

2017 Macrophyte Survey Report Pine River Pond, East Wakefield, NH

INTRODUCTION

SOLitude Lake Management (SOLitude) was contracted by the Pine River Pond Association to conduct a macrophyte survey of Pine River Pond in East Wakefield, NH for the 2017 season. The primary focus of the survey was to monitor and document the growth and potential spread of native whorled watermilfoil (*Myriophyllum verticillatum*) that was first observed during the 2014 growing season. Any other macrophyte growth observed within the littoral zone was identified and recorded with an approximate location of the growth.

The following report will discuss the findings of the survey, along with attached locative maps and plant codes for reference.

Lake Description

According to New Hampshire Fish and Game, Pine River Pond is an approximately 570-acre lake located in East Wakefield, NH with average and maximum depths of 15 and 55 feet, respectively. The shoreline of the lake is moderately developed with both seasonal and year-round homes. Water flows into the lake through tributaries, surface water run-off, and groundwater infiltration, and outflows into the Pine River which then flows towards Ossipee. The Arthur H. Fox Memorial Dam at the northern end of the lake was built in 1977 and augments the lake system and maintains the size of Pine River Pond. Its watershed (8,200 acres) is relatively small and includes undeveloped, forested hillsides. It is likely that the trophic state of the lake is due, in large part, to the limited development within the watershed. The 15 islands and flats of macrophyte growth provide variable habitat for the biota supported by the lake. The substrate of the lake is generally a mixture of rock and sand with limited areas of organic matter/muck.

METHODS

Day of Survey: September 21, 2017

The entire littoral zone was surveyed using a 16-foot skiff. The littoral zone was determined on site through the use of the most recent New Hampshire Fish and Game bathymetry map and an on-board sonar system. Real-time sonar allowed for visualization of macrophyte presence or absence. The vegetation growth was assessed visually when possible, and by the use of a throw-rake when growth was





indicated by the sonar unit but not visible from the boat. Observed plant species were identified to the species level and recorded, and relative locations were referenced with a hand-held GPS unit for reporting purposes.

As with the 2016 survey, weather conditions for the survey were ideal – clear skies and minimal wind – providing excellent conditions for visual observation with the use of polarized lenses.

RESULTS & ANALYSIS

On September 21st, a SOLitude Biologist performed a general macrophyte assessment. As in 2016, Pine River Pond is a mesotrophic waterbody and supports moderate aquatic plant growth to depths of approximately 18 feet. Previous reports had indicated macrophyte growth to only 10 feet, however the ‘increased growth’ from this year’s assessment is likely due to the enhancement of the survey with the sonar system.

A total of 27 species of aquatic plants were identified this year during the survey (Figures 1 & 2). However, the increase in richness (number of species) from the 2016 survey is likely due to the identification of bladderwort and pondweed species rather than just the genus, in addition to the use of the sonar unit. A species list with reference ID codes is attached to this report. Consistent with last year, the plant assemblage was dominated primarily by bladderwort (*Utricularia* spp.) and bushy pondweed (*Najas flexilis*), in addition to large-leaf pondweed (*Potamogeton amplifolius*) and spikerush (*Eleocharis acicularis*). Visually, vegetation cover was found at moderate density (50%) throughout the majority of the littoral zone, with higher densities in protected and cove-like areas. Scattered, low-density growth was found throughout the more exposed shoreline areas and at deeper depths.

Within the bladderwort genus, Purple bladderwort (*U. purpurea*) and common bladderwort (*U. vulgaris*) were the two most common species identified during the survey, and were found throughout the entire extent of the littoral zone. When present, the majority of plant growth was found out to approximately 10-13 feet from the shoreline, where specifically bladderwort and stonewort (*Nitella* sp.) were found primarily at the deeper locations within the littoral zone. Though appearing considerably similar to vascular aquatic plants, stonewort is a macro-algae species. It grows much like an aquatic plant, with root-like structures called rhizoids that act as stabilizers for the plant and sediment. Stonewort is a beneficial macro-alga for an aquatic system to support.

