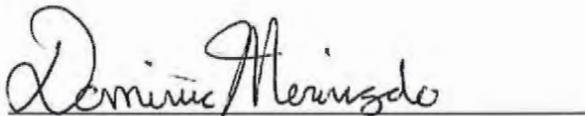


STATEMENT OF GUARANTEE – 2018 AYER PONDS AQUATIC MANAGEMENT PROGRAM

Based on the vegetation survey data collected at Sandy Pond, Flannagan Pond and Pine Meadow Pond in Ayer, Massachusetts, SOLitude Lake Management has determined that the 2018 weed control treatments have achieved >95% control of the target aquatic plant species. This includes variable milfoil (*Myriophyllum heterophyllum*) in Pine Meadow Pond and variable milfoil and fanwort (*Cabomba caroliniana*) in Flannagan and Sandy Pond. This exceeds the guaranteed level of control (>90%) as specified in the contract between the Town of Ayer and SOLitude Lake Management.

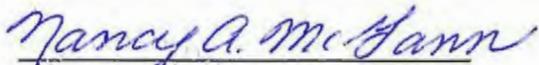
Signed



Dominic Meringolo

Senior Environmental Engineer/Territory Leader
SOLitude Lake Management

On this 31st day of October 2018, before me, the undersigned notary public, personally appeared Dominic Meringolo known to me through personal knowledge of identity, to be the person, whose name is signed on this document in my presence.



Nancy A. McGann, Notary Public

My Commission expires:

December 18, 2020



NANCY A. MCGANN
NOTARY PUBLIC
Commonwealth of Massachusetts
My Commission Expires
December 18, 2020

Pine Meadow, Flannagan, and Sandy Ponds

Ayer, Massachusetts 2018 Year-End Report

Report Prepared for: Ayer Conservation Commission
Town Hall, One Main Street
Ayer, MA 01432
concom@ayer.ma.us

Prepared On: October 31, 2018

In accordance with the existing aquatic plant management contract between SOLitude Lake Management and the Ayer Conservation Commission for Pine Meadow, Flannagan, and Sandy Ponds, the following document serves to provide this year's treatment and survey results, as well as management recommendations for next season.

All management activities performed in 2018 were consistent with the Order of Conditions (DEP #100-0293), and the License's to Apply Chemicals issued by the MA DEP – Office of Watershed Management.

- Pine Meadow Pond: LTAC# - 18222
- Flannagan Pond: LTAC# - 18213
- Sandy Pond: LTAC# - 18212

Introduction

Over the years, Pine Meadow, Flannagan, and Sandy Ponds have been treated intermittently for the control of invasive aquatic vegetation, including fanwort (*Cabomba caroliniana*) and variable milfoil (*Myriophyllum heterophyllum*). These treatments also served to reduce the nuisance growth of native waterlilies (*Nuphar/Nymphaea*), which can become relatively dense in the ponds. The most recent prior treatment programs were conducted in 2018 for all three water bodies.

In 2018, SOLitude Lake Management was contracted by the Ayer Conservation Commission to manage invasive and nuisance aquatic plant species in Pine Meadow, Flannagan, and Sandy Ponds in Ayer, Massachusetts. A unique management plan was devised for each pond, in order to achieve management goals. Elements of each plan included:

- Pre-treatment surveys to identify the distribution and abundance of target vegetation species, both invasive and nuisance, and to assess the best timing and range of treatment.
- Submission of Applications to Apply Herbicides to the Waters of the Commonwealth to the Massachusetts Department of Environmental Protection (MassDEP) and Division of Watershed Management (DWM), to permit the use of herbicides in each pond. These applications were submitted on April 17, 2018 and approved on April 23, 2018.
- Treatments to the defined areas of each pond to manage the target invasive and nuisance species.
- Notifications to the appropriate persons prior to any and all treatment events.



- Post-management surveys to identify the distribution and abundance of target vegetation species, and to evaluate the efficacy of the management program.

Early Season Surveys

On April 27th, a pre-treatment survey of Pine Meadow, Flannagan, and Sandy Ponds was conducted by a SŌLitude biologist to assess the distribution and abundance of variable milfoil (**Figure 1**) and fanwort (**Figure 2**). Each pond was surveyed by following the entire littoral zone while documenting observed plant growth. The littoral zone is the area adjacent to the shore where sunlight penetrates to the sediment and allows aquatic vegetation to grow. The survey was completed using the following techniques: visual observation, use of a “throw rake” and underwater camera. A “throw-rake” was used to help locate any submersed vegetation where it was not visible from the surface. The plant composition was recorded using a handheld GPS to plot target plant locations and field notes to document the specific species present.

