

Pine Meadow, Flannagan, and Sandy Ponds

Ayer, Massachusetts

2019 Year-End Report

Report Prepared for: Ayer Conservation Commission
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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 2019 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# - 19212
- Flannagan Pond: LTAC# - 19211
- Sandy Pond: LTAC# - 19213

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.

In 2019, SOLitude Lake Management was contracted by the Ayer Conservation Commission to continue managing invasive and nuisance aquatic plant species in Pine Meadow, Flannagan, and Sandy Ponds. 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 May 29, 2019 and approved on June 13, 2019.
- Treatments to defined areas of each pond, based on spring and fall monitoring, 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

A pre-treatment survey of Pine Meadow, Flannagan, and Sandy Ponds was conducted on June 10th, to assess the distribution and abundance of variable milfoil and fanwort, as well as other invasive and/or nuisance species. Each pond was surveyed by traveling along the 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 through visual observation and with analysis of a “throw-rake”. 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. The pre-treatment submersed plant assemblage and treatment areas can be observed in **(Figure 1)**.

Pine Meadow Pond

At the time of the survey, the invasive species curly-leaf pondweed (*Potamogeton crispus*) and variable milfoil were observed in trace to sparse densities scattered throughout the open water of the pond. Unlike in the 2018 season, fanwort was not observed in the waterbody at this time. 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 in dense amounts. Throughout the center and the southern portions of the shoreline was scattered sparse to moderate growth of all three floating-leaf aquatic plants. Muskgrass (*Chara* sp.), a native macro-algae, was also observed in the center and deeper sections of the pond. The presence of curlyleaf pondweed, another non-native species, has not been recorded at Pine Meadow Pond in the past, so it's widespread but sparse growth was unexpected.

Flannagan Pond

Throughout the survey, curly-leaf pondweed was observed scattered throughout a majority of the waterbody in sparse to moderate quantities. Variable milfoil was observed in trace quantities in the western portion of the waterbody. Fanwort was not observed at this time in the pond. Sparse to moderate patches of yellow and white waterlilies along with benthic growth of stonewort (*Nitella* sp.) were dispersed along the entire shoreline, especially in the northwestern and eastern basins. Robbin's pondweed (*Potamogeton robbinsii*) was only documented in the western basin in trace to sparse densities. As with Pine Meadow Pond, this was the first time that curlyleaf pondweed had been observed at Flannagan Pond.

Sandy Pond

At the time of inspection, variable milfoil and fanwort were observed in trace amounts in scattered patches near the southeastern inlet, the northwestern inlet, and near the beach. In years past, these species have also been observed along the eastern shoreline from the outlet to Flannagan Pond to the southern shoreline past the beach. A single trace patch of curly-leaf pondweed was observed along the eastern shoreline. Trace amounts of ribbon-leaf pondweed (*Potamogeton epihydrus*) was documented at the northwestern inlet, and trace amounts of Robbin's pondweed was found along the southeastern shoreline. There was a trace amount observed of waterlilies along the shoreline in small sporadic patches.



Herbicide Treatments

Over the course of the 2019 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**). The new found presence of curlyleaf pondweed was a concern this year, but fortunately the diquat herbicide historically used for control of milfoil is also quite effective on this plant allowing us to include its management in this year's program.

Table 1

Pond	Target Plant(s)	Approach
Pine Meadow	Variable milfoil Curlyleaf Pondweed Bladderwort Waterlilies/watershield	Spot treatment with Reward (diquat) herbicide for control of milfoil and bladderwort & spot treatment with AquaNeat (glyphosate) for floating leaf plants
Flannagan	Curlyleaf pondweed Variable milfoil Bladderwort Waterlilies/watershield	Spot treatment with Reward (diquat) herbicide for curlyleaf pondweed, variable milfoil and bladderwort control & spot treatment of nuisance floating leaf plants with AquaNeat (glyphosate) in high use areas.
Sandy	Variable milfoil Fanwort Waterlilies/watershield	Spot treatment with the pellet formulation of Sonar (fluridone) herbicide for Fanwort, spot treatment with Tribune (diquat) herbicide for milfoil control & spot treatment of nuisance floating leaf plants with AquaNeat (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	July 30 th	Tribune
	September 6 th	AquaNeat
Flannagan	July 30 th	Tribune
	September 6 th	AquaNeat
Sandy	July 26 th	Sonar One and Tribune
	September 6 th	AquaNeat

