



November 28, 2022

Ayer Conservation Commission
Ayer Town Hall – 1 Main Street
Ayer, MA 01432
Sent via email: concom@ayer.ma.us

Re: Ayer Ponds – 2022 Year End Report

Dear Commission Members:

It is our pleasure to present a year end summary report regarding the 2022 aquatic management program at Flannagan, Sandy, and Pine Meadow Ponds. The Town's objective of the aquatic management program is to manage invasive species and nuisance waterlilies within the three waterbodies. The purpose of the program is to restore and maintain habitat, public enjoyment, and recreation. These goals were met during the 2022 season through monitoring, reporting, communication, and treatments. Prior to the start of the program, a plan was developed for each individual pond, based on its unique needs.

All permitting, treatment and survey tasks were completed in accordance with the 2022 work plans and Orders of Conditions. The table below provides the specific dates of each task. Below the table, each visit/task performed is described in additional detail.

Summary Of 2022 Management Activities

Date	Task/Description
March 17, 2022	MA-DEP Licenses issued for Flannagan Pond (WM04-0000472), Sandy Pond (WM04-0000495), Pine Meadow Pond (WM04-0000494).
June 1, 2022	Pre-management surveys were conducted at Flannagan, Sandy, and Pine Meadow Ponds. Initial Sonar applications in Flannagan and Sandy Ponds (based on 2021 post-management surveys).
June 15, 2022	Diquat treatments at Flannagan, Sandy, and Pine Meadow Ponds for the control of variable milfoil and/or curly-leaf pondweed. Sonar booster applications in Flannagan and Sandy Ponds for the control of fanwort.
September 21, 2022	Post-management surveys were conducted at Flannagan and Pine Meadow Ponds. Treatment of waterlilies at Flannagan and Pine Meadow Ponds.
October 12, 2022	Post-management survey at Sandy Pond.



Pre-Management Surveys/Initial Sonar Treatments – June 1, 2022

On June 1st, Senior Environmental Scientist, James Lacasse, conducted the pre-treatment surveys at Flannagan Pond, Sandy Pond, and Pine Meadow Pond. Additionally, while on-site, the fanwort areas observed during the 2021 post-treatment survey in Flannagan Pond, and Sandy Pond were treated with the initial dose of Sonar (fluridone). Sonar works best early in the season; therefore, the earlier season approach gave us the best chance of success. The Conservation Commission was notified in advance of this treatment, and the shoreline was also posted with neon posters several days in advance. Conditions during the visit were cloudy with, at times, heavy rain. The survey was intermittently delayed during periods of heavy rains and continued following the rain stopping/slowing.

The pre-treatment survey was conducted to document the distribution and densities of invasive species in all three waterbodies. Visual observation was paired with the use of a throw-rake. Rakes were thrown approximately every 10' throughout the waterbodies (within the littoral zone). This approach was paired with ArcGIS Field Maps and an external GPS to document the locations of the invasive species. Points were input into ArcGIS Field Maps when invasive species were encountered during the rake tosses. The attached maps note our findings, which guided our treatment areas.

Sandy Pond

Sandy Pond has historically battled several invasive species, including fanwort, variable milfoil, and curly-leaf pondweed. The fanwort was not managed in 2021 due to budget constraints. The survey results from Sandy Pond included invasive species in the typical spots. Three submerged invasive species were documented; fanwort, variable milfoil, and curly-leaf pondweed. This was consistent with the historical records. The northern point contained all three invasive species, with the fanwort being very immature. The western point, at the outlet to Flannagan Pond, contained trace to sparse fanwort. A spot of variable milfoil was also documented on the eastern portion of Sandy Pond. The fanwort spots were treated with Sonar One, time released granular formulation, as planned. Sonar One allows for spot-treatment of fanwort, which is typically difficult with Sonar as it requires roughly 60+ days of contact exposure time at concentrations above 8+ parts per billion. The diquat treatment performed later in June targeted variable milfoil and curly-leaf pondweed. The phragmites stands treated in 2021 appeared primarily dead, with very little regrowth. Phragmites regrowth was planned for later in the season (September). The surface dissolved oxygen collected during the survey was 7.5 mg/l, which is sufficient to support fish and aquatic organisms. The pH was documented at 7.0, which is within a standard range for freshwater, and is considered neutral.

Pine Meadow Pond

Pine Meadow Pond has historically contained two invasive species, these being variable milfoil and curly-leaf pondweed. The June 1st survey was consistent with the 2021 pre-treatment survey. Curly-leaf pondweed was found in the middle to western half of the Pond, with scattered



variable milfoil mixed in. Milfoil was found mixed within the open areas of waterlilies. Fanwort was not found in Pine Meadow Pond, which is consistent with previous years. The waterlily population was notably reduced from the 2021 treatment. This helps promote open water habitat. The surface dissolved oxygen collected during the survey was 7.4 mg/l, which is sufficient to support fish and aquatic organisms. The pH was documented at 6.7, which is within a standard range for freshwater, and is considered fairly neutral. Based on the survey, diquat application was planned for later in the month. Diquat is highly effective at providing seasonal control of both variable milfoil and curly-leaf pondweed.

Flannagan Pond

During the 2021 season, Sonar (fluridone) was applied throughout Flannagan Pond. While we anticipated drastic reduction in fanwort and milfoil, curly-leaf pondweed reproduces through winter buds called turions. Because the Pond contains a seed bed of curly-leaf pondweed, we anticipated significant regrowth of the curly-leaf. Varying densities of curly-leaf were observed throughout the Pond, primarily the western half of the Pond through most of the middle channel. This ranged from low near the bottom, to surfacing at certain points. Variable milfoil was considerably reduced from 2021 and was only found in two spots, the northwestern corner, and the middle towards the southern shoreline. While the fanwort population regrowth was drastically reduced from the 2021 Sonar treatment effort, both in terms of density and cover, it was still observed in many areas, predominantly the eastern portion of the Pond. It was noted at only trace to sparse densities as we moved towards the middle of the Pond away from the inlet at Sandy Pond. Approaching the eastern basin, where fanwort was more prevalent, densities increased and were surfacing in spots. The eastern basin of Flannagan Pond might have had lesser carry over control of fanwort for a few reasons. This area was subject to much higher flows at the inlet in 2021, especially given the consistent heavy rains throughout the entire treatment season. Additionally, at the request of Conservation, we left a buffer around a swan's nest in this area, where product was intentionally not applied. The surface dissolved oxygen collected during the survey was 8.2 mg/l, which is sufficient to support fish and aquatic organisms. The pH was documented at 6.4, which is within a standard range for freshwater, and is considered fairly neutral. Sonar was applied to the contracted areas near the inlet where it was documented during the 2021 post-treatment survey, however additional areas extended beyond this. We anticipated some control outside of the treated areas in Flannagan Pond. The diquat treatment performed later in June targeted predominantly curly-leaf pondweed and also controlled the small areas of variable milfoil. Unfortunately, diquat does not control fanwort.