Pine Meadow Pond

At the time of the survey, variable milfoil was observed at trace and sparse abundances scattered throughout the open water portion of the pond. One patch of a couple plants of Fanwort was observed during the pre-treatment survey. Dense patches of white and yellow waterlilies (*Nymphaea odorata* and *Nuphar variegata*) and watershield (*Brasenia schreberi*) were documented primarily around the north and northwestern perimeter of the pond. Some sporadic growth of all three floating-leaf aquatic plants occurred throughout the center and other portions of the shoreline. Muskgrass (*Chara* sp.), a native macro-algae, was dominant throughout the center and deepest sections of the pond.

Flannagan Pond

During the survey, only variable milfoil was observed within the sections of dominance from 2017. The majority of the growth was at trace abundance, with patches of sparse to moderate growth in the northwestern and eastern inlets from Pine Meadow Pond and Sandy Pond. One stem of Fanwort growth was noted in the middle channel between the west and east basins, however this may also be due to the early nature of the survey in addition to the 2017 treatment program. Sparse to moderate patches of yellow and white waterlilies along with benthic growth of stonewort (*Nitella* sp.) were dispersed along the entire shoreline, most notably in the northwestern and eastern basins. Robbin’s pondweed (*Potamogeton robbinsii*) was only documented in the western basin, from the Pine Meadow Pond inlet to the outlet of Flannagan Pond. Sparse to moderate growth of filamentous algae was noted throughout the entire pond.

Sandy Pond

At the time of the survey, no fanwort growth was noted within Sandy Pond. However, previous survey years have determined that fanwort growth in the pond begins later in the season. Comparatively, variable milfoil was observed in three sections around the perimeter of the pond – the eastern inlet, the along the southern shoreline near the beach, and at the outlet into Flannagan Pond. The northwestern inlet contained milfoil growth in 2017, however, no growth was documented at the time of the 2018 pre-treatment survey. Waterlilies were not observed along the perimeter, which may be due to late emergence. Ribbon-leaf pondweed (*Potamogeton epihydrus*) was documented at the northwestern inlet, while Robbin’s pondweed was found along the southeastern shoreline after the eastern inlet. A small patch of native water starwort (*Callitriche* sp.) was also noted just after the eastern inlet.



Herbicide Treatments

Over the course of the 2018 season, multiple treatment events were performed at each pond. The treatment approach differed for each waterbody based on the target species and distribution (**Table 1**).

Table 1

Pond	Target Plant(s)	Approach
Pine Meadow	Variable milfoil Waterlilies/watershield	Spot treatment with Reward (diquat) herbicide for control of milfoil & spot treatment with AquaPro (glyphosate) for floating leaf plants
Flannagan	Variable milfoil Fanwort	Spot treatment with the pellet formulation of Sonar (fluridone) herbicide for Fanwort, spot treatment with Reward (diquat) herbicide for milfoil control & spot treatment of nuisance floating leaf plants with AquaPro (glyphosate) in navigable waterways
Sandy	Variable milfoil Fanwort	Spot treatment with the pellet formulation of Sonar (fluridone) herbicide for Fanwort, spot treatment with Reward (diquat) herbicide for milfoil control & spot treatment of nuisance floating leaf plants with AquaPro (glyphosate)

Information pertaining to these treatment events including dates and herbicide product used is provided in **Table 2**.

Table 2:

Pond	Treatment Date	Herbicide Product (tradename)
Pine Meadow	June 7 th	Reward
	August 27 th	Aquapro
Flannagan	May 11 th	Sonar One
	June 7 th	Sonar One & Reward
	July 13 th	Sonar One
	August 27 th	AquaPro
Sandy	May 11 th	Sonar One
	June 7 th	Sonar One & Reward
	July 13 th	Sonar One
	September 27 th	AquaPro

The Town was notified well in advance of each event and, a week prior to each treatment event, the shoreline of each pond was thoroughly posted with caution signs in order to inform the residents of the upcoming treatment(s) and warn of the temporary water use restrictions. At no time during any of the treatments were fish mortalities or significant non-target impacts to other aquatic organisms or wildlife either observed or reported.