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 of Pine Meadow Pond was conducted on July 30th, utilizing the herbicide Tribune (diquat). The treatment was conducted utilizing a 10-foot jon boat equipped with a low-pressure spray pump and an onboard mixing tank, where the herbicide was mixed with pond water and evenly distributed throughout the pond via submersed hoses. Throughout the middle of the pond, patches of nuisance native species bladderwort spp. (*Utricularia spp.*) and invasive species Variable milfoil and curlyleaf pondweed growth were targeted during the treatment. The second treatment was conducted on September 6th, utilizing the herbicide AquaNeat (glyphosate). The treatment targeted waterlily species throughout the middle of the pond, similarly to the previous treatment, the herbicide was mixed onboard in a mixing tank but applied to the floating leaves of the waterlily species.

Flannagan Pond

The initial treatment of Flannagan Pond was conducted on July 30th, utilizing the herbicide Tribune (diquat). The treatment was conducted utilizing a 10-foot jon boat equipped with a low-pressure spray pump and an onboard mixing tank, where the herbicide was mixed with pond water and evenly distributed throughout the pond via submersed hoses. Growth of milfoil and curlyleaf pondweed as well as the nuisance native species Bladderwort were targeted during the treatment in the western and middle portions of the waterbody. The second treatment was conducted on September 6th, utilizing the herbicide AquaNeat (glyphosate). The treatment targeted waterlily species throughout the middle of the pond and along high use areas of the shoreline, similarly to the previous treatment, the herbicide was mixed onboard in a mixing tank but applied to the floating leaves of the waterlily species.

Sandy Pond

In Sandy Pond, the fanwort and milfoil distribution were observed in both inlets of the pond, similar to the 2018 treatment season. Targeted applications of granular Sonar herbicide were used in these areas to treat fanwort, while similar treatments with Tribune (diquat) were used for control of milfoil. As in previous years, an extended contact time was required, so multiple treatments were performed throughout the season. The first herbicide treatment was conducted on July 26th, and the second herbicide treatment was conducted on September 6th.

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, Tribune, was combined with pond water in an onboard mixing tank and applied to both the surface and subsurface a spray nozzle and weighted hose. Treatment for waterlilies and watershield was conducted on September 6th, a majority of the shoreline was selectively treated. This treatment was selective 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

The late season surveys for all three ponds, Pine Meadow, Flannagan, and Sandy Pond, were conducted on October 11th to assess the overall effectiveness of the 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 and excellent chlorosis of the observed fanwort (**Figure 2**). **Figures 3, 4 & 5** depict the assemblage of native species present during the late season surveys.

Pine Meadow Pond

Observations from the late season survey included sparse densities of coontail (*Ceratophyllum demersum*), common bladderwort (*Utricularia vulgaris*), floating bladderwort (*Utricularia gibba*) and purple bladderwort (*Utricularia purpurea*), as well as moderate densities of muskgrass in scattered patches throughout the entirety of the pond. Along the perimeter and the northern portion of the pond, waterlilies and watershield were observed, with a significant reduction in the treatment areas of these species. The invasive species variable milfoil, fanwort, or curly-leaf pondweed were not observed at this time.

Flannagan Pond

During the survey, variable milfoil or curly-leaf pondweed were not observed at this time, but sparse amounts of fanwort were observed in scattered patches in the southwestern, southern, and the southeastern portion of the



pond. Since no fanwort was recorded during the pre-treatment survey, the observed plants represented new re-growth which emerged over the course of the season. Although a small, localized treatment of fanwort was conducted near the inlet from Sandy Pond with Sonar in 2018, the last pond wide treatment for fanwort was conducted in 2017. Based on previous cycles, more substantial but still segmented re-growth of fanwort would be expected to start about this time.

Scattered throughout the waterbody in sparse to moderate densities were, ribbon-leaf pondweed (*Potamogeton epihydrus*), common bladderwort, floating bladderwort and purple bladderwort. Along the western shoreline, Robins' pondweed (*Potamogeton robbinsii*) was observed in moderate quantities. A significant reduction in the waterlily and watershield populations was observed in the treatment areas, with a healthy quantity of waterlilies left for habitat.