Diquat Treatment (All Ponds) / Sonar Booster Treatment (Sandy/Flannagan) – June 15, 2022

Sandy Pond

On June 15th, Senior Environmental Scientist, James Lacasse, and Field Assistant, Grace Adams, completed a site visit to Sandy Pond. The visit consisted of performing a survey, collecting basic water quality data, and conducting a treatment. Conditions during the visit were sunny and partly cloudy.

Upon arrival, a survey was conducted using visual observation paired with a standard throw-rake and handheld GPS/ArcGIS Field Maps, as applicable. Within all three target areas, the western shoreline, northwestern cove, and eastern shoreline by the inlet, there was curly-leaf pondweed, variable milfoil, and fanwort observed in sparse to moderate densities. Also noted were the phragmites which were treated in 2021, which had very little regrowth. In addition, there were native plants including waterlilies, watershield, ribbon leaf pondweed, cattails, bladderwort, and snailseed pondweed. This was very much consistent with our recent pre-treatment survey.



Figure 1 Previously treated phragmites area



Figure 2 Collection of Secchi disk data at Sandy Pond

disappearance, called the Secchi depth, is a measure of the transparency of the water. The Secchi reading was 12ft 2in, which is indicative of excellent water clarity.

While on-site, basic water quality was collected using calibrated meters. The pH was 7.5, which is within a standard range for freshwater and is considered neutral. The water temperature was consistent with other similar waterbodies we manage in the area, and the dissolved oxygen was sufficient to support fish and aquatic organisms. Water clarity was also assessed using a Secchi disk. A Secchi disk is a disk with alternating black and white quadrants. It is lowered into the water of a lake until it can no longer be seen by the observer. This depth of

As planned, and based on the survey, a treatment was conducted for the control of milfoil, fanwort, and curly-leaf pondweed. The liquid herbicide, Tribune (diquat), was applied using a treatment boat equipped with a calibrated sub-surface injection system. This application methodology allows for even coverage within the treatment areas. Additionally, a Sonar "booster" treatment was applied to the small areas of fanwort. Sonar works by maintaining contact exposure time, so the booster treatment helped maintain the desired concentration of Sonar within the treatment areas. The granular Sonar (Sonar One) was applied using a calibrated spreader within the areas containing fanwort. Several days prior to treatment, the shoreline was

posted with neon posters noting the treatment and the affiliated water use restrictions. We also monitored the beach schedule to have minimum interference with the recreational beach.

Pine Meadow Pond

On June 15th, Senior Environmental Scientist, James Lacasse, and Field Assistant, Grace Adams, completed a site visit to Pine Meadow Pond. The visit consisted of performing a survey, collecting basic water quality data, and conducting a treatment. Conditions during the visit were sunny and partly cloudy.

Upon arrival, a survey was conducted using visual observation. This was conducted to confirm the data that was collected during the pre-treatment survey and to further confirm the timing of the treatment. Throughout the pond there were dense densities of watershield and waterlilies, and in the water column there were sparse densities of ribbon leaf pondweed. In the northern end there were also dense populations of cattails. All target species were noted, which were variable milfoil and curly-leaf pondweed; no fanwort was observed. This was consistent with the pre-treatment survey (please refer to pre-treatment survey map noting locations of invasive variable milfoil and curly leaf pondweed).



Figure 3 Dense waterlilies and watershield

While on-site, basic water quality was collected using calibrated meters. The pH was 7.3, which is within a standard range for freshwater and is considered neutral. The water temperature was consistent with other similar waterbodies we manage in the area, and the dissolved oxygen was sufficient to support fish and aquatic organisms. Water clarity was also assessed using a Secchi disk. The Secchi reading was 4ft 4in, which is an indication of about average water clarity.



Figure 4 Open water area in Pine Meadow Pond

As planned, and based on the survey, a treatment was conducted for the control of curly-leaf pondweed and milfoil. The liquid herbicide, diquat, was applied using a treatment boat equipped with a calibrated sub-surface injection system. This application methodology allows for even coverage within the treatment areas. Several days prior to the treatment, the shoreline

of the pond was posted with neon posters noting the treatment and affiliated water use restrictions.

Flannagan Pond

On June 15th, Senior Environmental Scientist, James Lacasse, and Field Assistant, Grace Adams, completed a site visit to Flannagan Pond. The visit consisted of performing a survey, collecting basic water quality data, and conducting a treatment. Conditions during the visit were sunny and partly cloudy.

Upon arrival, a survey was conducted using visual observation paired with a standard throw-rake and handheld GPS/ArcGIS Field Maps, as applicable. Along the majority of the shoreline, as well as the coves of the Pond, there were trace to dense densities of waterlilies. The remainder of the waterlilies were scattered throughout the pond, on the surface, as well as in the water column. The target species, curly-leaf pondweed, fanwort, and variable milfoil were all treated, and ranged from trace to dense densities, scattered throughout the pond (see pre-treatment survey maps). The eastern basin in specific had dense densities of bladderwort, with some of it flowering. The fanwort in the eastern basin was observed in moderate to dense densities, also starting to flower. The curly-leaf had slightly decreased in density since the previous visit, as it is a colder water invasive species. Throughout the patches of waterlilies, there were also numerous floating islands, which is a result of the uprooting of the waterlilies. In addition, there were sparse densities of ribbon leaf



Figure 5 Dense areas of lilies and watershield in Flannagan Pond



Figure 6 Open water areas in Flannagan Pond resulting from 2021 Sonar program

pondweed, a beneficial native plant. It is nice to see native plants like ribbon leaf starting to recolonize following the 2021 extensive Sonar treatment.

While on-site, basic water quality was collected using calibrated meters. The pH was 7.2, which is within a standard range for freshwater and is considered neutral. The water temperature was consistent with other similar waterbodies we manage in the area, and the dissolved oxygen was sufficient to support fish and aquatic

organisms. Water clarity was also assessed using a Secchi disk. The Secchi reading was 4ft, which is indicative of average water clarity.

As planned, and based on the survey, a treatment was conducted for the control of fanwort, variable milfoil, and curly-leaf pondweed. The diquat will also impact nuisance densities of bladderwort. The liquid herbicide (diquat) was applied using a treatment boat equipped with a calibrated sub-surface injection system, and the granular product (Sonar One) at the inlet area where fanwort was observed during the 2021 post treatment survey was also "bumped." Sonar works much more slowly than the diquat and requires maintaining contact exposure time. This application methodology allows for even coverage within the treatment areas. Prior to treatment, the Ayer Conservation Commission was notified, and neon signs were posted along the shoreline several days in advance. These posters note any affiliated water use restrictions.

Post-Mgmt. Surveys/Waterlily Treatment (Flannagan/Pine Meadow) – September 21, 2022

Pine Meadow Pond

On September 21st, Senior Environmental Scientist, James Lacasse, completed a site visit to Pine Meadow Pond. The visit consisted of performing a survey, collecting basic water quality data, and conducting a treatment. Conditions during the visit were mostly cloudy and calm.