Few species were identified during the 2017 survey that had not been identified during the previous surveys. Again, the presence of these species are likely not newly established, and are a result of increased rake tosses and the augmentation of the survey through the use of a sonar unit.



Whorled milfoil was documented in three locations (Figure 2), two of which were the same locations as last year. However, no whorled milfoil was documented at site C from last year, the boat ramp at the end of Blackwood Road, or the open cove west of Area A from 2016. The milfoil growth around the floating island, or quaking bog (pictured to the right), was the densest, but did not appear to inhibit other native growth, diversity, or richness. Whether the other native growth has declined over time prior to the start of the annual



survey is unknown. Multiple rake tosses were done outside the canal into the quaking bog, and no whorled milfoil was found. The cove adjacent to Lees Way (Area A from 2016) also supported milfoil growth in sparse density throughout the cove. Again, the milfoil growth appears to be growing simultaneous of high native diversity and richness. A new area of whorled milfoil plants was identified on the northern shore near Sparhawk Terrace; four small stems were noted during the survey. Growth within the cove near Sparhawk Terrace that flows into the lake may also contain whorled milfoil growth due to this documentation. Very little flow was occurring between the lake and cove at the time of the survey.

As with previous years, floating leaf species growth was limited. Select coves and protected areas supported white and yellow waterlily species (*Nymphaea odorata* and *Nuphar variegata*, respectively). No dense waterlily or floating-leaf growth was documented.

SUMMARY

- General macrophyte distribution, diversity, and richness in the lake are desirable for aquatic biota (fish and wildlife) and recreational pursuits.
- The ‘new’ species identified within the littoral zone are due to the use of enhanced survey methods rather than indicative of new species establishment.
- Whorled milfoil growth was densest around the quaking bog and sparse in the cove near Lee’s Way. A new location of four small plants was noted by Sparhawk Terrace.
- No non-native species were documented within the littoral zone of Pine River Pond.
- The extent of littoral zone within Pine River Pond is potentially vulnerable for establishment of non-native, invasive species such as fanwort (*Cabomba caroliniana*), variable milfoil (*Myriophyllum heterophyllum*), or Eurasian milfoil (*Myriophyllum spicatum*), which are primary invaders within the state of New Hampshire and Maine.
- A lack of public access is beneficial to avoiding new invasive establishment, however, homeowners coming from surrounding waterbodies should still maintain awareness.

MANAGEMENT RECOMMENDATIONS

The proximity of Pine River Pond to known non-native plant infestations creates a high likelihood of potentially noxious plant introductions. As with the previous years, we recommend that the Association continue with the preventative efforts to keep from introducing non-native aquatic species to Pine River



Pond, including the annual survey to confirm the lack of non-native species. We further suggest that the Association employ state trained 'weed watchers' and begin to monitor aquatic vegetation in the lake with the use of trained weed watchers. Early detection is paramount for the success of preventative management and should remain a priority for the Association and lake residence.

While native, the concerning whorled watermilfoil growth may be best rectified through the use of diver hand-pulling. The use of hand-pulling inflicts minimal disturbance on the surrounding species, especially in areas like the quaking bog with high native aquatic plant diversity. Due to the nature of whorled milfoil growth, and conversations with NH DES, and other projects involving nuisance native plant control, selective use of herbicide is not feasible. Diver hand-pulling requires a permit from the NH Wetlands Bureau, however, this control activity has the highest probability of being approved by the State, while targeting the milfoil growth where necessary.

We hope you find this information helpful in making your pond management decisions, and look forward to assisting in the continued monitoring of Pine River Pond in the following growing season. If you have any questions or need anything further, please contact our office.