Sandy Pond

Observations during this survey displayed a healthy assemblage of native vegetation throughout the littoral zone of the pond. Curly-leaf pondweed was not observed at this time. The native vegetation observed were waterlilies, watershield, common bladderwort, purple bladderwort, Robbins' pondweed in sparse quantities, and ribbon-leaf pondweed in sparse to moderate quantities. The waterlilies and watershield that were treated, displayed a significant reduction in density, along the road of the eastern shoreline watershield and waterlilies were left to maintain habitat for aquatic life. Trace amounts of variable milfoil and fanwort were observed only at the southeast inlet; variable milfoil growth observed was brown in color indicating it was unhealthy/dying and fanwort growth observed were extremely chlorotic and not viable for reproduction.

Ongoing Management Recommendations

Based on the observations made during the late-season surveys, the 2019 management program significantly reduced the target species, curlyleaf pondweed, variable milfoil, and fanwort, and reduced the nuisance growth of waterlilies in all three ponds. Based on the characteristics and history of the species within these waterbodies, it is likely that ongoing management will continue to be required in order to maintain a balanced aquatic ecosystem.

The observations of the invasive species, curly-leaf pondweed, have been noted and should be included in the management plan moving forward. This plant historically grows early in the season in late spring and should be managed in early May to early June.

Pine Meadow Pond

Over the course of the 2019 season, the presence of fanwort was not observed and the overall distribution/abundance of variable milfoil, curlyleaf pondweed and waterlilies in Pine Meadow Pond was significantly reduced. Due to the shallowness of the pond and the continued aggressive re-growth expected, SOLitude recommends continuing with a similar program for the 2020 season, including early/late season monitoring and separate herbicide treatments for curly-leaf, milfoil and waterlily regrowth.

Flannagan Pond

Over the course of the 2019 season, the distribution and abundance of curlyleaf pondweed and variable milfoil was significantly reduced throughout the entirety of Flannagan Pond. Though Fanwort was not observed during the pre-treatment survey or the initial treatment, growth was observed during the late season survey. The nuisance growth of waterlilies was also reduced significantly; however, these species can be highly aggressive, especially in the shallower areas and as such needs to be treated consistently each year.

SOLitude recommends a similar management program including early/late season monitoring, continued spot treatments with Tribune to control any variable milfoil and curly-leaf regrowth and spot treatments with AquaPro for control of waterlily and watershield. Unfortunately, related to the endangered species in the area, the Commission has not pursued the use of flumioxazin herbicide (Clipper) to spot-treat fanwort growth, so it is recommended to spot treat with the fluridone (Sonar) herbicide to control and reduce any fanwort growth observed during the season. 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. SOLitude 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 2019 season, the distribution and abundance of variable milfoil and fanwort was substantially reduced. SOLitude recommends continuing with a similar management program in 2020, 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 inlet areas). With no viable Fanwort being observed in the post-treatment survey, we recommend monitoring for Fanwort and possible treatment using Sonar if necessary, in 2020.

In addition, SOLitude 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.

