanded Algae List (Other Species)**

ORGANISM	#/ml	ORGANISM	#/ml	ORGANISM	#/ml
<b>Tribophytes/ Eustigmatophytes</b>		<b>Desmids</b>		<b>Chrysophyta: Flagellated Classic Chrysophytes</b>	
Centritractus		Closterium		Chromulina	
Ophiocytium		Cosmarium		Chrysococcus	
Pseudostaurastrum		Desmidium		Chrysophaerella	
Pseudotetraedron		Euastrum		Dinobryon	
Tribonema		Hyalotheca		Kephyrian/Pseudokephyrian	
Vaucheria		Micrasterias		Mallomonas	
Mischococcoid Taxa		Mougeotia/Debarya		Ochromonas	
Chloramoeboid Taxa		Octacanthium		Synura	
Rhizochlorid Taxa		Pleurotaenium/Related		Uroglena	
Heterogloeolid Taxa		Spirogyra (#)		Uroglenopsis	
Other Tribophytes		Staurastrum (#)		Others	
Raphidophytes		Staurodesmus		Non Motiles	
Gonyostomum Taxa		Teilingia		Haptophytes	
<b>Euglenophyta</b>		Xanthidium			
Euglena		Zygnema/Zygnemopsis			
Eutrepti		Others			
Lepocinclis					
Phacus		<b>Chlorophytes</b>			
Trachelomonas		Oocystis			
Strombomonas		Pediastrum (#)			
Others		Paulschulzia			
		Polyedriopsis			
		Pseudopediastrum			
		Quadrigula			
		Scenedesmus	58		
		Schroederia/Ankyra			
		Selenastrum			



		Sphaerocystis			
		Tetrademus (#)			
		Tetraedron			
		Tetrastrum			
		Treubaria			
		Other Coccoid			
		Other Elongate			
				<b>Total Cell Count: 68/ml</b>	