Figure 7 Lilies on Pine Meadow Pond (South to North view)

Upon arrival, a survey was conducted using visual observation paired with a standard throw-rake and handheld GPS/ArcGIS Field Maps, as applicable. Rake tosses were thrown regularly throughout the Pond, and information specific to vegetation species was collected using ArcGIS Field Maps application. The Pond looked great as all target species were controlled. Variable milfoil was documented in the southeastern corner but appeared very unhealthy and was covered in epiphytic algae. Epiphytic algae indicates that the plant is dying/decaying. Variable milfoil was only found in this one spot - no other invasive species were noted, including curly-leaf pondweed which was a target of the initial treatment. Watershield, waterlilies, callitriche, bladderwort, coontail, and duckweed were also documented throughout the survey, all native species. Bladderwort, watershield, and waterlilies were the most prominent species observed. Cattails surround the majority of the shoreline, specifically around the northern, western/northwestern, and eastern shorelines. Waterlilies and watershield were scattered in the southern half of the Pond, and more moderate to dense in the northern half.

While on-site, basic water quality was collected using calibrated meters. The water temperature was consistent with other similar waterbodies we manage in the area, and the dissolved oxygen

was sufficient to support fish and wildlife. Water clarity was also assessed using a Secchi disk. The Secchi reading was 4'10 (to the bottom). This illustrated slightly above average water clarity.

As planned, a treatment was conducted for the control of waterlilies. The liquid herbicide (Rodeo) was applied using a treatment boat equipped with a calibrated pump system via foliar methodology. This application methodology allows for even coverage within the treatment areas. Posters stating the restrictions (no restrictions) were posted around the Pond several days prior to treatment. The focus of the waterlily treatment is by no means to eliminate waterlilies, but to scale them back to a more desirable density/cover. Due to the density and cover, this process will take several years to continually scale them back. Progress has already been made as open-water habitat has been increased through last year's lily treatment.



Figure 8 Photo showing progress in creation of open-water habitat

Flannagan Pond

On September 16th and September 21st, Senior Environmental Scientist, James Lacasse, completed site visits to Flannagan Pond. The visits consisted of performing a survey, collecting basic water quality data, and conducting a treatment. Conditions during the two visits were partly cloudy and calm. Due to an equipment issue on September 16th, the survey was conducted on that date and the treatment was started. The remainder of the treatment was postponed to the 21st. The Commission was notified of this change, and new posters with a new treatment date were posted for the 21st, on the 16th.



Figure 9 Open water created at Flannagan Pond

Upon arrival on September 16th, the post-treatment survey was conducted using visual observation paired with a standard throw-rake and handheld GPS/ArcGIS Field Maps. Rake tosses were regularly thrown throughout the Pond, and GPS points were collected documenting nuisance/invasive vegetation, as well as native vegetation assemblage. Overall, the 2022 aquatic management program worked extremely well, as minimal invasive species were noted during the survey. Open-water was noticeably increased through both the 2022 effort as well as carry over control from the more intensive 2021 Sonar treatment program. The

two invasive species documented included fanwort and variable milfoil, which were found in scattered, trace to sparse densities. Variable milfoil was found in two locations, both as isolated patches. These areas included the northwestern corner and within the eastern basin. Fanwort was found scattered, with the largest area by the launch (middle of the southern shoreline). The majority of the minimal invasive species observed were covered in epiphytic algae, which indicates that the plant is dying/decaying. Other species noted included watershield, bladderwort, and ribbon-leaf pondweed. Bladderwort was documented as moderate to dense as this species was noted throughout the majority of the Pond. Bladderwort was observed growing on the bottom, within the water column, and surfacing. Bladderwort is a native species. Curly-leaf pondweed, another invasive species targeted in Flannagan Pond, was not found during the survey. The water level was much lower than usual. Very shallow depths and dense native bladderwort occasionally made navigating around the Pond difficult.

While on-site, basic water quality was collected using calibrated meters. The water temperature was consistent with other similar waterbodies we manage in the area, and the dissolved oxygen was sufficient to support fish and wildlife. Water clarity was also assessed using a Secchi disk. The Secchi reading was 3 feet, to the bottom. The water clarity was documented as average.

As planned, started on the 16th and finished on the 21st, a treatment was conducted for the control of waterlilies. The liquid herbicide (Rodeo) was paired with a non-ionic surfactant which acts as a sticking agent and increases uptake, was applied using a treatment boat equipped with a pump system via foliar methodology. This application methodology allows for even coverage within the treatment areas. Posters noting any affiliated water-use restrictions were posted several days ahead of each treatment, and the Conservation Commission was also notified in advance of both visits.

Post-Management Survey (Sandy Pond) – October 12, 2022

On October 12th, Senior Environmental Scientist, James Lacasse, completed a site visit to Sandy Pond. The visit consisted of conducting a survey and collecting basic water quality data. Conditions during the visit were sunny and calm. We delayed the survey until previously documented algae bloom had lessened. We did this out of the safety of our staff.

Upon arrival, a survey was conducted using visual observation paired with a standard throw-rake and handheld GPS/ArcGIS Field Maps, as applicable. Two invasive species were documented during the survey, including variable milfoil and phragmites. Variable milfoil was only found in one location, which was the southeastern

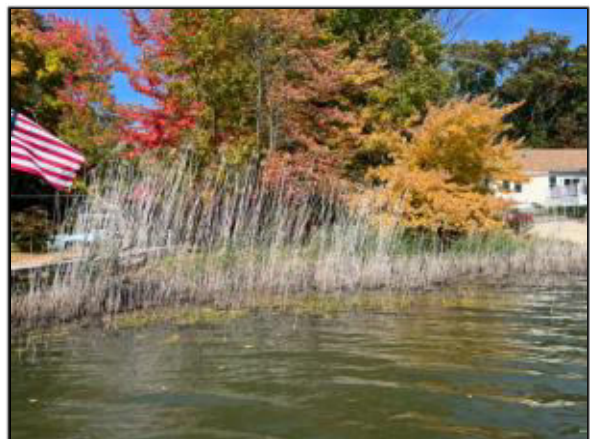


Figure 10 Phragmites area treated in 2021



Figure 11 Dense microscopic algae bloom in windblown areas

microscopic algae bloom documented throughout the Pond, visible both on the surface and throughout the water column. It was especially dense in wind-blown areas of the Pond. This caused the color of the Pond to appear "green" and resulted in decreasing water clarity/quality. Because a public health advisory was in place, we were unable to treat waterlilies and/or phragmites this season. A special condition within MA-DEP WM04 permits prevents the licensed applicator from treating a pond when an advisory is in place. This treatment was not invoiced to the Town.

corner. The milfoil noted included just a few strands that appeared very unhealthy as they were brown/black in color and covered in epiphytic algae. Epiphytic algae indicates that the plant is dying/decaying. Phragmites were noted in a few locations along the northern shoreline and one location on the southern shoreline. There was minimal regrowth documented in areas treated in 2021. No fanwort was found, as the 2022 treatments targeting milfoil and fanwort proved extremely effective. Other species noted included waterlilies, watershield, bulrush, cattails, and ribbon-leaf pondweed. There was a dense

While on-site, basic water quality was collected using calibrated meters. The water temperature was consistent with other similar waterbodies we manage in the area, and the dissolved oxygen was sufficient to support fish and wildlife. Water clarity was also assessed using a Secchi disk. The Secchi reading was 2'10", which illustrated poor water clarity. This was due to the microscopic algae bloom.