Pine Meadow Pond

The initial treatment, on June 7th, was performed using a 10-foot jon boat equipped with a low-pressure spray pump. The herbicide Reward (diquat) was mixed with pond water in an onboard tank and applied using a subsurface hose throughout the pond, with exception to the very northern region. The treatment targeted the invasive variable



milfoil growth throughout the pond. The second treatment, on August 27th, was performed in a similar fashion to the initial treatment, however, the herbicide Aquapro (glyphosate) was used. Aquapro was applied to the floating leaves of the waterlily and watershield patches.

Flannagan & Sandy Pond

In both Flannagan and Sandy Ponds, the fanwort and milfoil distribution were scattered and maintaining a lake wide concentration was not advisable from either an ecological or a cost perspective. Targeted applications of granular Sonar herbicide were used to treat areas of fanwort, while similar treatments with Reward (diquat) were used for control of milfoil. 2017 post-treatment areas of Fanwort growth as well as 2018 pre-treatment areas were used as target treatment areas for the 2018 Fanwort treatment program. As with the application of Sonar in 2017, an extended contact time was needed and multiple applications were performed.

Each treatment was conducted using a 10-foot jon boat equipped with a low-volume spray pump and 55-gallon drum. The pelletized herbicide Sonar One (fluridone) was dispersed using the backpack, gas powered spreader. The liquid herbicide, Reward, was combined with pond water in an onboard mixing tank and applied to both the surface and subsurface a spray nozzle and weighted hose. Flannagan Pond was treated with AquaPro on August 27th for waterlilies and watershield. Target areas were navigable paths and some waterfront properties which had a significant amount of growth. Sandy Pond was treated with AquaPro for waterlilies and watershield on September 27th, the entire shoreline was treated, selectively. This was a selective treatment because there was not an overwhelming amount of floating-leaf species present and these species provide good habitat for fish, frogs and other wildlife species.

Late Season Surveys

On September 4th, a SOLitude biologist conducted late season surveys of Pine Meadow, Flannagan, and Sandy Pond to assess the overall effectiveness of the 2018 management program. The surveys were performed with the same techniques as the early season surveys. The late season surveys revealed a significant overall reduction in the target species, variable milfoil (**Figure 3**) and excellent chlorosis of the observed fanwort (**Figure 4**).

Pine Meadow Pond

During the survey, variable milfoil was observed in only trace to sparse abundance in the middle of the waterbody, please note however, all the observed plants were brown in color, which indicates they were unhealthy/dying. A healthy assemblage of native vegetation was also observed throughout the pond. Along the perimeter of the pond, sparse to dense patches of waterlilies and watershield were observed, with the herbicide treated portions beginning to degrade. Water primrose (*Ludwigia palustris*) and coontail (*Ceratophyllum demersum*) were present at trace densities in isolated locations. A sparse abundance of common bladderwort (*Utricularia vulgaris*), floating bladderwort (*Utricularia gibba*) and purple bladderwort (*Utricularia purpurea*), as well as muskgrass was observed throughout the entire pond.

Flannagan Pond

During the survey, neither variable milfoil nor fanwort were observed throughout the waterbody. A healthy assemblage of native vegetation around the perimeter of the pond was noted. The waterlily and water shield growth which had been treated in the week prior showed good chlorosis (the results will be further assessed in 2019). Some floating mats of dead waterlily rhizomes were observed throughout the waterbody; these will eventually break down and fall to the bottom of the pond. Native species such as Robins' pondweed (*Potamogeton robbinsii*), ribbon-leaf pondweed (*Potamogeton epihydrus*), common bladderwort, floating bladderwort and purple bladderwort were observed sporadically throughout the pond.

Sandy Pond

During the survey, trace to sparse variable milfoil was observed only at the southeast inlet; growth observed was brown in color indicating it was unhealthy/dying. The only remaining growth of fanwort was observed at trace density at the southeast inlet, however the plants observed were extremely chlorotic and not viable for reproduction. Additionally, there was a healthy assemblage of native vegetation throughout the littoral zone of the pond. The native vegetation included: waterlilies, watershield, common bladderwort, purple bladderwort,



Robbins' pondweed, tape grass (*Vallisneria* spp.), and ribbon-leaf pondweed. A waterlily and watershield treatment was conducted after the post-treatment survey, therefore, the results of this treatment will be assessed in 2019.