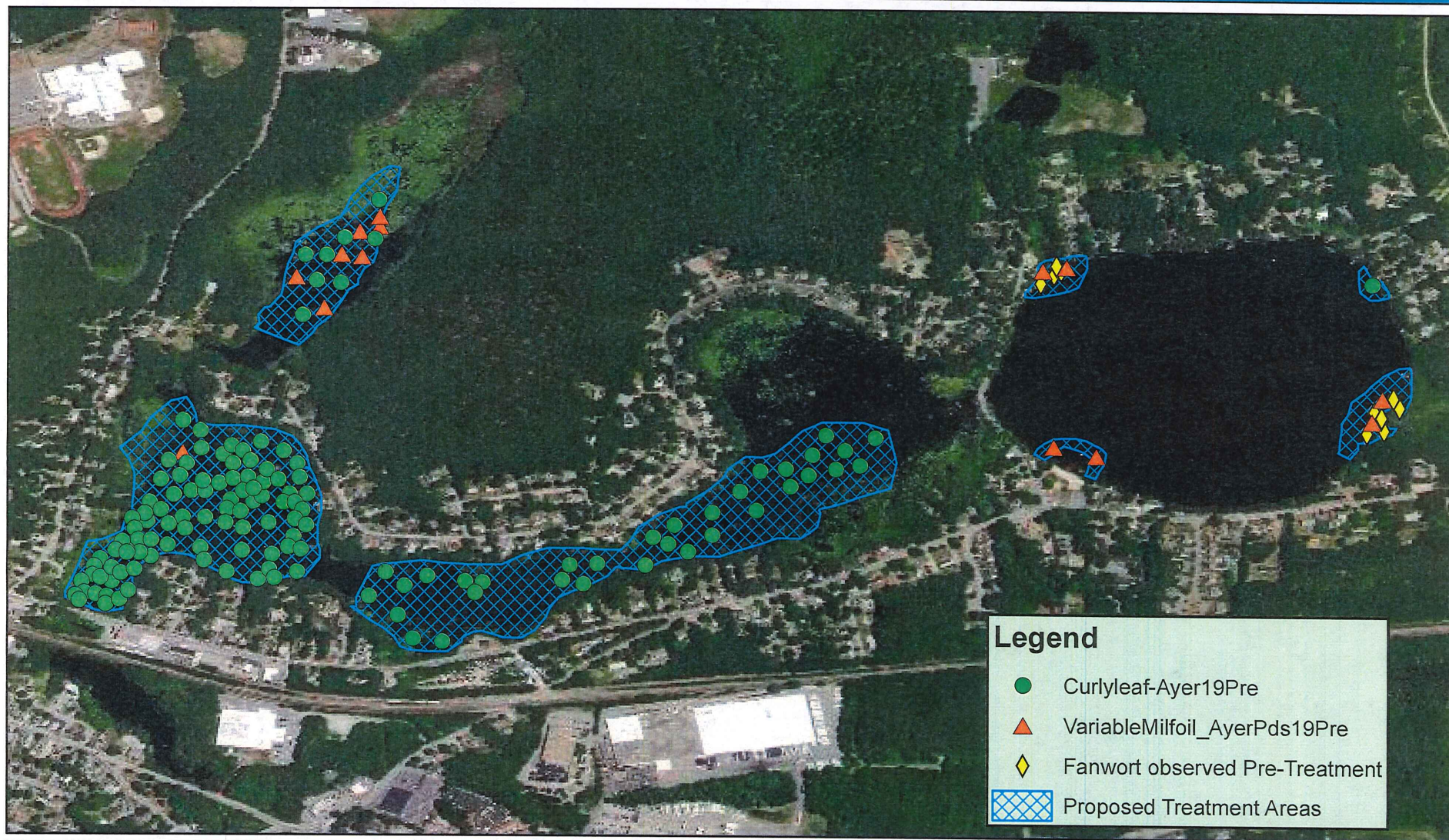
Overall, we recommend instituting on-going, annual programs at these ponds to monitor vegetation conditions and conduct management of invasive plants and other nuisance vegetation as needed. This is preferable to allowing the ponds to return to pre-management conditions that will require large scale management efforts and may actually reduce costs and herbicide usage over the long term. In terms of budget for 2020, 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

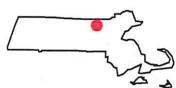
Pond	2018 Management Actions	Budget
Pine Meadow	<ul style="list-style-type: none"> Monitor early and late season vegetation. Manage curlyleaf pondweed and variable milfoil with spot treatments using diquat herbicides. Continue to thin out floating leaf plants using glyphosate herbicide. 	\$5,000-\$7,500
Flannagan	<ul style="list-style-type: none"> Monitor early and late season vegetation. Conduct spot treatment with Sonar (fluridone) to any areas of re-growth of fanwort. Manage curlyleaf pondweed and variable milfoil with spot treatments using diquat herbicides. Maintain levels of floating leaf plants using glyphosate herbicide. 	\$12,500-\$17,500
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 and curlyleaf pondweed with spot treatments using diquat herbicides. 	\$7,500-\$10,000