FIGURE 1: WEST PORTION OF PINE RIVER POND

September 21, 2017

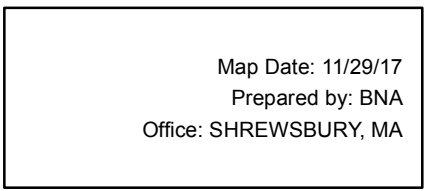
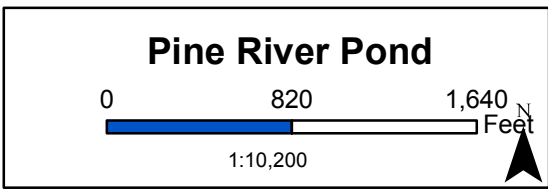
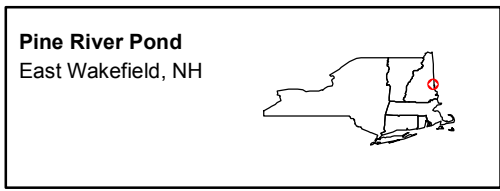
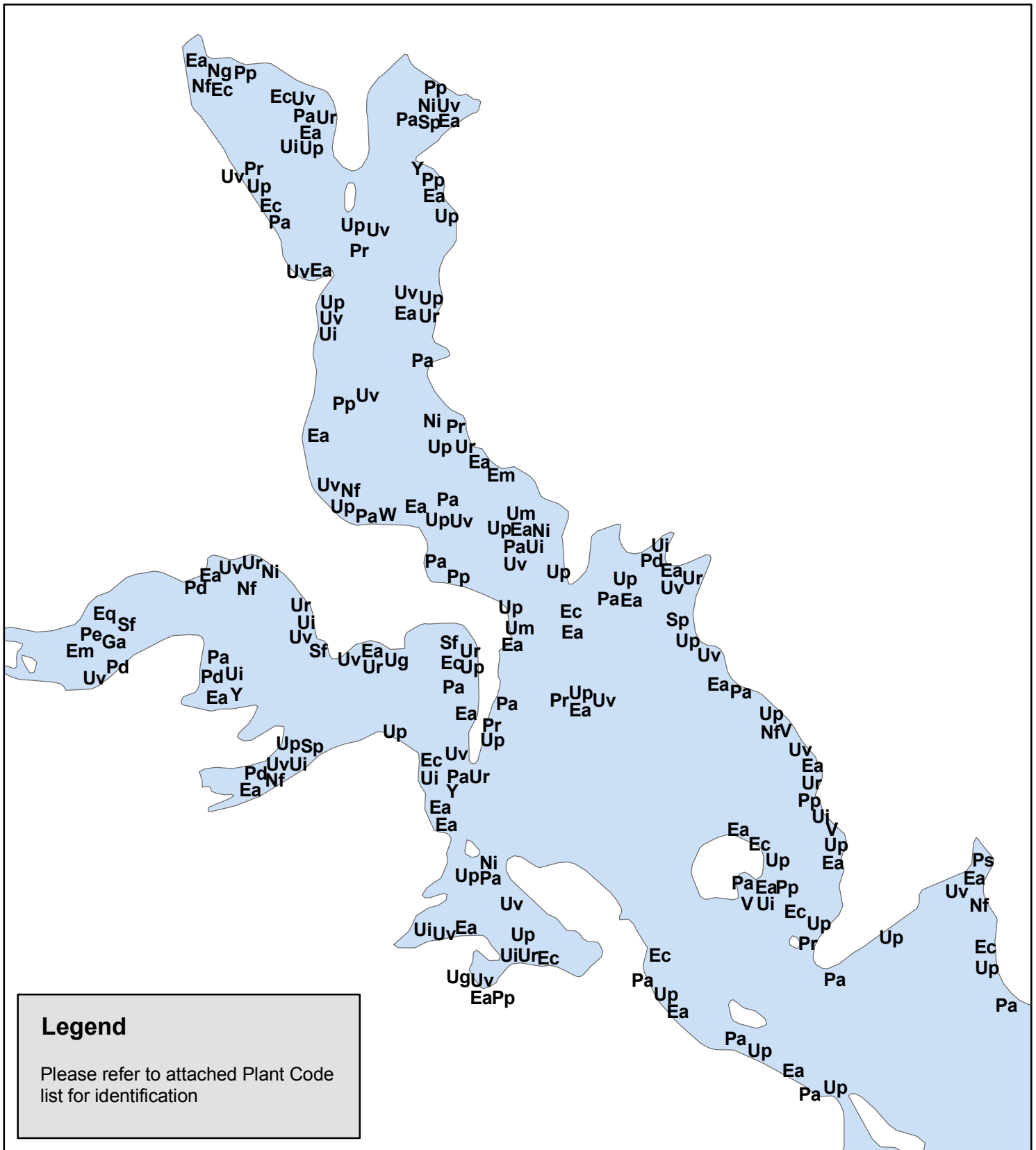
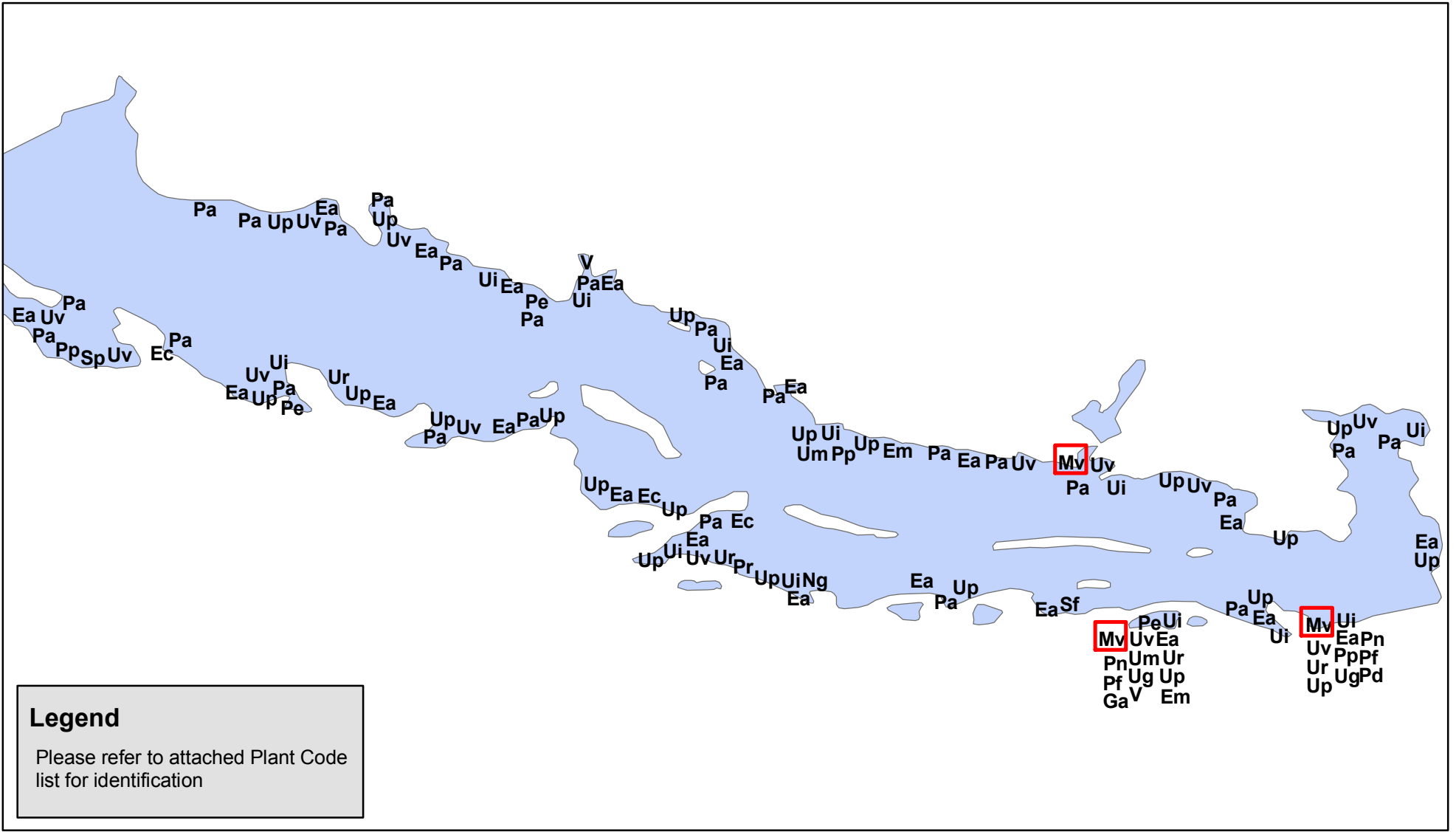