Algae control is not part of the Ayer's management program, and the bloom came on late in the season, so no action was taken to resolve the issue. We take the bloom extremely seriously and have included information pertaining to both proactive and reactive control within the recommendations section below.

Temperature / Dissolved Oxygen Readings

Temperature and dissolved oxygen readings were collected throughout the season at all three Ayer Ponds using a calibrated YSI meter. Dissolved oxygen can be affected by many outside factors, such as: temperature, time of day, and pollution. Fish and other aquatic organisms typically require a minimum of four to five milligrams per liter (mg/l) of oxygen. Healthy water should generally have concentrations of about 6.5-8 mg/L. Readings at the Ayer Ponds showed sufficient dissolved oxygen throughout the season. At no point (during our collections) was the dissolved oxygen in any of the three ponds below a threshold sufficient to support fish and other aquatic organisms.

The amount of dissolved oxygen a pond can hold is largely determined by water temperature. When the water temperature is cooler, it can hold more oxygen. Generally, water cannot hold oxygen at levels that will support fish when above 85 degrees Fahrenheit.

The table below shows the recorded dissolved oxygen and temperature readings for each pond, during each visit.

Date	Flannagan Pond		Sandy Pond		Pine Meadow Pond	
	Surface Temp (°C)	Surface D.O. (mg/l)	Surface Temp (°C)	Surface D.O. (mg/l)	Surface Temp (°C)	Surface D.O. (mg/l)
6/1/2022	22.6	8.2	23.2	7.5	23.4	7.4
6/15/2022	23.1	8.97	26.7	9.62	27.3	7.86
9/21/2022	20.1	7.1	-	-	19.2	7.1
10/12/2022	-	-	17.4	6.7	-	-

Summary / 2023 Recommendations

Flannagan Pond

Prior to the 2021 Sonar “reset” performed in Flannagan Pond, dense fanwort had taken over the majority of the Pond. A drastic reduction in fanwort was documented during the 2022 season, leading to much improved conditions. Despite this, we are still battling several invasives including areas where less multi-year fanwort control was achieved. These include higher flow areas, and an area that was avoided in 2021 due to the presence of a swan’s nest. Variable milfoil was also greatly reduced from the 2021 effort. Curly-leaf pondweed is a perennial plant that reproduces through turions. The turions typically germinate in the fall and the curly leaf pondweed plants typically grow extensively shortly after ice-out in the Spring. Given that CLP turions can survive at least five years of dormancy in ponds, annual control is recommended to gain extensive control over time.



Figure 12 Flannagan Pond

Based on this information, the continued maintenance approach to invasive species control in Flannagan Pond is recommended. This includes use of diquat herbicide for the control of variable milfoil and curly-leaf pondweed regrowth. Unfortunately, diquat is not effective on fanwort so other options must be considered. There are only two MA/EPA approved herbicides which have efficacy on the invasive fanwort. The first is flumioxazin, commonly called by the brand name Clipper. Clipper is a contact herbicide, much like diquat. It provides seasonal fanwort control and must be repeated annually. Unfortunately, Clipper is not approved in the Ayer Ponds which only



leaves one herbicide option. Sonar, which was used extensively in Flannagan Pond in 2021 and has been used in other years, including 2022, to spot-manage fanwort growth, continues to be the recommended option for fanwort control. Sonar requires building and maintaining a concentration of the active ingredient (fluridone). This makes spot-treatment with Sonar difficult. To combat this, we recommend continuing with use of Sonar One, the time released granular formulation. In addition to this, an initial treatment and a booster treatment should be applied. One major change which was made when Water & Wetland, LLC took over management is the timing of treatments. The contact herbicide treatments using diquat were applied earlier in the season in mid-June versus after July 1. This approach helps minimize biomass die-off and is generally best practice. Perhaps more importantly, Sonar is best applied early in the season as well. Historically, Sonar was applied to Flannagan and Sandy Ponds in July and August. While May is optimal, from a cost perspective, pairing the initial Sonar treatment with the pre-management surveys in very early June is still beneficial. This allows for the booster application to be completed in mid-June. This timing was extremely effective in 2022 and should be continued in 2023 and beyond. In order to accomplish this, fanwort management areas should be based on the prior season's maps. Management of milfoil and curly-leaf pondweed can be based on the current year's pre-management survey.

Excessive waterlily growth has taken over much of Flannagan Pond, which is generally what most abutters ask us about when we are posting/treating. Waterlilies are a native species which provide valuable habitat and cover. Dense waterlily growth such as in Flannagan Pond can limit oxygen transfer and biodiversity. The waterlilies have been greatly reduced over the years, but there is still work to be done. Reduction was experienced from 2021 to 2022 and we anticipate further reduction in waterlily regrowth into 2023 (from the 2022 treatment). A similar treatment should be conducted during the 2023 season. We are able to save on costs by pairing this treatment with the post-management survey. Waterlily treatment is most effective late in the season, so this timing works extremely well. The goal will never be to eliminate lilies, but rather to scale them back to a more desirable and beneficial density and cover.

Pine Meadow Pond

Conditions in Pine Meadow Pond in 2022 were consistent with previous years. Luckily, fanwort has not been introduced into Pine Meadow Pond. If it does find its way into the Pond, ideally it will be caught early through the regular surveys being conducted. Water & Wetland staff is diligent about cleaning and inspecting our boats in between each pond we visit to help limit the spread of invasives. The Town may want to consider signage at any access points to the ponds, noting the importance of cleaning and inspecting boats. Several other ponds in the area contain invasive water chestnut which was not found in any of the three Ayer Ponds which Water & Wetland manages. Signage and best management practices will help keep this horrible invasive species out of Pine Meadow Pond, Sandy Pond, and Flannagan Pond.

Aside from keeping any new invasive species out of Pine Meadow Pond, continued management of the to invasive species, curly-leaf pondweed and variable milfoil, is necessary. Diquat herbicide has been extremely effective at providing season long control of both target invasive species in Pine Meadow Pond. Unfortunately, diquat is a contact herbicide which only provides season long control of these invasive species. For this reason, diquat application should be repeated annually, based on the pre-treatment survey. The benefits to diquat are that it is fast acting, which makes it great for spot treatment. It is also much less costly verses other herbicides such as Sonar. We also considered other herbicide options, such as Procellacor, which is a newer herbicide that is widely considered the ultimate milfoil control tool. One of the benefits to Procellacor is that it is highly selective to milfoil. In the case of Pine Meadow Pond, a second target invasive species is curly-leaf pondweed, which will not be controlled through Procellacor treatment. Based on this we recommend continuing with diquat during the 2023 season for the control of the two target invasive species.

Similar to Flannagan Pond, excessive waterlily cover and density has taken over much of Pine Meadow Pond, especially in the northern portion. Since Water & Wetland took over management, there has been a drastic increase in open-water habitat, but waterlily treatment is still necessary in upcoming years. Continuing to pair this treatment with the post-management survey in September will help reduce costs.