Figure 1: Pre-Management Survey Submersed Invasive Vegetation Assemblage

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Ayer Ponds
Ayer, MA



AYER PONDS: Pine Meadow, Flannagan, & Sandy

1:11,438

0 500 1,000 2,000
Feet

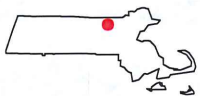


Map Date: 6/21/2019
Prepared by: BNA
Office: SHREWSBURY, MA

FIGURE 2: 2019 Post-Treatment distribution of Fanwort and Variable Milfoil



Ayer Ponds
Ayer,
Massachusetts



1:10,780

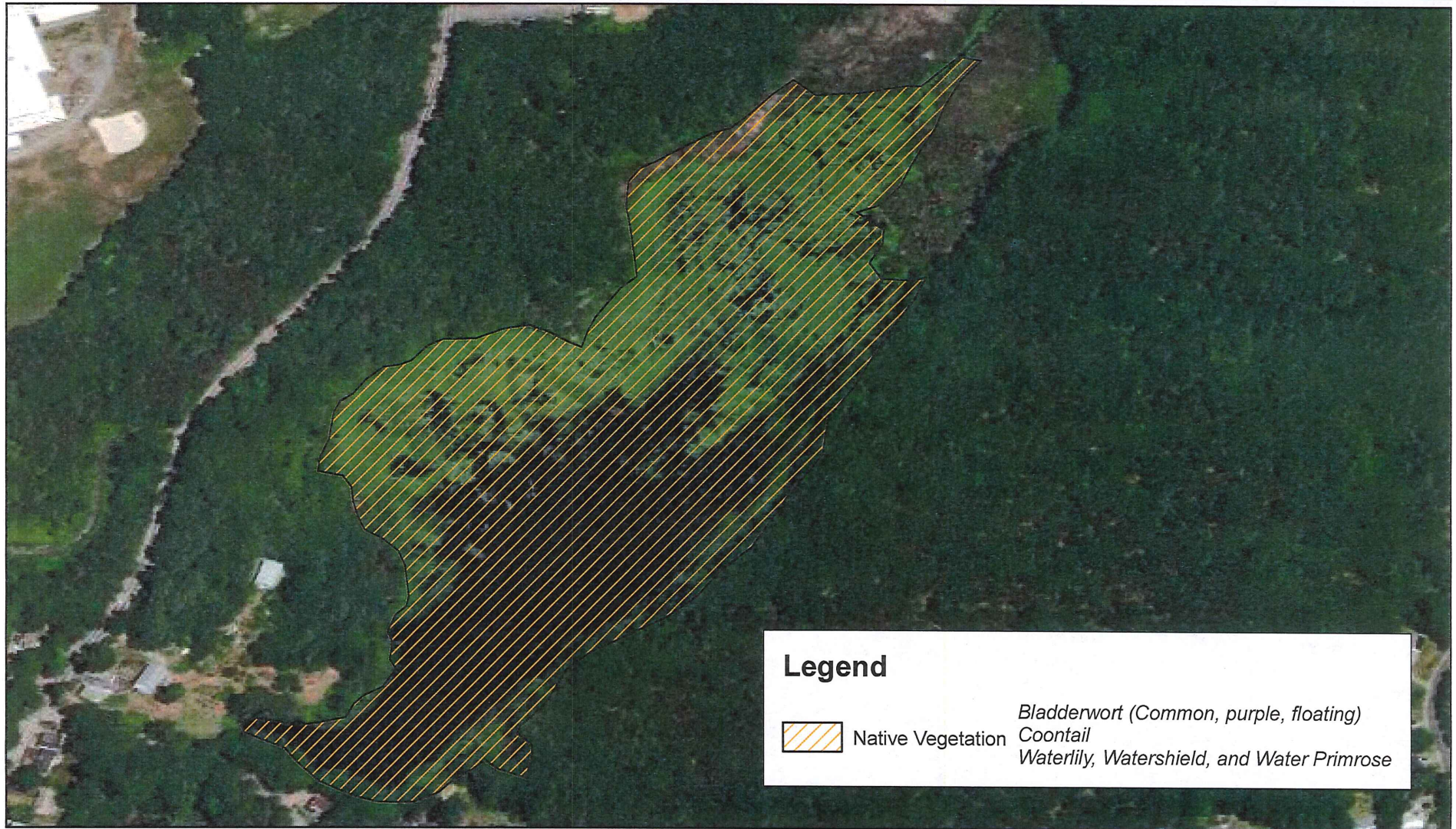
Ayer Ponds