Ongoing Management Recommendations

Based on the results of the surveys, the 2018 management program successfully controlled >95% of the pre-management growth of the target species, variable milfoil and fanwort, and suppressed the nuisance growth of waterlilies in Pine Meadow, Flannagan, and Sandy Pond. Based on the characteristics of the species within these waterbodies, however, and their recent history, it is likely that ongoing management will continue to be required in order to maintain a balanced aquatic ecosystem. Below are management recommendations for each pond for the 2019 season.

Pine Meadow Pond

Over the course of the 2018 season, the distribution and abundance of variable milfoil and waterlilies in Pine Meadow Pond was significantly reduced and the presence of fanwort was only observed once, during the pre-treatment survey. Due to the shallowness of the pond and the continued aggressive re-growth expected, SŌLitude recommends continuing with a similar program for the 2019 season, including early/late season monitoring and separate herbicide treatments for milfoil and waterlily regrowth. In particular, waterlily growth can take several years to push back effectively given the inherent challenges associated with foliar treatment approaches.

Flannagan Pond

Over the course of the 2018 season, the distribution and abundance of both target species, variable milfoil and fanwort, was substantially reduced throughout the entirety of Flannagan Pond. The nuisance growth of waterlilies was also successfully suppressed; however, these species can be highly aggressive, especially in shallow areas and as such needs to be treated consistently each year. With the inflow from the Sandy Pond inlet creating high levels of dilution, we suspect it may be possible that we see some minor growth of the three-target species next season while the remainder of the pond should see good carryover control.

SŌLitude recommends a management program including early/late season monitoring, continued spot treatments with Reward to control any variable milfoil regrowth and spot treatments with AquaPro for control of waterlily and watershield. With no viable Fanwort being observed in the post-treatment survey, we recommend monitoring for Fanwort and possible treatment using Clipper or monitoring of the Fanwort in preparation for treatment with Clipper or Sonar in 2020. As a result of the many years of increased biomass in the east and west basins of Flannagan Pond, areas of the waterbody are becoming increasingly shallow. SŌLitude recommends targeted hydro-raking of the shoreline in these areas to remove a portion of the built-up sediment and restore some depth to these areas.

Sandy Pond

Over the course of the 2018 season, the distribution and abundance of variable milfoil was greatly reduced. Due to the late season emergence of fanwort in non-treatment areas and survival of some growth in the eastern inlet area in 2017, all areas of growth from the fall of 2017 were treated beginning in the spring of 2018. SŌLitude recommends continuing with a similar management program in 2019, including: early/late season monitoring and targeted diquat/AquaPro treatments to continue reducing the distribution of the invasive and nuisance vegetation (we suspect, due to a higher flow rate, that there is possibility of new Fanwort growth in the southeastern inlet in Sandy Pond). With no viable Fanwort being observed in the post-treatment survey, we recommend monitoring for Fanwort and possible treatment using Clipper or monitoring of the Fanwort in preparation for treatment with Clipper or Sonar in 2020.

In addition, SŌLitude recommends discussing the feasibility of adding Clipper (flumioxazin) herbicide to the program, as it will provide a more efficient method of treating small, scattered areas of fanwort growth in Sandy Pond and may also assist in managing re-growth in Flannagan Pond. Doing so is likely to require approval from the National Heritage & Endangered Species Program (NHESP), as we understand there are listed species within or near the pond.