Sandy Pond



Figure 13 Sandy Pond

Sandy Pond has historically battled three invasive species: fanwort, variable milfoil, and curly-leaf pondweed. Luckily, Sandy Pond is deep, and these invasive species have stayed confined to only a few small areas. This allows for spot-management of curly-leaf pondweed and variable milfoil with diquat, and management of fanwort with Sonar One. This program should continue in 2023. It is important to ensure that treatments are timely. We recommend continuing with the initial Sonar treatment during the pre-management survey, with treatment areas to be based on 2021 maps. Additionally, the Sonar booster application can be applied with the mid-June diquat application. Sandy Pond has less issues with waterlilies than Flannagan Pond and Pine Meadow Pond, but waterlilies should continue to be monitored and scaled back as necessary. The several areas of invasive phragmites around the shoreline of Sandy Pond should also be monitored and treated as necessary as well. Drastic reduction in phragmites regrowth was achieved from the 2021 treatment, but they were unable to be treated in 2022 due to the public health advisory.

Sandy Pond has historically battled three invasive species: fanwort, variable milfoil, and curly-leaf pondweed. Luckily, Sandy Pond is deep, and these invasive species have stayed confined to only a few small areas. This allows for spot-management of curly-leaf pondweed and variable milfoil with diquat, and management of fanwort with Sonar One. This program should continue in 2023. It is important to ensure that treatments are timely. We recommend continuing with the initial Sonar treatment during the pre-management survey, with treatment



Sandy Pond was shut down late in the season due to visual signs of a possibly harmful algae bloom. Water & Wetland and the Town takes this very seriously, and we have several recommendations for future algae control at not only Sandy Pond, but also Flannagan and Pine Meadow.

All Ponds

To our knowledge, the Ayer Ponds do not have a history of frequent cyanobacteria blooms. Cyanobacteria have the ability to reproduce rapidly, as was the case with Sandy Pond in the late Summer. Weather patterns can drastically impact cyanobacteria, the 2022 season was extremely hot and dry, which may have helped exacerbate the issue in Sandy Pond. Despite this anomaly, it's extremely important to have plans in place to manage potentially harmful algae blooms, and to further understand the causes. By understanding the causes of frequent blooms, programs designed to target source nutrients can be implemented. Unfortunately, the MA DEP WM04 Permit we obtained, which allows us to treat, restricts us from treating algae when a public health advisory is in place. This limited any possible action in 2022. Per MA DPH, a public health advisory is implemented when blue-green cell counts exceed 70,000 cells/ml. The Town of Ayer was extremely proactive in shutting down Sandy Pond upon the visual observations of the dense bloom.

Phosphorus is the limiting nutrient typically fueling potentially harmful algae blooms. Water quality results for Sandy Pond and the other Ayer Ponds are scarce at best, but we can assume the phosphorus levels, specifically in Sandy Pond, are likely elevated. At a minimum in 2023, baseline nutrient analysis should be collected. This will help to make phosphorus mitigation decisions in the future. More extensive sampling could also be completed as budget allows, this would include multiple locations, depths, and rounds of sampling. Exploration of alum use can be explored, but we'd recommend bringing in a consultant such as ESS Group/TRC Environmental, who specializes in dosing aluminum treatments. Alum is commonly used in ponds, lakes and drinking water reservoirs to remove phosphorus through precipitation, forming a heavier than water particulate known as floc. This floc settles to the bottom of the waterbody to create a barrier that slows sediment phosphorus release. Alum dosing can vary greatly. A low dose treatment can be used to strip phosphorus from the water column but may need to be repeated annually or more. Higher doses may be needed to inactivate sediment phosphorus reserves. Higher doses also typically require buffering with sodium aluminate. In either case, dosing is the key to success, and a specialist such as ESS Group can assist with intense sediment sampling and dosing. Given the need for this extensive testing. We recommend keeping alum in mind for the long-term future of Sandy Pond but are not recommending its' use for 2023. We also believe alum may have been applied to Sandy Pond many years ago, but do not have any data in regard to this.

Even prior to having this data, some proactive measures could be taken to address phosphorus. One possible low-cost addition to the 2023 program would be the possible use of BioChar socks



at the inlets. BioChar, a product similar to activated charcoal, is a natural solution to water filtration. This specially produced, highly absorbent product is placed in porous socks and has the ability to filter nutrients such as phosphorus as water passes through. This of course assumes that the phosphorus within the Pond and entering the Pond is elevated. It makes most sense to conduct water quality testing during the 2023 season to further home in on appropriate approaches to phosphorus mitigation, if applicable. SePRO (manufacturer of many aquatic management technologies) also has new phosphorus mitigation technologies being released in 2023 that may be applicable to Sandy Pond (again, without having proper water quality data in hand), these three technologies can be deployed alone or integrated to inactivate phosphorus from inflows/outflows, water column and sediment. One in particular is called EutroSORB and may be an alternative to the BioChar socks. This proprietary product is similar to BioChar in that it provides filtration, however SePRO has designed the product specifically to target phosphorus. They tout as much as 15x-20x more phosphorus removal than BioChar.

As is always the case, we recommend using best management practices. These practices include not using fertilizers on lawns/turf or using non-phosphorous fertilizers when not fertilizing is not an option. Encouraging beneficial buffers will also help limit nutrient input into the Pond. This can be as simple as not mowing directly up to the shoreline.

Ultimately, based on the above dialogue and analysis, the immediate recommendation for either just Sandy Pond, or all three Ayer Ponds would be collection of a baseline water quality sample which includes several basic parameters as well as a suite of nutrients. This may help us “predict” blooms. Aside from this, we are always available to either collect on-call samples for algae ID and enumeration, or if budget allows, set a regular program to monitor algae species and counts. By using this data, we can determine the need for an algaecide treatment prior to conditions shutting down the waterbody. The best approach to actual management in 2023 is on-call algaecide applications with copper-sulfate if needed based on either visual monitoring, or sampling. Copper sulfate is frequently used in drinking water reservoirs, so it is extremely safe. By applying copper sulfate at the early stages of a bloom, we can control it prior to it reaching a level which would warrant a pond shut down. Copper sulfate applications are limited to ½ of the waterbody at a time per the product label. We have provided copper sulfate application costs for all three ponds within our cost table. It is recommended to budget a small amount towards copper sulfate application if applications are necessary during the 2023 season.

Conclusion

Much was accomplished in 2022 as we have continued to control invasive species and nuisance waterlilies within the Ayer Ponds. An algae bloom led to a late season shutdown of Sandy Pond, but several steps can be taken in future years to either proactively limit the chances of this or controlling it prior to a shutdown. As described above, there’s still work to be done. For 2023, we recommend the work described above, paired with the same approach to pre-treatment and post-treatment surveys.



We hope that this year-end report has provided the Commission with valuable information regarding the details of the work performed at Ayer Ponds during the 2022 season. All work performed was consistent with the Orders of Conditions, and the scope of services provided to the Commission. We look forward to working closely with Ayer Conservation Commission to continue to improve the health of the Ayer Ponds for many years to come.

Sincerely,

A handwritten signature in black ink, appearing to read 'James Lacasse', with a long horizontal flourish extending to the right.