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Feet

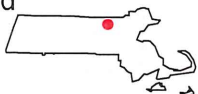


Map Date: 12/10/2019
Prepared by: JM
Office: Shrewsbury, MA

FIGURE 3: Pine Meadow Pond 2019 Post-treatment Native Aquatic Vegetation



Pine Meadow Pond
Ayer,
Massachusetts



Pine Meadow Pond

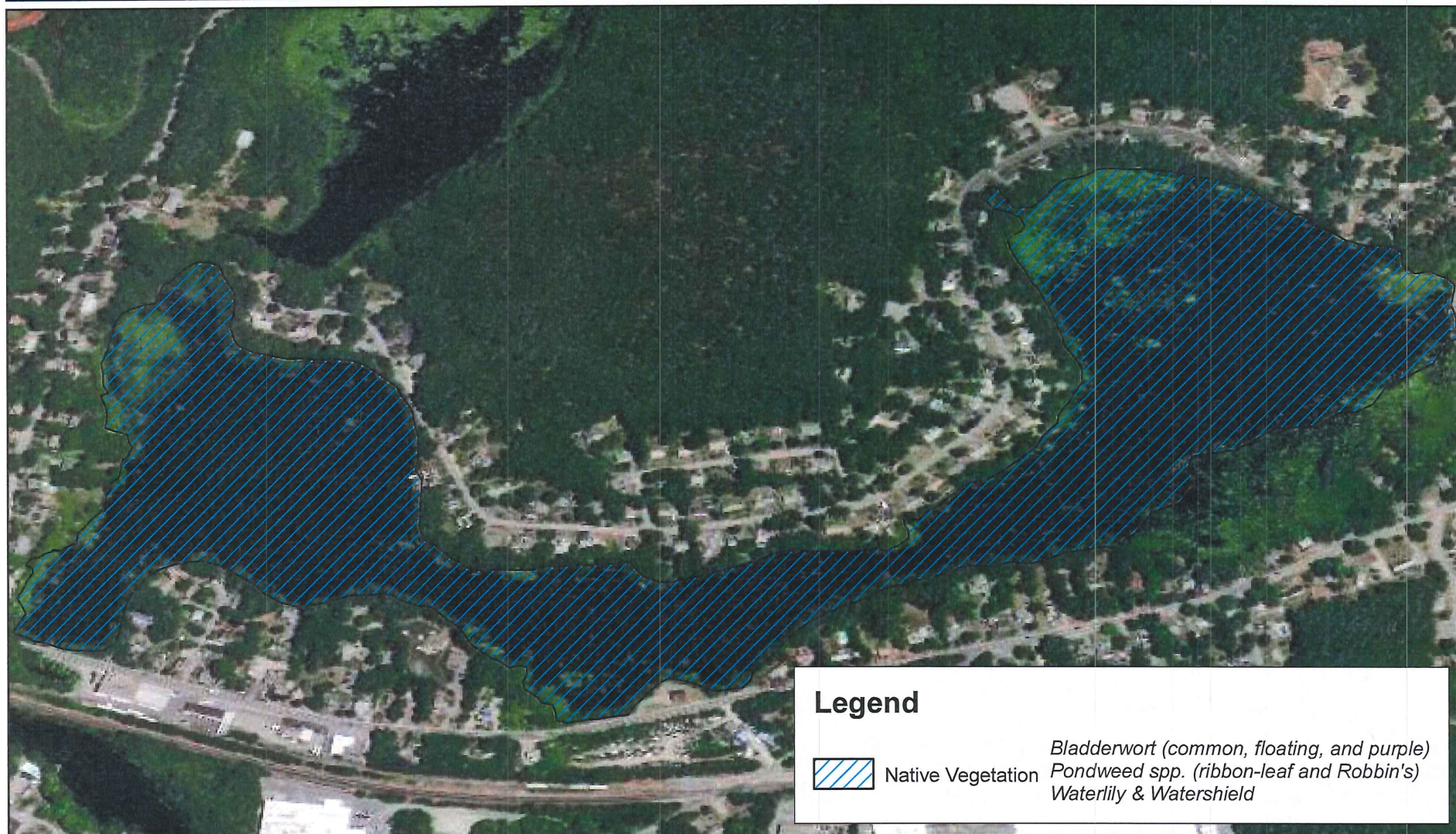
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Feet



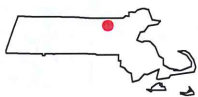
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Map Date: 12/10/2019
Prepared by: JM
Office: Shrewsbury, MA