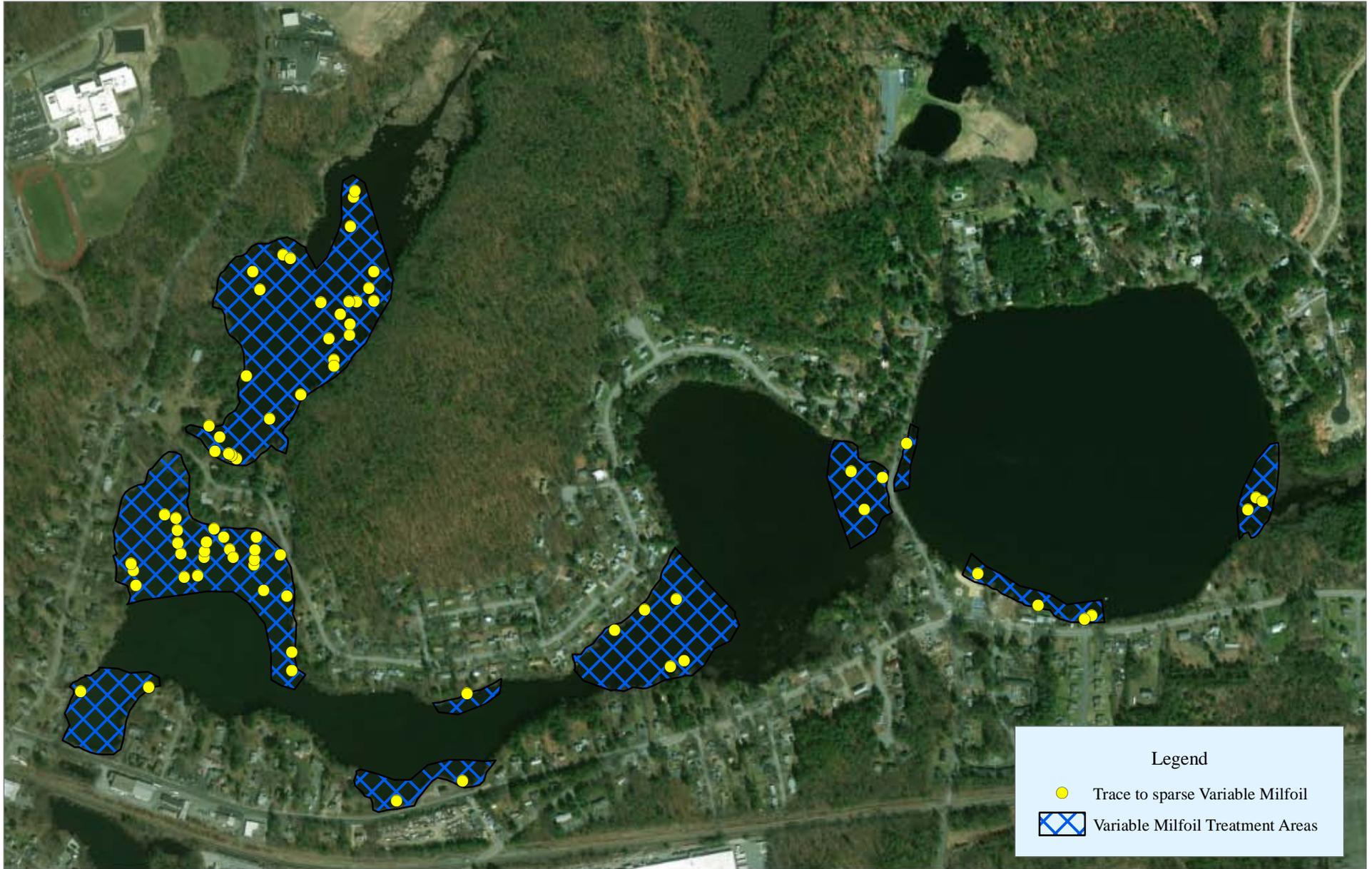


Overall, we recommend instituting on-going, annual programs at these ponds to monitor vegetation conditions and conduct management of invasive plants and other nuisance vegetation as needed. This is preferable to allowing the ponds to return to pre-management conditions that will require large scale management efforts and may actually reduce costs and herbicide usage over the long term. In terms of budget for 2019, we suggest the following ranges (**Table 3**), but would be happy to work with the Commission to develop more definitive, detailed costs based on the Town's goals.

Table 3

Pond	2018 Management Actions	Budget
Pine Meadow	<ul style="list-style-type: none"> • Monitor early and late season vegetation. • Manage variable milfoil with spot treatments using diquat herbicides. • Continue to thin out floating leaf plants using glyphosate herbicide. 	\$5,000-\$7,500
Flannagan	<ul style="list-style-type: none"> • Monitor early and late season vegetation. • Conduct spot treatment with Sonar (fluridone) to any remaining areas or re-growth of fanwort. • Manage variable milfoil with spot treatments using diquat herbicides. • Maintain levels of floating leaf plants using glyphosate herbicide. 	\$10,000-\$12,500
Sandy	<ul style="list-style-type: none"> • Monitor early and late season vegetation. • Conduct spot treatment with Sonar (fluridone) to any remaining areas or re-growth of fanwort. • If possible, manage scattered, shoreline fanwort growth with Clipper (flumioxazin) herbicide. • Manage variable milfoil with spot treatments using diquat herbicides. 	\$7,500-\$12,500