James Lacasse
Project Manager
Senior Environmental Scientist
c: 774-276-6098
o: 888-4WETLAN(D)
james@waterandwetland.com
www.waterandwetland.com

Attachments Include

- **Notarized Control Statement**
- **Pre-Treatment Invasive Species Maps**
- **Post-Treatment Maps Invasive Species Maps**
- **Post-Treatment Native Plant Assemblage Maps**

***Please note that the invasive species maps note locations where plants were found (by species). As noted within the above dialogue, the invasive species documented during the post-treatment surveys consisted of a small number of plants in each location, most of which was extremely unhealthy and covered in epiphytic algae.**

November 29, 2022

Ayer Conservation Commission
c/o Office of the Board of Selectmen
Town Hall, One Main Street
Ayer, MA 01432

Dear Ms. Hampson and Commission Members:

I, Colin Gosselin, certify that 90% minimum control of fanwort, milfoil, and curly-leaf pondweed was achieved during the 2022 season. Phragmites treatment was not completed at Sandy Pond during the 2022 season due to the public health advisory, this work was not invoiced. Given this, no statement pertaining to 2022 phragmites control can be provided. Based on surveys, it appears that significant control was gained in 2021 (>95%) and has carried over reduction into 2022.

Sincerely,



Colin Gosselin – Water & Wetland, LLC

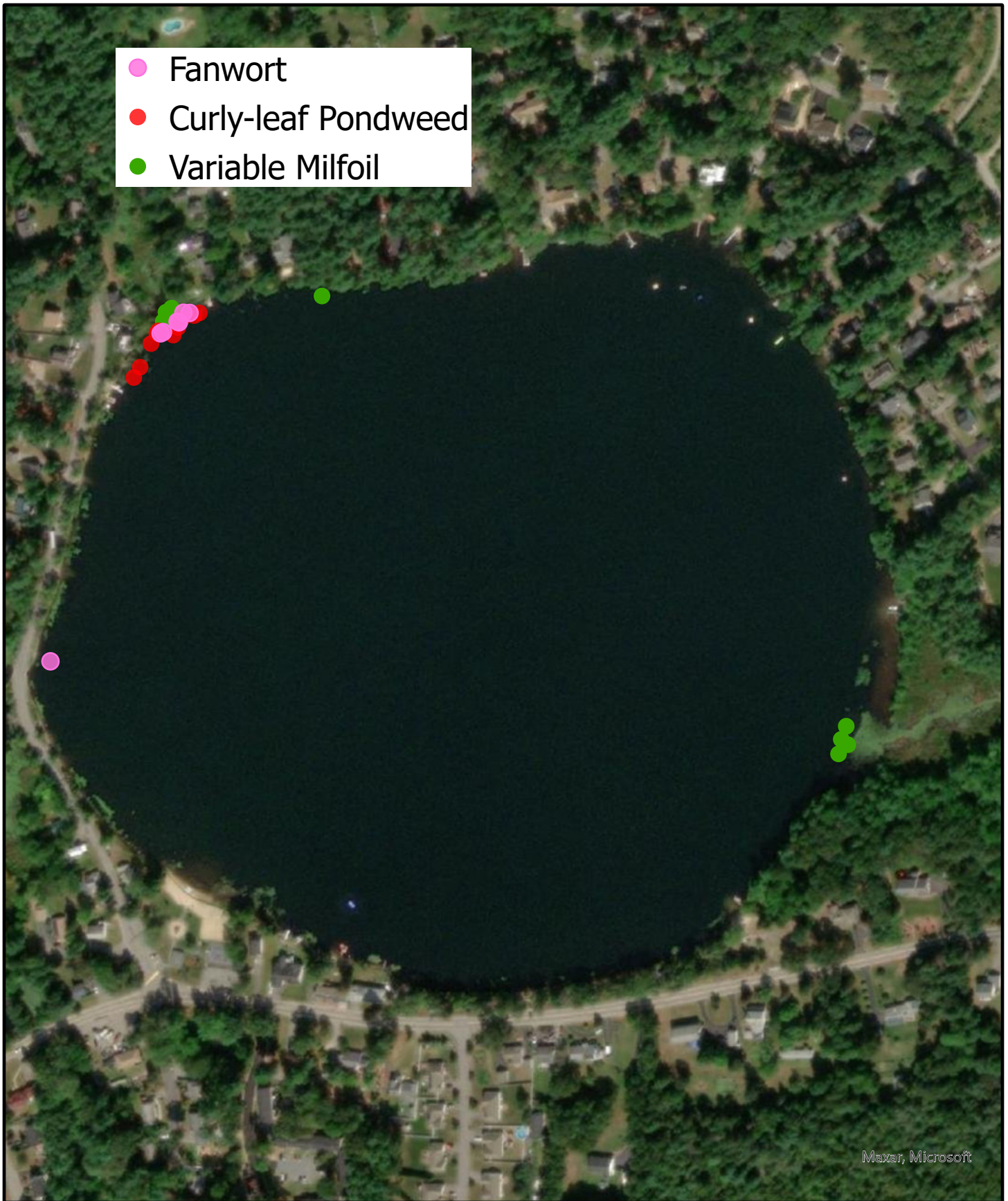
11/29/22
Date

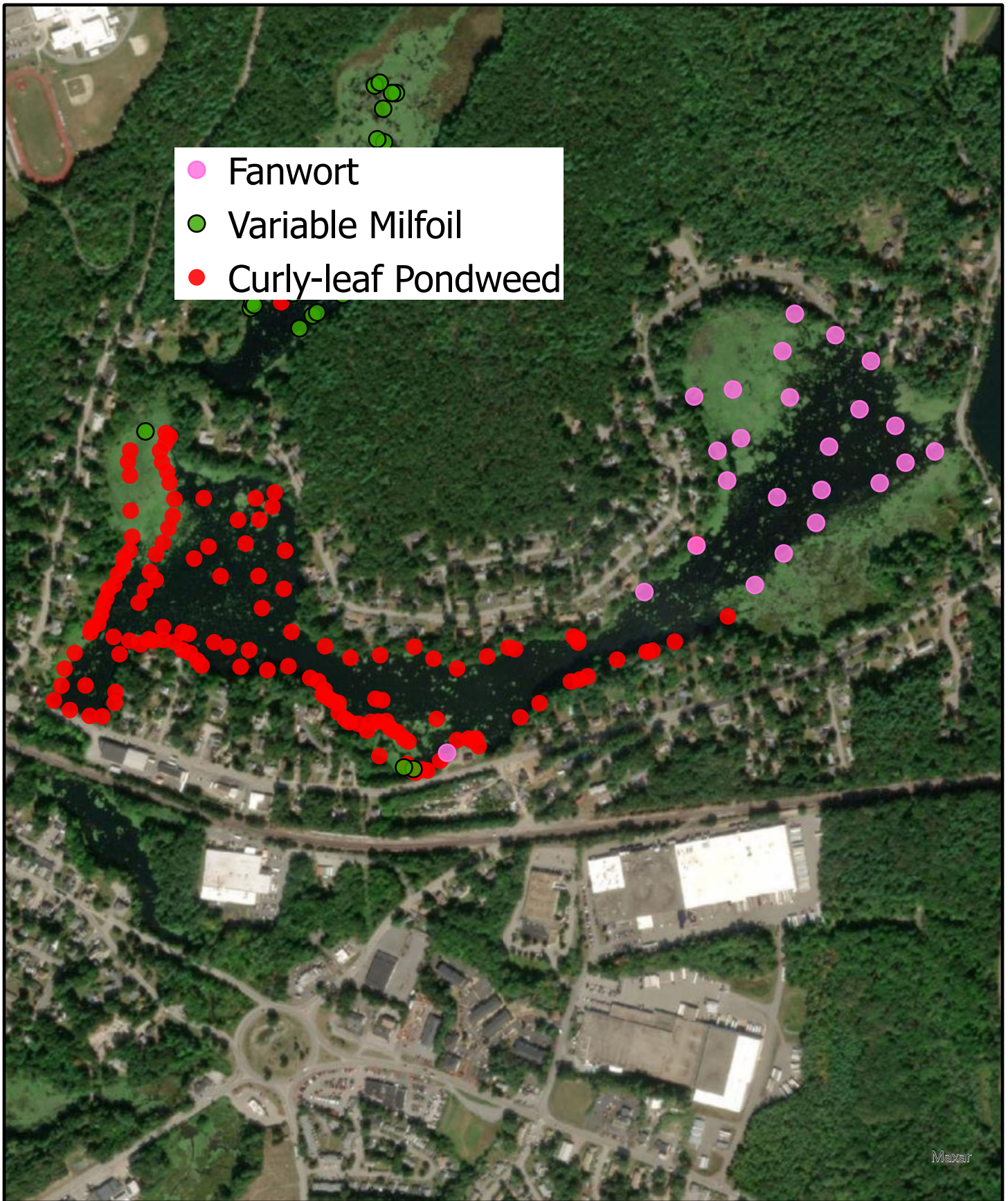
I,  (NOTARY) as a notary public certify that I witnessed the signature of the aforementioned signatory above and I verified the individual's identity on this date:
November 29, 2022