FIGURE 2: EAST PORTION PINE RIVER POND
September 21, 2017



Legend
Please refer to attached Plant Code list for identification

Pine River Pond
East Wakefield, NH

PINE RIVER POND

0 600 1,200 2,400
Feet

1:15,000

Map Date: 11/29/17
Prepared by: BNA
Office: SHREWSBURY, MA

Pine River Pond - Macrophyte Survey
 September 21, 2017

ID Code	Common Name	Latin Name
Ea	Spikerush	<i>Eleocharis sp.</i>
Ec	Common Waterweed	<i>Elodea canadensis</i>
Em	Small Waterwort	<i>Elatine minima</i>
Eq	Seven-angle Pipewort	<i>Eriocaulon aquaticum</i>
Ga	Golden Hedge-hyssop	<i>Gratiola aurea</i>
Mv	Whorled Milfoil	<i>Myriophyllum verticillatum</i>
Nf	Bushy Naiad	<i>Najas flexilis</i>
Ng	Slender Naiad	<i>Najas gracillima</i>
Ni	Stonewort	<i>Nitella sp.</i>
Pa	Large-leaf Pondweed	<i>Potamogeton amplifolius</i>
Pd	Waterthread	<i>Potamogeton diversifolius</i>
Pe	Ribbonleaf Pondweed	<i>Potamogeton epihydrus</i>
Pf	Leafy Pondweed	<i>Potamogeton foliosus</i>
Pn	Floating Pondweed	<i>Potamogeton natans</i>
Pp	Small Pondweed	<i>Potamogeton pusillus</i>
Pr	Robbin's Pondweed	<i>Potamogeton robbinsii</i>
Sf	Floating Bur-reed	<i>Sparganium fluctuans</i>
Sp	Sago Pondweed	<i>Stuckenia pectinata</i>
Ug	Creeping Bladderwort	<i>Utricularia gibba</i>
Ui	Flatleaf Bladderwort	<i>Utricularia intermedia</i>
Um	Small Bladderwort	<i>Utricularia minor</i>
Up	Purple Bladderwort	<i>Utricularia purpurea</i>
Ur	Little Floating Bladderwort	<i>Utricularia radiata</i>
Uv	Common Bladderwort	<i>Utricularia vulgaris</i>
V	Tapegrass	<i>Vallisneria americana</i>
W	White Waterlily	<i>Nymphaea odorata</i>
Y	Yellow Waterlily	<i>Nuphar variegata</i>



2016 Milfoil Map for reference

****Although still relatively dense, Areas A & B appeared to be slightly less dense than what was seen in 2015.**

****A few new Mv (milfoil) plants were observed in the open cove to the west of Area A (marked with red "Mv")**

****The Milfoil in the tip of the Area C cove was dense (similar to 2015).**