Figure 1: 2018 Pre-Treatment Distribution & Proposed Treatment Areas of Variable Milfoil



Ayer Ponds
Ayer,
Massachusetts



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Figure 2: 2018 Pre-Treatment Distribution & Proposed Treatment Areas of Fanwort



Ayer Ponds
Ayer,
Massachusetts



Figure 3: 2018 Post-Treatment Distribution of Variable Milfoil



Ayer Ponds
Ayer,
Massachusetts



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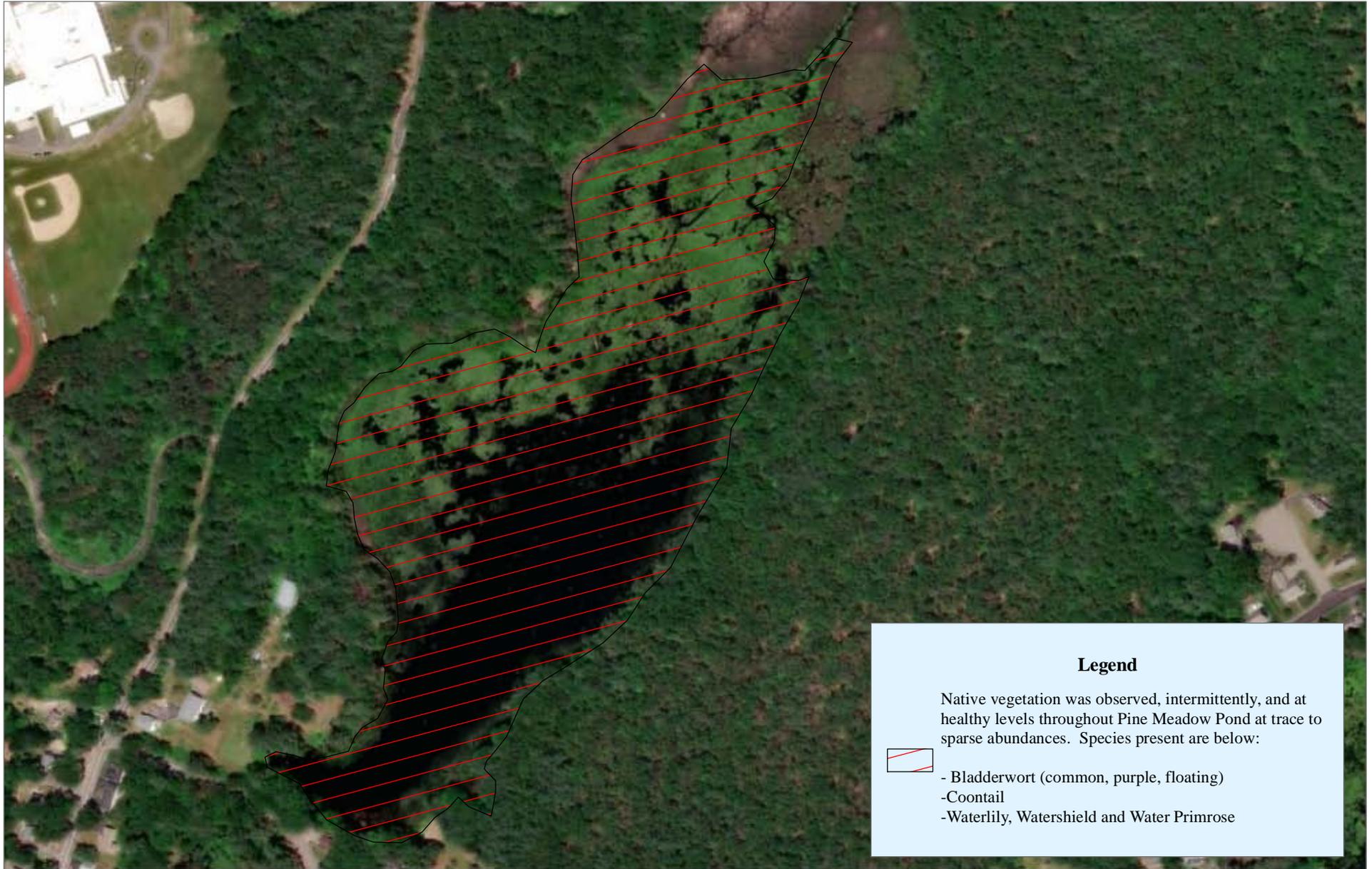
Figure 4: 2018 Post-Treatment Distribution of Fanwort