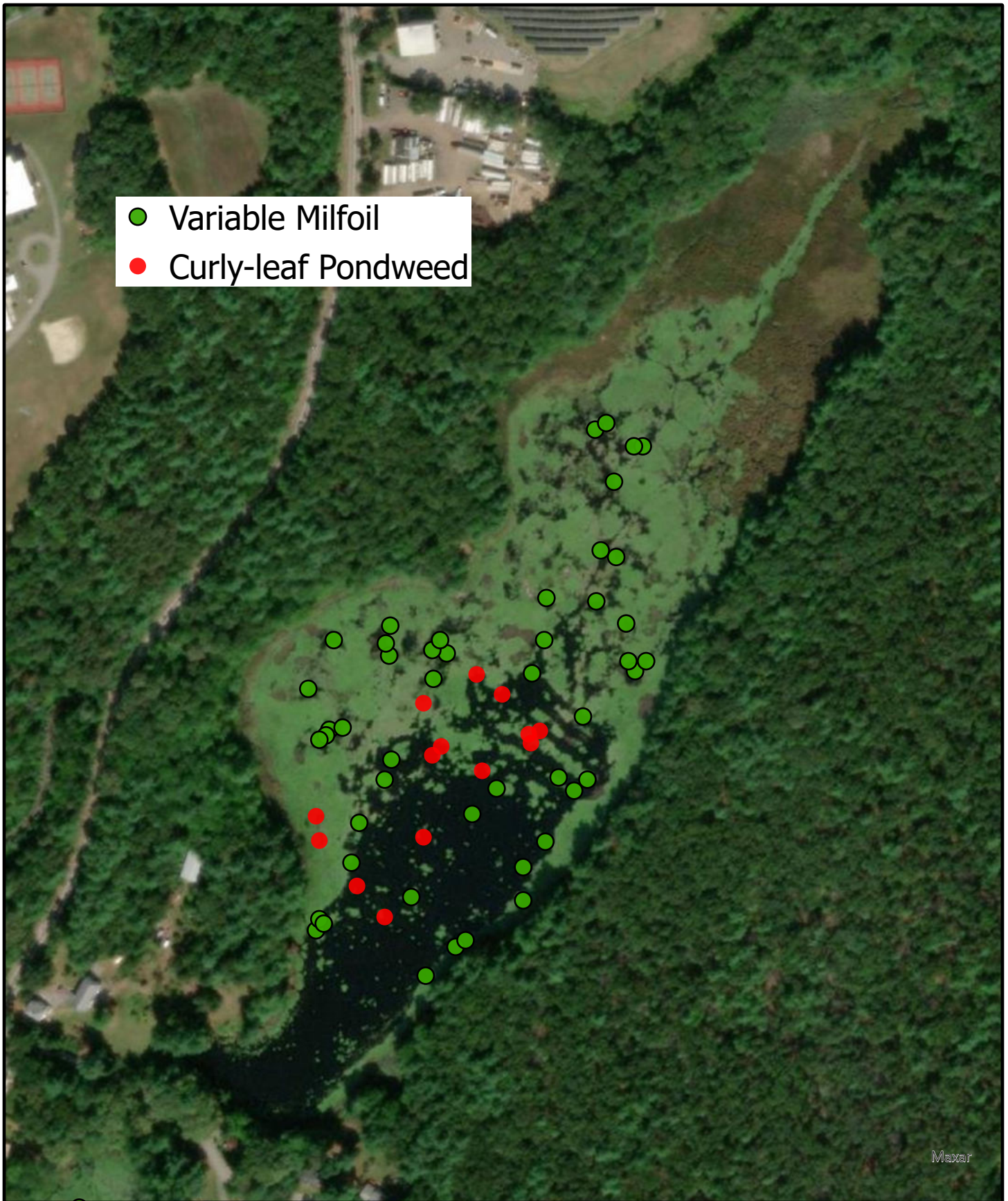
My commission expires on:



AFFIX NOTARY SEAL



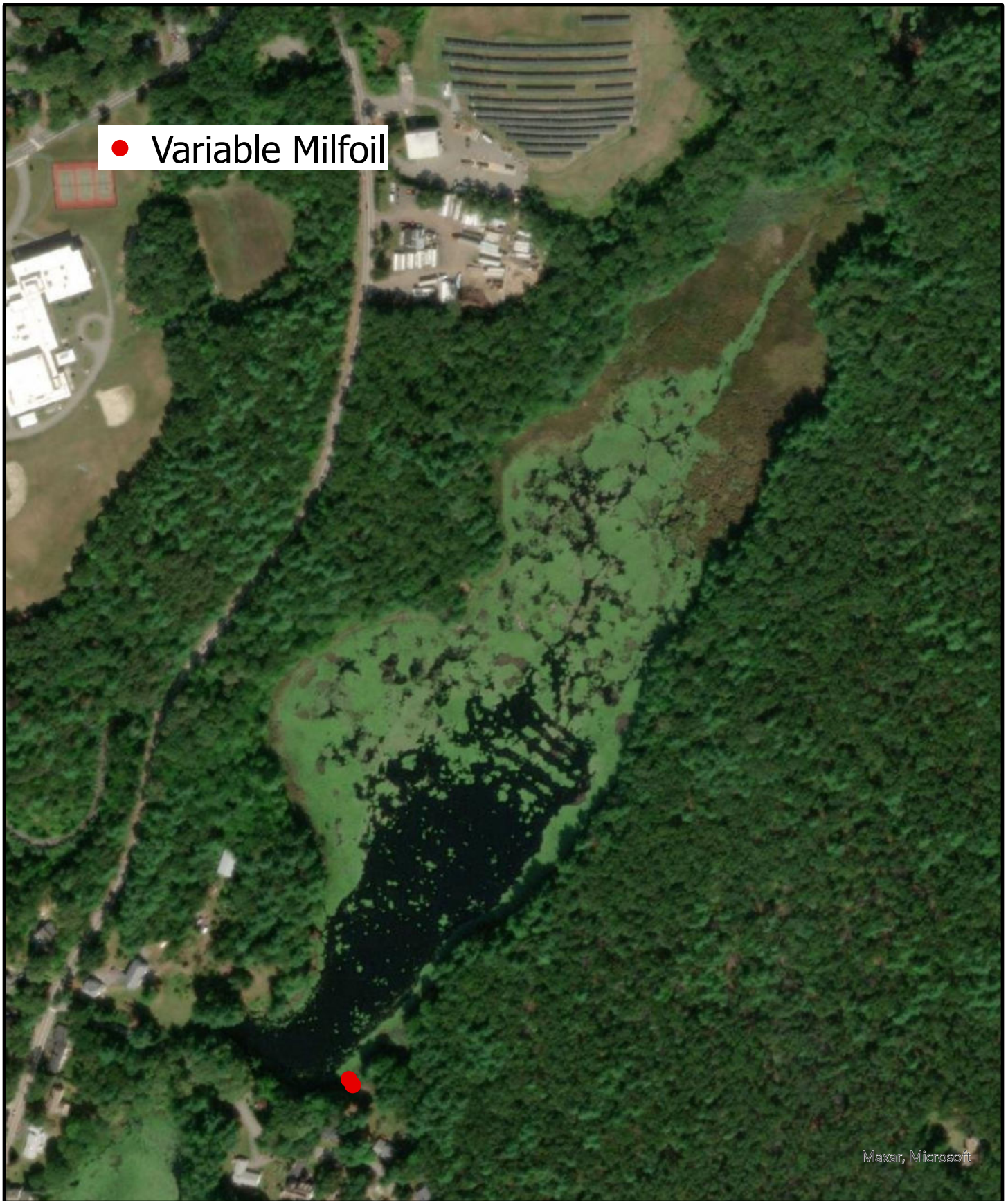




● Variable Milfoil







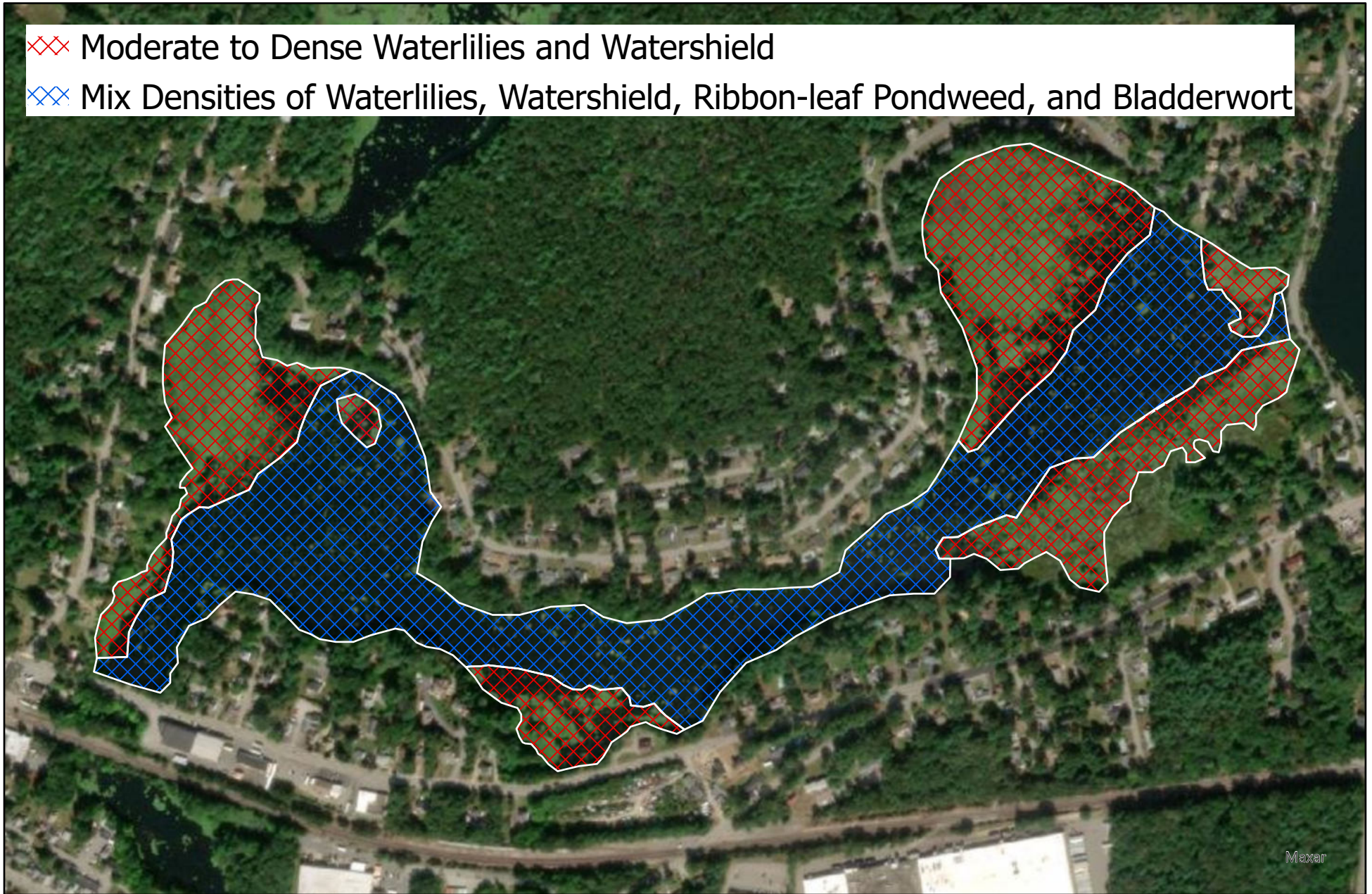
- ✕ Mix Densities of Ribbon-leaf Pondweed, Bladderwort, Waterlilies, and Watershield
- ✕ Waterlilies and Watershield



Maxar



- ✕✕ Moderate to Dense Waterlilies and Watershield
- ✕✕ Mix Densities of Waterlilies, Watershield, Ribbon-leaf Pondweed, and Bladderwort



- ✕ Sparse to Moderate Waterlilies, Watershield, Ribbon-leaf Pondweed, Bladderwort, Coontail, and Duckweed
✕✕ Moderate to Dense Waterlilies and Watershield