FIGURE 4: Flannagan Pond 2019 Post-treatment Native Aquatic Vegetation



Flannagan Pond
Ayer,
Massachusetts



1:7,303

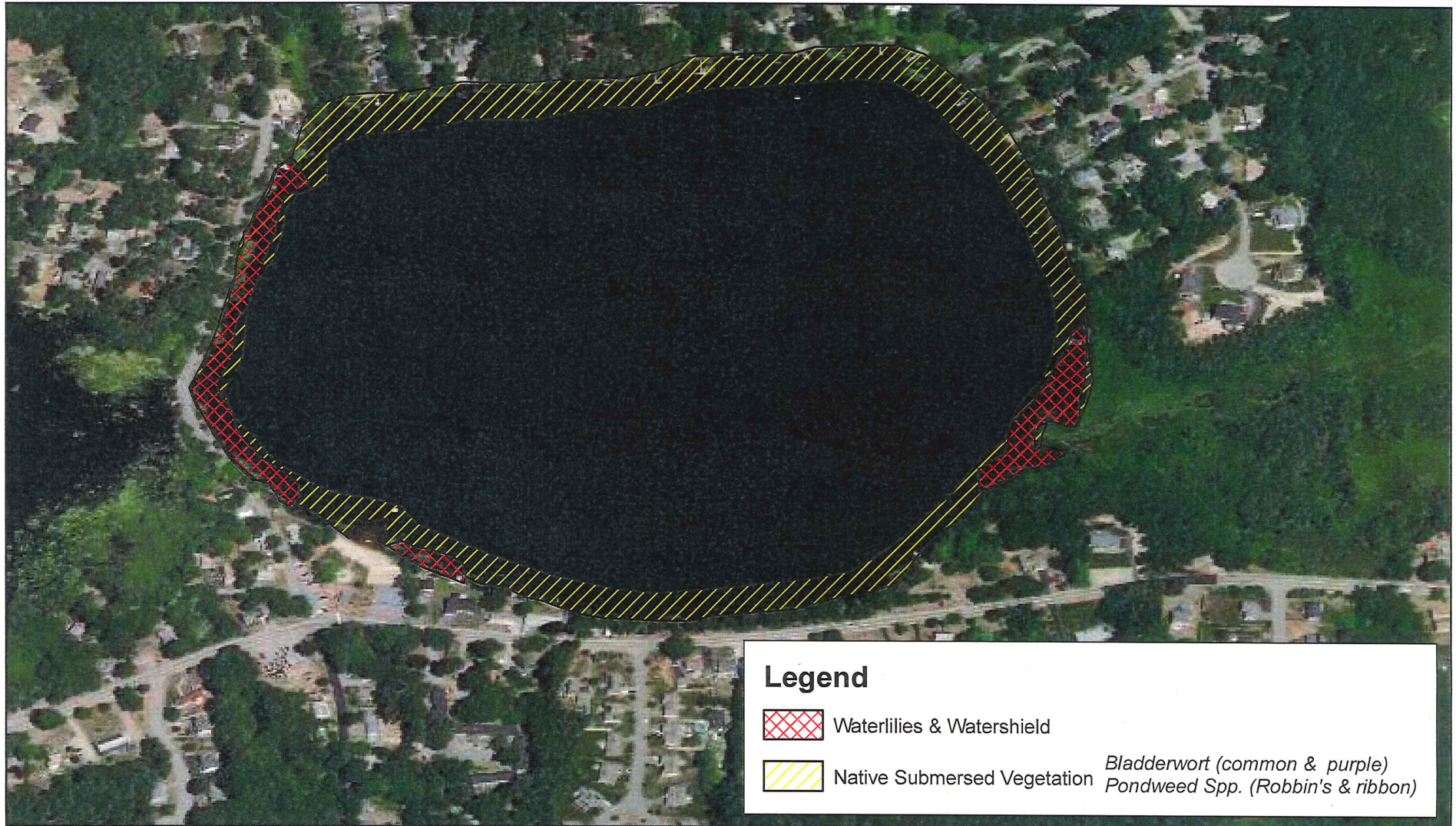
Flannagan Pond

0 390 780 1,560 Feet

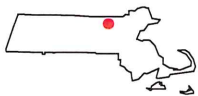


Map Date: 12/10/2019
Prepared by: JM
Office: Shrewsbury, MA

FIGURE 5: Sandy Pond 2019 Post-treatment Native Aquatic Vegetation



Sandy Pond
Ayer,
Massachusetts



Sandy Pond

0 295 590 1,180
Feet

1:5,411



Map Date: 12/10/2019
Prepared by: JM
Office: Shrewsbury, MA