**Ayer Ponds
Ayer,
Massachusetts**



Figure 5: Pine Meadow Pond 2018 Post-Treatment Native Aquatic Vegetation



Pine Meadow Pond
Ayer,
Massachusetts

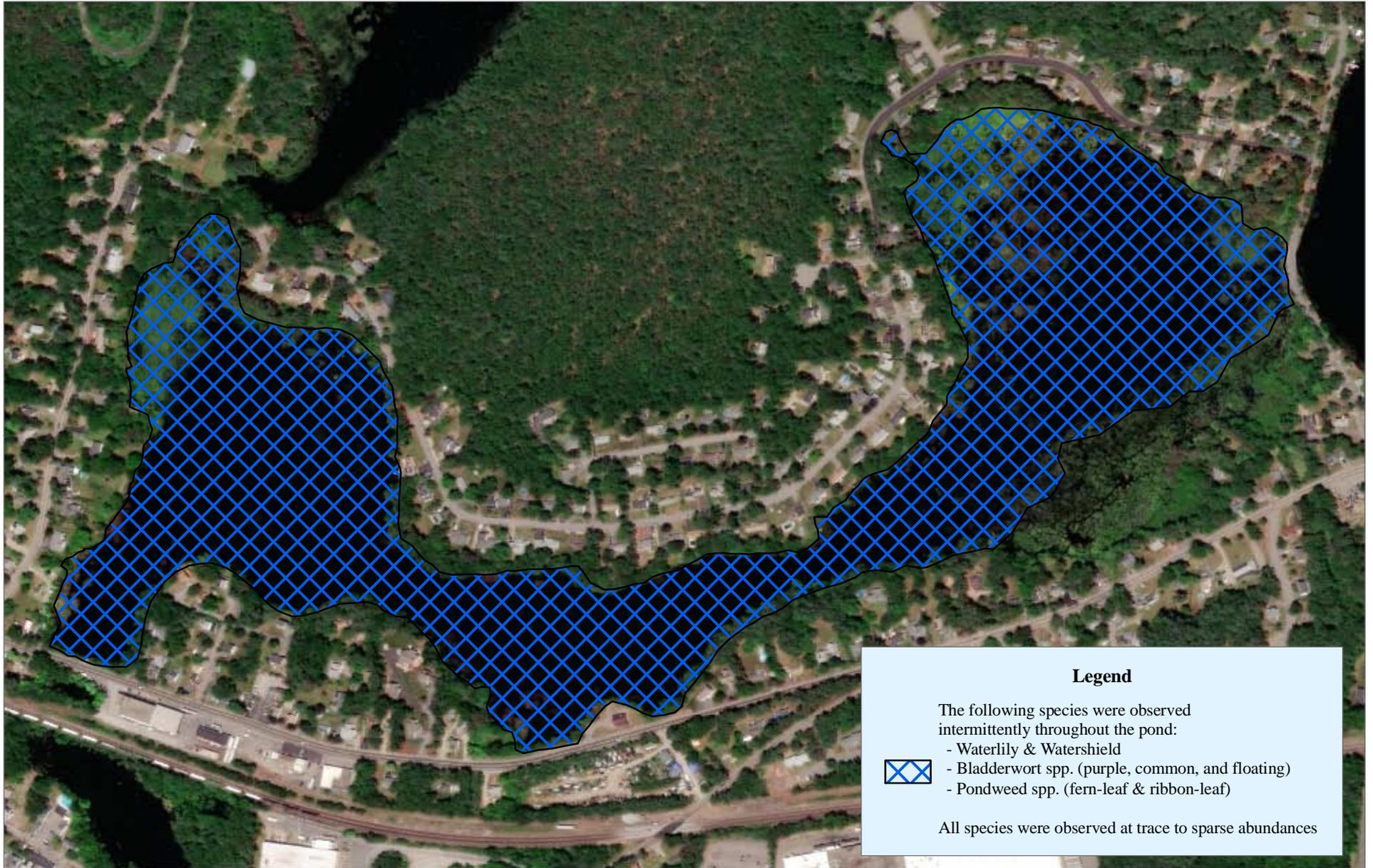


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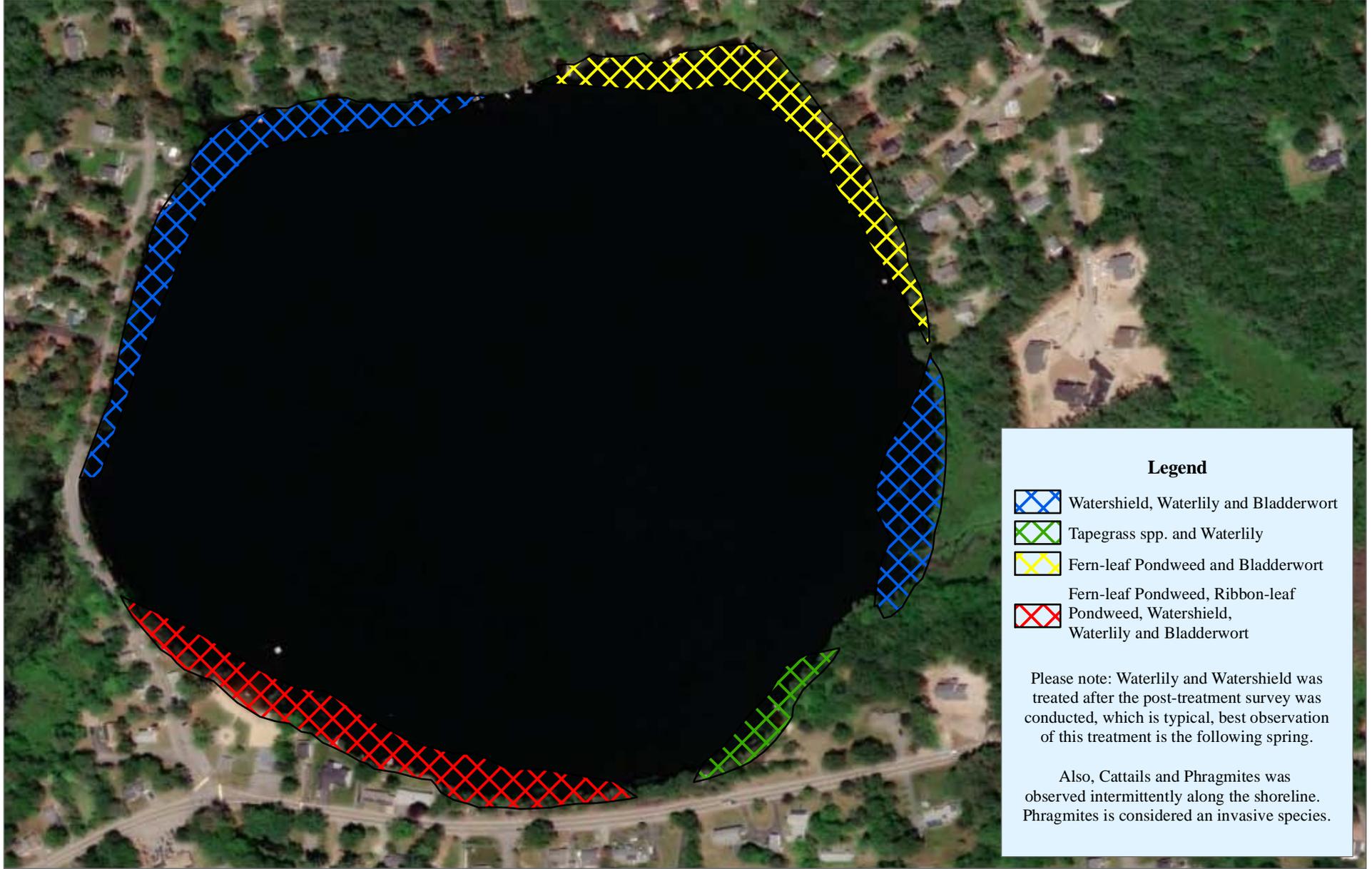
Figure 6: Flannagn Pond 2018 Post-Treatment Native Aquatic Vegetation



Flannagan Pond
Ayer,
Massachusetts



Figure 7: Sandy Pond 2018 Post-Treatment Native Aquatic Vegetation



Sandy Pond
Ayer,
Massachusetts



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